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UNIVERSITY OF WALES

ASPECTS OF GENDER MUTATION IN WELSH

ENLLI MÔN THOMAS

PhD
2001

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List of abbreviations

Adj	Adjective
AM	Aspirate Mutation
ICM	Initial Consonant Mutation
N	noun
NM	Nasal Mutation
PVA	Pre- Vocalic Aspiration
SM	Soft Mutation
y	definite article

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Er ei thrai isel dan warth yr oesoedd,
Er mygu ei llais gan ddirmyg llysoedd,
Er ei myned i gomin drycinoedd
A'i chau o loddest yr uchel wledoedd,
Rhyw un eiliad, drwy'r niwloedd - gwelais des
A hithau, aeres, yn hawlio'i thiroedd.

Ifor Baines

Summary

Research on the acquisition of grammatical gender has shown that for many languages, children gain an early command of gender. However, often in these languages gender marking is quite overt and provides a clear one-to-one correspondence between a marker and the gender encoded. In Welsh, gender marking is more complex. Gender is marked by mutations, a set of morpho-phonological changes that affect the initial consonants of words, and the mapping between mutation and gender is quite opaque. Two mutation types are used in part to mark feminine gender: both feminine nouns modified by the definite article and adjectives following feminine nouns undergo Soft Mutation, and the feminine gender of the possessive adjective *ei* is marked by Aspirate Mutation on the modified noun. The four studies in this thesis examined children's productive command of gender as expressed in the mutation of nouns modified by the definite article, of adjectives modifying nouns, and of nouns modified by the homonymic feminine and masculine possessive adjective. Mutation in non-gendered contexts was also examined.

Subjects were 4- to 9 1/2-year-old children from North Wales. First, a semi-naturalistic study was conducted to obtain knowledge about children's ability with gender marking. A Cloze procedure was also used to elicit children's production of masculine and feminine forms, both real words and nonsense forms, in a variety of linguistic contexts. Some of these contexts provided cues to gender status, some did not.

The data obtained indicated that the acquisition of the Welsh gender system is a drawn-out process, and children have not mastered the system even by 9 1/2 years of age. In addition, children become proficient in marking feminine nouns modified by the definite article and adjectives modifying feminine nouns before they do so on nouns modified by feminine *ei*. Results suggest that when a language has a complex gender system that is marked by opaque morpho-phonological processes the course of development is protracted and variable.

Introduction

Numerous cross-linguistic studies of grammatical gender have indicated that children learn to mark gender distinctions quickly and effortlessly. Gender marking is said to be in place by around the age of 3 years. However, when the language being learned is very opaque and lacks clear-cut form-function mappings, studies have shown somewhat more protracted acquisition.

Most of the Indo-European languages studied mark gender in much the same way: languages have masculine and feminine articles, and noun gender agrees with adjectives, pronouns, and sometimes verbs. However, one group of languages mark gender in an uncommon fashion: this is Welsh and its related Celtic languages. The focus here is on Welsh. Unlike other systems, Welsh does not have distinct forms for the definite article (Welsh has no indefinite article) to mark masculine vs. feminine noun gender. And unlike many of the languages that have more transparent systems, the form of most nouns in Welsh provides little overt information about the gender of the noun. Instead, Welsh marks gender by *mutations* -- a set of morpho-phonological rules that affect the initial sounds of words when they appear in particular lexical and syntactic environments. Feminine nouns that appear after the definite article, adjectives modifying feminine nouns, and nouns that appear after the masculine possessive pronoun undergo the Soft Mutation process; nouns that appear after the feminine possessive pronoun undergo Aspirate Mutation. The mutation system itself is a highly complex system that requires phonological, syntactic, and sometimes semantic knowledge, and is ubiquitously variable. Thus far, there has been no extensive study of children's acquisition of the Welsh grammatical gender system. Given the complexity of the systems involved, how do Welsh-speaking children learn the Welsh gender system? And given that the children are learning an opaque gender system that is itself marked by an opaque mutation system, are Welsh-speaking children, like children learning Hebrew or Spanish for example, able to construct abstract representations of the system they are learning, or will their knowledge remain more piecemeal? These questions form the basis for this thesis.

The thesis starts with a review of cross-linguistic research that has explored the acquisition of grammatical gender (Chapter 1).

Chapter 2 presents an overview of the Welsh mutation system, noting the opacity and variability of the system where possible. This chapter also describes gender marking in Welsh, noting the opacity and variability inherent to the gender system, and the relationship of gender marking with mutations in general.

Since very little is known about the acquisition of grammatical gender in Welsh, and since mutation is an integral part of gender marking, Chapter 3 will review what we know about the acquisition of mutations from studies available in the literature.

Chapters 4 to 8 report on four different studies that were designed to investigate Welsh-speaking children's acquisition of grammatical gender. Chapter 4 reports on a semi-naturalistic study (Study 1). Chapter 5 reports on an exploratory study of children's familiarity with nouns in preparation for Study 2 (Chapter 6). Chapter 6 reports on an experimentally controlled study that allowed for the manipulation of possible cues to gender status. To complement the data from Study 2 that looked at gender marking in local constructs, Chapter 7 reports on data for the marking of gender in distant constructs. In addition, since the marking of gender depends on mutation, Chapter 8 reports on a study that looked at participants' ability to use soft mutation and aspirate mutation in gender-free contexts. Finally, Chapter 9 presents a discussion of the whole of the data for this thesis.

CHAPTER 1

The Study of Grammatical Gender: A Review

1.0 Introduction

One of the most striking aspects of language acquisition is the apparent ease and efficiency with which children are able to acquire not only productive vocabulary -- the overt signal to the hearer that language is being learnt -- but also grammar -- the rules that underpin all aspects of speech. Children have been shown to acquire relatively complex grammatical systems (e.g., inflectional morphology) and do so swiftly and with relative ease.

One area of language that has demonstrated such rapid and effortless acquisition is that of *grammatical gender* -- a class system whereby all nouns are arbitrarily assigned into two or more different classes based on the gender they take. Not all languages show grammatical gender distinctions; some show only *natural* or *semantic gender* (e.g., Chinese -- Vigliocco & Franck, 1999 -- and English), also referred to as *conceptual gender* (Vigliocco & Franck, 1999). Others lack any kind of gender distinction, for example Modern Persian (Peinovich, 1979) and Finnish. These latter languages use exactly the same grammatical forms when talking about either a male or a female being.

In languages that show “natural” gender, gender distinctions can largely be made only for those referents that can be distinguished by sex. For example, in English, *father* is masculine because it always refers to a male human; *bull* is likewise masculine because it always refers to a male animal. In the same way, *mother* is feminine because it always refers to a female human; *hen* is likewise feminine because it always refers to a female animal. Thus, in English, the assignment of gender is based on semantic, or extralinguistic, information. The rudimentary case system for third person singular pronouns -- in the nominative (*he, she, it*), accusative (*him, her, it*), dative (*him, her, it*), and genitive cases (*his, her,*

its, hers) (Martinez & Shatz, 1996) -- is one way in which English marks gender. Such markers can agree with a co-referential noun in English in the following way: “The waiter is kind. He is a nice man” vs. “The waiter is kind. *She is a nice man” (cf. “The lady is kind. She is a nice woman” vs. “The lady is kind. *He is a nice woman”). However, the pronoun is not the only marker of gender in English: some feminine noun suffixes for humans can be added to some nouns denoting males. For example, adding *-ess* distinguishes between a male (e.g., *waiter, actor*) and a female (e.g., *waitress, actress*). Although gender marking in English is by far less prominent than it is in grammatical gender languages, Corbett (1991) notes that the English system should nevertheless be classified as a gender system, a “pronoun gender system” (although this is not a universal view; see Corbett, 1991). In English, inanimate nouns are mostly given no gender status¹.

Gender assignment is different for languages that show grammatical gender. In such languages, “gender” denotes a grammatical classification of nouns and not an indication of the sex of the nouns’ referents. This can be confusing; as Griffiths and Jones (1995) state, “it is misleading and unfortunate that the labels *masculine* and *feminine* have to be used . . . It would be just as logical to classify nouns as red nouns and green nouns, or as round nouns and square nouns” (p. xii). However, some disagree with this statement: it is no accident that “masculine” gender usually includes words for males and “feminine” gender words for females.

Nouns are often divided into two or three different gender classes, in the case of most Indo-European languages (and even more classes in some noun-class languages; see below for more detail), based on the linguistic properties of the nouns. These categories usually take the names feminine and masculine, and for those languages that have an additional third class -- neuter. Members of these

¹ However, some inanimate objects that are “personified personal possessions” (Martinez & Shatz, 1996) are frequently assigned a gender pronoun (Mathiot & Roberts, 1979). For example, a “ship” is frequently used as a feminine noun in English, thus allowing statements such as “there she sails,” and a car might be assigned feminine gender thus allowing for such descriptions as “she’s a good runner.”

different classes often take different determiners, different adjectival forms, and so on (Frigo & McDonald, 1998).

Animate nouns are often placed into gender categories based on their biological sex, but this is not always the case. Although girls are “naturally” female, in German *Mädchen* “girl” is grammatically neuter (Matthews, 1997), in Irish *cailín* “girl” is grammatically masculine (Dinneen, 1938), and, although cats can be naturally male or female, *cath* “cat” is grammatically feminine in Welsh. A noun is assigned its gender based on its shared grammatical properties with those of other words or phrases that mark gender; gender is a way of establishing morpho-syntactic concord among elements within a sentence (Gathercole, 1995). Thus, in the following two Spanish examples², all items in the sentences agree in gender:

1. *La mesa redonda* “the brown table (feminine)”
2. *El anillo redondo* “the brown ring (masculine)”

In the first example, *mesa* (feminine) “table” is preceded by the feminine article *la* and is followed by the adjective marked by its feminine form *redonda*; all items thus correspond in gender. In the second example, *anillo* (masculine) “ring” is preceded by the masculine article *el* and is followed by the adjective marked by its masculine form *redondo*.

Often, in grammatical gender languages, there operates a (sometimes) fairly consistent set of “rules”³ for gender assignment, with overt morphological and phonological features on the noun itself (see below for discussion). However, “consistent” systems of this kind are imperfect at best.

This chapter reviews cross-linguistic research that has focused on grammatical gender and will attempt to answer the following questions:

- How does a language assign gender?

² According to the analysis of Harris (1991) /o/ and /a/ endings in Spanish are word markers. The class of Spanish nouns that have the suffix *-o* invariably attach to masculine stems and the suffix *-a* invariably attaches to feminine stems.

³ According to Koehn (1994), the term “rule” (in morphology) is used to refer to either the processes that underlie morphological behaviour or to denote the regularities in the morphological system of a particular language. For the purpose of gender marking, I use “rules” in the latter sense.

- On what basis do different languages assign each noun into a specific gender class?
- How do children succeed in acquiring such a complex system?

1.1 Related Systems

In the past, discussion of grammatical gender has mainly focused on a small set of languages, usually those of the Indo-European variety. Often, such languages exhibit gender systems that are not typical of the systems found elsewhere in the world (Corbett, 1991). Most Indo-European languages show gender; for example, French and Spanish have two gender classes -- masculine and feminine (e.g., Clark, 1985; Levy, 1983a, 1983b; Karmiloff-Smith, 1978, 1979, for French; Levy & Tolchinsky, 1999; Gathercole, 1989, 1995; Cain, Weber-Olsen, & Smith, 1987; Andersen, 1984, for Spanish), and German and Polish have three gender classes -- masculine, feminine, and neuter (e.g., Mills 1986a, 1986b; Böhme & Levelt, 1979, for German; Smoczyńska, 1985, for Polish). However, some other languages show even greater numbers of classes. For example, Swahili is said to have six genders (Grosjean, Dommergues, Cornu, Guillelmon, & Besson, 1994; see also Wald, 1990), whereas Tsez, a Nahk-Daghestanian language, has four noun classes⁴ (Polinsky & Jackson, 1999). According to Corbett, the Niger-Kordofanian family of languages shows the greatest number of noun classes; the degree to which gender is reflected in syntax is also greater in these languages. The classificatory criteria by which nouns are assigned to a particular class in such languages are very complex and rely on a number of different factors, including semantic and even pragmatic information about the referents of nouns. For example, Foley and Van Vallin (1984) (cited in Jones, 1988, pp. 3-4) cite work by Bruce (1979) which states that in the Alambalak of Papua and New Guinea “masculine gender with inanimate objects denotes long thin things, while feminine denotes short, fat, and round

⁴According to Polinsky and Jackson (1999) (after Hockett 1958), noun classes and genders are different terms for the same concept. However, “genders” are used more for languages that have up

objects” (p. 325). Likewise, in the Tsez language, Class 1 includes all nouns referring to male humans and those supernatural beings that are conceptualised as male; Class 2 includes nouns referring to female humans and deities, as well as a large group of inanimate nouns that fall into a mixed group of semantic sets (e.g., berries, flat objects); Class 3 generally includes nouns referring to animals, but also includes a set of inanimate objects that are semantically mixed (e.g., names for some body parts, some tools); and Class 4 includes nouns that adhere to one formal principle -- that is, they are derived inanimate nouns (e.g., abstract nouns with particular suffixes) (Polinsky & Jackson, 1999). It might be possible to distinguish between what are generally accepted to be gender classification systems and what are generally accepted to be *noun classes*. According to Corbett, only one type of classification counts as a gender system. If the gender classification is reflected beyond the actual nouns themselves -- that is, if the classification is involved in the modifying of “associated words” (e.g., adjectives, verbs, articles) -- then this is classified as a gender system. Therefore, “saying that a language has three genders implies that there are three classes of nouns which can be distinguished syntactically by the agreements they take” (Corbett, 1991, p. 4). And since noun class systems can also show agreement (although the criterion of inclusion in a given class is more complex) they can be accepted as being gender systems.

Gender marking is therefore widespread in the world's languages, some operating a grammatical system, others operating a semantic one. Since most of the acquisitional research has been conducted on the Indo-European languages, noun-class systems are not discussed further in this thesis.

I now turn to the relevance of marking grammatical gender agreement in these languages.

to three classes (feminine, masculine, neuter); “noun classes” is used for languages that predominantly use a semantic/pragmatic classification for inclusion in a given noun class.

1.2 Why Gender Agreement at all?

The function of gender marking as a linguistic device has long been debated. The correspondence between gender and sex with animate nouns is indirect at best (Bates, Devescovi, Pizzamiglio, D'Amico, & Hernandez, 1995); no such correspondence exists with inanimates. There is no reason why, as Maratsos (1981) points out, the term for “the flute” in German -- *die Flöte* -- is feminine, whereas the term for “girl” -- *das Mädchen* -- is neuter. So, lacking any foolproof semantic classificatory criteria, how and why do a number of the world's languages retain what looks to be a redundant classifying system?

Karmiloff-Smith (1979) noted that as early as 1889 linguists saw gender as a powerful syntactic process that signals the relation between sentence segments (e.g., Brugmann, 1889; Meillet, 1952; Martinet, 1956; Mok, 1968; see also Weber, 2000). Since then, numerous explanations, based on the internal laws of language, have been proposed to suggest why languages have gender distinctions. For example, Bates, Devescovi, Hernandez, and Pizzamiglio (1996) suggested that gender serves a communicative function. Gender marking, both within and across sentences, could aid the listener's attention to the several different referents in a complex discourse, thus allowing the listener to be better able to “keep track” of those referents. Gender functions as a process that allows us to compute long-distant relations among elements in a sequence (Vigliocco & Franck, 1999). Bates et al. cite research by Kilborn (1987) that provides some corroborative data for this view in that German-speaking listeners have an advantage over English-speaking listeners in a word-monitoring task. The tasks required the listeners to identify words in syntactically well formed but semantically anomalous prose -- for example, *Farblose grüne Gedanken schlafen wütend* “Colourless green IDEAS sleep furiously”.

1.3 Different Languages, Different Systems

Languages that show grammatical gender differ in many respects. To begin, they differ in terms of how they show gender distinctions at surface level.

Generally, depending on the language, gender classes differ in noun inflections in different case contexts, in determiner endings, in adjectival endings, in pluralization markers, in verb agreement markers, or in different sets of co-referential pronouns (Maratsos, 1983). Typically, in richly inflected languages, gender agreement is circular (e.g., between nouns and determiners, nouns and adjective modifiers, nouns and pronouns) (Vigliocco & Franck, 1999). The selection of the appropriate form is dictated by agreement; if, in Spanish, for example, a noun is feminine (e.g., nouns ending in *-a*, which often take feminine gender, although there are exceptions), it will take *-a* on the definite article and on most adjectives employed (see Example 1 above). Similarly, if the noun takes *la* as its definite article, it will also take *una* as its indefinite article; the noun would therefore be feminine. In like manner, if the noun took *el* as its definite article, it will also take *un* as its indefinite article. These nouns would be masculine (note, however, that this is also not without exception). The question that arises is what dictates whether a noun takes *el* or *la* in the first place (Maratsos, 1982)? This is where gender systems differ the most. Whereas some languages have relatively clear sets of “rules” that can help aid the speaker to determine the gender of nouns, and subsequently the agreement they can take, others have no such useful information. In the next section, I will describe the differences that are to be found cross-linguistically.

1.4 Cross-Linguistic Differences in Cue Type

For some languages there are two types of semantic cues that can aid the speaker’s knowledge about the gender of some nouns. The first of these cues I have already discussed: the biological sex of the referent. Such information appears to be useful for natural gender languages, and useful, in part, for animate nouns in grammatical gender languages. I will not be concerned here with nouns that can be

of either gender (e.g., *camarade* “friend” in French), although it is worth noting that even semantic information of this sort can add confusion to what seems to be initially a simple system. The second type of semantic cue is membership in a semantic class. For example, in German, seasons, months, days of the week, weather features, and North, South, East, and West are masculine. However, these are not without exceptions (e.g., whereas *Regen* “rain” is masculine, *Sonne* “sun” is feminine; also *die Gabel* “the fork” is feminine, *das Messer* “the knife” is neuter, and *der Loeffel* “the spoon” is masculine in German -- Maratsos, 1988) (also see Chapter 2 for information about Welsh semantic classes). However, for most languages, gender categories are only peripherally tied to meaning (Maratsos, 1983). Therefore, the question arises of how, semantic-based knowledge aside, children learn the gender associations of nouns.

There exists, in a number of languages, a set of linguistic cues that can, depending on the language, act as good, or fairly good, predictors of noun gender. These are often called *distributional privileges*. Children’s use of cues to help them define the agent or actor of an action in ambiguous contexts has been shown in cross-linguistic studies to differ in terms of the cues they use and the different weighting children give to a specific noun; these depend on the specific structural possibilities of the language the children are learning (Carroll, 1999). For some languages, gender can be inferred from the word ending: the phonological form of the noun suffix can predict the noun’s gender (Maratsos, 1983). This means that for some languages gender is systematically marked. These languages have what are called *transparent systems*. For example, in Hebrew, nouns ending in stressed /a/ or /t/ are feminine (Levy, 1983a, 1983b; Maratsos, 1983), they take *-ot/* as their plural suffix ending, and take various other sets of verb and adjective agreement markers. Nouns with other endings are usually masculine, take *-im/* as their plural form, and take a different set of verb and adjective agreement markers (Maratsos, 1983). In Italian, nouns ending in *-o* are masculine (e.g., *sasso* “stone”) and nouns ending in *-a* are feminine (e.g., *pietra* “rock”) (Vigliocco & Franck, 1999). Spanish is similar.

Teschner and Russell (1984) calculated that Spanish nouns ending in *-o* are masculine 99.87% of the time and nouns ending in *-a* are feminine 96.3% of the time. Such consistencies in a language help provide a basis on which children can develop their system and acquire gender (see also Surridge, 1995, for information on French endings; Surridge, 1989, for information on Welsh endings; and Zubin & Köpcke, 1986, for information on the distribution of gender in German based on folk-taxonomy). Once a speaker knows one gender-marked form that goes with a noun, he or she will be able to predict the form of the other agreeing elements in an orderly manner. This is what makes some systems productive: new uses can be made from the orderly knowledge of the system (Maratsos, 1982).

Recent research shows that children attend to such regularities: they are able to construct a rule-based system that relates the phonological shape of the noun to other agreeing elements, and they do so at a very young age (Maratsos, 1983). Therefore gender assignment is often seen to be rule-governed, although exceptions are abundant, as is common with lexical phenomena (Salmons, 1994). One possibility for this early, often accurate, knowledge of agreement between the different elements that mark gender is that children's knowledge of gender marking may be, initially, in the form of limited scope formulas. These formulas might allow the children to, know, at some surface level, that a certain form co-occurs with a certain noun ending, and so on. (This is the case only if the system they are learning has a regular mapping between form and function.) Children might only later break down these elements to allow analysis of the linguistic relationships between items, thus allowing for more "systematic learning" (Cruttenden, 1981), or more productive control of the system (Perkins, 1999). These two stages -- the proposed early formulaic learning (or *holistic* knowledge -- Perkins, 1999) and the later more system-based learning (or *analytic* knowledge -- Perkins, 1999) -- would be one explanation for the presence of an U-shaped curve often found across ages (see e.g., Karmiloff-Smith, 1992; see also Hickey, 1993, for some data on the early acquisition of formulas). I will return to discuss research data later in the chapter.

In some languages one cannot find one simple ending that can be taken as the marker of masculine nouns and another ending that can be taken as the marker of feminine nouns. Maratsos (1983) considers Russian, Polish, and German to have such complex gender systems. Russian, for example, has six cases and three genders. Feminine singular nouns take *-a* in the nominative, *-u* in the accusative, and *-oy* in the instrumental. Masculine nouns take *-om* in the instrumental; they are not inflected in the other cases. Neuter nouns take stressed *-o* in the nominative and *-om* in the instrumental. The only way in which children can learn this, according to Maratsos, is if they learn the associations between endings: nouns that take *-a* in the nominative take *-u* in the accusative and take *-oy* in the instrumental; nouns that take no ending in the nominative take nothing in the accusative and *-om* in the instrumental; and nouns that take *-o* in the nominative take nothing in the accusative and *-om* in the instrumental. What this means, according to Maratsos, is that children must first learn which case marker a particular noun takes in various case environments and subsequently learn that some nouns tend to share markings. The child's task would then be to construct categories that summarise this information about the shared uses of nouns.

However, there can be numerous irregularities in these systems also. For example, in Russian, although it is the feminine nouns that tend to take the *-a* ending, many masculine nouns also end in *-a*, the most notable examples being *papa* "father", *dyada* "uncle", and *diduska* "grandfather" (Maratsos, 1983; Popova, 1973).

Given these cross-linguistic differences in grammatical gender systems, children might follow different developmental paths to acquisition, with differences reflecting the different surface systems they are learning. The next section presents an overview of the main theoretical accounts for the acquisition of grammatical gender. This section is followed by a review of the research that has been conducted on the acquisition of grammatical gender.

1.5 Theoretical Accounts of the Acquisition of Grammatical Gender

Linguists and researchers have identified two main (and overtly contradictory) theoretical approaches to the acquisition of grammatical gender. These are discussed in turn below.

One of the main theories of the acquisition of grammatical gender is what has been often termed the *sexus theory* (e.g., Karmiloff-Smith, 1978), or otherwise known as a *natural gender theory* (Pérez-Pereira, 1991a). It suggests that the origins of gender lie essentially in extralinguistic reality, namely the semantic features found in natural, biological sex distinctions. Initially, it is the natural gender of beings that have sexual dimorphisms that determine the gender of the corresponding noun (Pérez-Perera, 1991a). This would suggest, as Levy (1988) pointed out, that children perform better (firstly) on animate nouns. The assignment of gender to semantically arbitrary nouns -- that is, nouns that are not assigned their gender based on any referential criteria -- is seen as an extension of such natural classificatory criteria, possibly through overgeneralization of gender distinctions to things that men and women typically own. For example, *pipe* will be masculine by virtue of its association with males, and *lipstick* will be feminine by virtue of its association with females. Subsequently, the distinctive phonological features peculiar to a given class are taken to stem from the need to mark such natural distinctions (Levy, 1988). This latter stage of the *sexus theory* corresponds to Schlesinger's (1981) semantic-assimilation model: the semantics of the gender categories are continually redefined, becoming gradually more flexible, allowing the child to assimilate more disparate examples into the classes. (See also Macnamara, 1982, and Pinker, 1984, for comparable views.)

An interesting stance on the natural *sexus theory* is one put forward by Martinez and Shatz (1996). Considering that children are said to acquire information about male and female physical characteristics from around 2;6 years of age (Golombok & Fivush, 1994; Serbin & Sprafkin, 1986), and are able to label themselves and others by gender (the notion of gender identity -- see Bem, 1981) at

this age, children will hypothesise that linguistic gender categories are based on natural gender. Consequently, whenever the system shows conflict between the linguistic gender and what conceptual information the child has about the referent of the noun, the child must endeavour to make sense of the system, that is, to give some kind of meaning to the system. Martinez and Shatz noted two ways in which the child could aim to override such conflict; both approaches are dependent on the type of language the child is aiming to master. First, children who are learning a natural gender language (e.g., English and Chinese) might notice that everything that corresponds to natural gender distinctions is marked in distinctive ways; this would allow the child to understand the relation between linguistic form and conceptual organisation. Conversely, children who are learning a grammatical gender language (e.g., French, German, Russian, Polish, Italian, Hebrew, Dutch, Welsh) must deal with the organisation of both animate nouns, that are often marked with a corresponding linguistic gender, and inanimate nouns, for which linguistic gender is arbitrarily assigned. On the one hand, the child might simply have difficulty in sorting out the inconsistencies between linguistic form and conceptual structure. Martinez and Shatz favour this explanation, drawing on a semantic bootstrapping approach, arguing that children find meaningful distinctions easier to learn than arbitrary ones (Bates & MacWhinney, 1987). According to the “meaning first” view (Levy, 1988), early speech should consist of one-to-one mappings between linguistic elements and their corresponding meaning units. However, when a language is devoid of such correspondences (e.g., languages that have elaborate grammatical gender systems that assign gender arbitrarily), the system will be acquired late. This also coincides with Gleitman's (1981) stage model, which notes that early representations are conceptual; only later in acquisition, throughout maturation, does the child develop a formal grammar (Gleitman, 1981; Levy, 1983a, 1983b) (cf. Brown, 1973, and Slobin, 1973).

The opposing view holds that children approach grammatical gender systems by establishing a linguistic category. This view claims that children pay

more attention to, and note regularities in, the more formal properties of the language than they do to the nature of the referents (e.g., Maratsos, 1983, 1988; Valian, 1986; Karmiloff-Smith, 1983, 1986; Maratsos & Chalkley, 1980). This has often been named the *formal theory*. According to it children discount semantic information for the more foolproof linguistic cue. If children approach the acquisition of gender in this way they should be able to learn arbitrary formal categories and semantically based categories equally well (Martinez & Shatz, 1996), although natural gender must stem from these formal regularities. Children should also be able to learn these morpho-phonological patternings for all nouns, animate and inanimate alike (Levy, 1988).

One modification of a strict formal theoretical view takes into account that no system is truly transparent. Children may need, at some point when faced with an arbitrary cue to gender status, to take on board some semantic underpinnings to aid their understanding of the gender of nouns. One other possible approach to learning, put forward by Levy (1983a, 1983b), is that children learn gender distinctions for animates by following a semantic route and gender distinctions for inanimates by following a formal route. If this is the case for any language, Levy argues, there should be no overlapping generalisations or any overlap of systematic errors across the animate/inanimate distinctions.

Given that gender systems differ in the extent to which formal properties (or distributional privileges) and semantic information can aid the child's first best guesses about the gender of a noun, it is expected that children's learning strategies, and their developmental path, may be dictated by these differences. As Karmiloff-Smith (1979) suggested, "whether a child initially acquires a given category by a phonological, semantic, pragmatic, or syntactic procedure will usually depend on the predominant patterns in the input" (p. 235). And as Mills (1986b) found, "the course of acquisition [for English and German] is linked closely to the structural properties of the language concerned" (p. 31). Thus one could predict that children learning a more transparent, overtly marked gender system, where syntactic

distinctions form the most consistent basis for the choice of particular form in the adult language, would make more use of the formal regularities in the system than of semantic information (De Houwer, 1987). Conversely, children learning a more opaque system, where the morpho-phonological regularities are not transparent, might need to make some use of semantic information to help them make sense of the irregularities in the system. As De Houwer argues, “the relative distributional status of gender marking forms, combined with their absolute frequency of occurrence in input, have a strong determining influence on what forms the child will initially produce” (p. 56).

In the next section I report on the growing body of research that has appeared in the literature for grammatical gender, and in particular, research investigating acquisition. Much of the cross-linguistic studies of gender has been geared at investigating the semantic vs. syntactic route to acquisition. However, because of the characteristics of the Welsh language, and in particular the Welsh grammatical gender system (see Chapter 2), this review of the acquisition data focuses mainly on two things. First, it focuses on data for languages where children seem to be relying on the formal properties of the linguistic system they are learning; second, it focuses on what happens in languages that have opaque gender systems.

1.6 Acquisition Data

Much of the research that has looked at the acquisition of grammatical gender falls into one of two types. On the one hand researchers have investigated very young children’s abilities with grammatical gender in naturalistic situations; this has been done using either longitudinal or cross-sectional observations (e.g., Mills, 1986a, 1986b; Berman, 1981, 1985; Hernández-Pina, 1984; Levy, 1983a, 1983b; MacWhinney, 1978; Henzl, 1975; Popova, 1973). This type of research not only provides invaluable cross-linguistic information about the rate and timing of acquisition, but also allows for analysis of errors in production (Peréz-Pereira,

1991a) that can reveal interesting facts about the acquisition process. On the other hand, researchers have administered experimentally controlled sets of studies that allow for the manipulation of intralinguistic and extralinguistic cues to gender status. This type of research is valuable in determining the extent to which children learning specific languages rely on certain types of cues (semantic vs. syntactic) to determine the gender of nouns. However, for some of these studies, other researchers have highlighted methodological flaws and numerous inconsistencies. More often than not, these flaws are a product of a lack of attention to the degree to which formal linguistic cues can aid the child's choice of gender (see e.g., Levy, 1988, and Pérez-Pereira, 1991b for criticisms of various studies).

1.6.1 Formal vs. semantic route to grammatical gender acquisition.

Only a few studies that have been conducted on the acquisition of grammatical gender seem to support a semantic-based theory of acquisition. Slobin (1966), for example, indicated that for the Russian child, semantic correlates are important factors for the learning of gender form-class distinctions. Children begin by overextending the use of the dominant feminine past tense ending to all nouns, even those that have obvious male referents (e.g., *papa* "father"). The masculine past tense is later used for nouns that are semantically feminine.

In her study, Mulford (1983, 1985) replicated another study that was previously conducted on German by Böhme and Levelt (1979) with children learning Icelandic. Eighty children took part; these were divided into one of five age groups, ranging from 4 to 8 years of age. In Icelandic, neither semantic information nor formal properties are necessarily good predictors of masculine, feminine, and neuter gender (Mulford, 1983). This study involved the use of nouns for people, animals, vehicles, and nonsense nouns. The formal cues provided were the presence of endings that denote a particular gender: *-a* was used to denote a feminine noun, *-i* to denote a masculine noun, and *-(c)c* was used to denote neuter. The children were provided with four arrays consisting of three objects and were

asked three questions per array (e.g., “where is he/she/it?”). The children’s required response was to either act upon or describe one of the three objects. Overall, the results showed that the children produced around 75% mean correct responses with nouns for people, 66% with nouns for animals, and 45% with nonsense nouns. Therefore they performed better when faced with natural gender than when faced with syntactic gender. Mulford concluded that formal information about noun gender was not very useful to children acquiring Icelandic until after the age of 7 years. Moreover, she noted that it was not until 7 years of age that children seemed able to assign gender based on the phonological properties of the nouns above chance level. Mulford’s data thus indicates that children learning an opaque system may attend to the natural gender properties of referents before they are able to attend to the formal properties for gender categorisation (Mulford, 1985). However, Pérez-Pereira’s (1991b) re-analysis of Mulford’s data suggested that Icelandic children found formal cues more useful than was originally anticipated by Mulford (1985).

Another study that provided preliminary evidence to support the notion of semantic-based learning for children learning Icelandic was that conducted by Pálsdóttir (1982). In a single-case longitudinal study, Pálsdóttir found that the use of pronouns in reference to both animate nouns and inanimate nouns was variable until the child almost reached her third birthday. At around that time, she seemed to abruptly understand semantic gender; this was evident in her ability to use the appropriate pronoun in reference to people and dolls from that age on (Pálsdóttir, 1982, cited in Mulford, 1985).

Levine (1999) conducted a study in which native and non-native adult speakers of German were given a set of 40 nonsense nouns and asked to assign each noun its gender by writing the appropriate definite article in front of each word. Levine noted from her results that, for some adults, semantic information in the form of the gender of similar, more frequently known nouns, might play a role in adults’ assignment of gender to nonsense nouns.

If these studies give an accurate picture of the acquisition of gender in these languages (that is, that semantic information is more important than syntactic information), then it is more surprising that studies on languages with semantic gender systems, like English, often indicate that children have difficulty with the semantic notion of gender (Levy, 1983a, 1983b). In a study performed by Ervin-Tripp and Kluwin (in preparation), English-speaking children did not find the sex of the referents depicted in pictures nor the gender of proper nouns useful indicators of gender. Mills (1986a, 1986b) compared 3- and 4-year-old German- and English-speaking children's gender marking on pronouns. Each child was given pictures of three children, one baby, one man, and one woman, and was asked to provide names for them. The experimenter would use the names given by the children to ask questions and expected the use of pronouns in response. Mills' data showed that the German-speaking children performed at near ceiling level, a performance that was better than that of their English counterparts (approximately 74% correct overall). She attributed their performance to the fact that German operates an extensive grammatical gender system, a system that English lacks. Levy (1988) made the same point, namely that it is reasonable to assign the German-speakers' superior ability to the differences found in the gender systems of these two languages. On the one hand, German operates a grammatical gender system. Although, as Levy points out, the German system of noun endings is not as regular as it is in a language like Hebrew, it nevertheless offers the child some systematic basis on which one may be able to predict the gender of a noun. For example, nouns ending in *-e* (e.g., *Henne* "hen" and *Jacke* "jacket") are often associated with feminine gender (Mills, 1986b). Phonetic rules of this type also apply to proper nouns. On the other hand, English operates a semantic gender system, where there are no such formal criteria that can indicate the gender of a noun. Therefore, for the German-speaking child, phonological markings particular to masculine and feminine gender help children determine the appropriate pronoun to use in conjunction with the noun.

In contrast to these studies supporting a semantic route to the acquisition of gender, the majority of research conducted on the acquisition of grammatical gender seems to support a more formal route to acquisition. Children are said to attend to the formal properties of the linguistic systems they are learning, and do so even when semantic information is available or is in conflict. For example, many studies indicate that children are able to rely on such cues very early on in development. From her longitudinal study of a German-speaking child, Mills (1985) noted that most errors were conducted on neuter and masculine animate nouns thereby contradicting a semantic-based explanation. Accordingly Mills argued that children attended to the morphological features of the nouns to determine the appropriate article to use.

Mulford (1983) noted that within grammatical gender research, there is one type of error that is repeatedly found in the language of 2- to 3-year-olds; this is often in parts of the system that are grammatically opaque and may require semantic knowledge about the referent to help determine the appropriate choice of the gender form. For example, she notes the he/she distinction in English, the [+/-virile] distinction for plural nouns in Polish, and the second person pronoun and verb forms in Hebrew and Russian as providing particular problems.

Slobin (1981) summarised a single-case study of one child's use of pronouns and gender marking on past-tense verbs in Russian, and the data coincide with Mills' (1986a, 1986b) and Levy's (1988) research presented above. Slobin found that at 2;4 years of age, the child could produce correct noun-verb combinations that agreed in gender once full nouns appeared in his speech. However, Slobin also observed that the child showed confusion with the pronouns "I" and "you", but no confusion with *on* "he" and *oná* "she". Thus Slobin found that this Russian child experienced difficulty with the past tense when his only cue to linguistic gender was the gender of the referent in the real world (*I, you*). When the pronouns were formally marked for their respective genders, the child experienced no such difficulty, producing correct agreement from early on.

Therefore, as Mills, and Levy, suggested, it could be that the Russian-speaking child's better ability with gender pronouns is due to the number of cues to gender agreement that are available in the language, and that children will attend to these more than to the semantic information that is also available.

Böhme and Levelt (1979) conducted another study that looked at German-speaking children's gender marking. They tested slightly older children, between the ages of 3;11 and 5;5 years. Both phonological and semantic cues were given to the children. The children were asked to complete phrases such as "his/her colour is . . ." or "his/her scarf is . . ." Results showed that the children produced more errors in the natural-gender task than in the syntactic-gender task. Thus they concluded children did not attend to the obvious sex of the proper names given; rather, they attended to the phonological form of the nouns. However, when the same children were later tested on the relationship between forms and gender, they were better at explaining the natural gender rule than the semantic gender rule, indicating that children were aware of the natural gender rule (Böhme, 1983).

MacWhinney (1978) conducted another study of children's gender marking in German. The children tested this time were 3- to 12-year-olds. MacWhinney's study differed from the above studies in that he used real and nonsense nouns in the hope that he could infer productivity from their performance on the nonsense nouns. (However, Mills, 1986a, 1986b, criticised the methodology, in that some of the noun endings used to cue masculine, feminine, and neuter gender were not clear-cut markers of those genders.) MacWhinney's results indicated that German-speaking children made little use of the semantic cues and relied more on the formal features of the noun endings.

Levy (1983b) conducted a longitudinal study on the acquisition of noun pluralization in 3- to 6-year-olds learning Hebrew. Recall that in Hebrew, nouns ending in a stressed /a/ or in /t/ are feminine; these nouns take /ot/ as their plural suffix. All other nouns are generally masculine; these take /im/ as their plural suffix (Levy, 1983a). In fact, Hebrew probably has one of the most regular gender

systems. Levy noted that plurals appeared first in the children's speech at 1;10 years. By the age of 3 years, the children began to show understanding of the phonological regularities of the final noun syllable that determines the choice of the plural suffix.

In a comparable cross-sectional study of 32 children (mean age = 2;6), Levy (1983b) elicited the plural form to investigate children's knowledge of gender and number. Error analysis revealed that the children's performance was based on phonological generalisations. These results confirmed the earlier findings from a group of twenty 2-year-olds reported in Levy (1982).

Karmiloff-Smith (1978, 1979) conducted an extensive study of children's orientation towards phonological markers to determine noun gender in French. She hypothesised that in the young child, there is simultaneous progression of the various semantic and syntactic functions of language with the ongoing phonological development; it is the interplay ("the momentary predominance of one or the other and conflicts between them" -- p. 5) between these processes that allows insights into the acquisition processes of a more general nature, both in language and other cognitive spheres (Karmiloff-Smith, 1978).

French nouns are either masculine or feminine. Adjectives, pronouns, and so forth agree in gender with the noun they modify or to which they refer. There is no systematic way of assigning gender by syntactic properties, although there are a few exceptions that allow for this (e.g., there are some noun suffixes that act as primary markers for a gender).

There were 339 French-speaking children who took part in the study, 3;2 to 12;5 years of age. The stimuli consisted of a set of 30 nonsense words. These were assigned to pairs of identical, but differently coloured (colours that have phonological distinction in French) pictures of imaginary objects, animals, and Martians. The cues used were the phonological endings of the nouns: the nonsense words ended in suffixes that are typically masculine, typically feminine, or typically arbitrary (typical of neither gender). The children were given a set of cues to

gender status; some of these cues were grammatically and/or semantically congruous, others were incongruous. The experimenter asked the children a series of questions about some objects that they saw.

Results showed that when the article gender was given as a cue, children had problems assigning gender to nouns with arbitrary noun endings; the figures for successful gender assignment were somewhat lower for gender marking of arbitrary noun endings than when both a natural cue and a phonological cue were given, or when only a phonological cue was given, before the age of 7 years. However, Karmiloff-Smith (1979) noted all the children from 3 years of age were able to make use of the gender of the indefinite article to decide the gender of the definite article if there was no phonological cue on the suffix. Karmiloff-Smith concluded that when there are no strong phonological cues present, children from 3 years of age are implicitly aware of the article's function in indicating gender distinctions.

When the children were given only a phonological cue, and were required to produce the article, the children, from 3 years of age, were able to produce the appropriate article. When the article gender and noun suffix did not agree in gender, children under the age of 5 years seemed to attend to the suffix rather than the gender of the indefinite article as a cue to gender.

When the semantic information and noun suffix (with no article) did not agree in gender, children up to the age of 10 years used the phonological cue to produce article gender, even though the sex of the referents was clear. At all ages, in the case of discord, children seemed to have a strong tendency towards using the phonological cue rather than natural gender information. However, when they were faced with a weak cue for the arbitrary suffixes, natural gender was taken into account more frequently than in the marked suffix case. Karmiloff-Smith (1978,1979) concluded that children tended to base their responses on phonological procedures, although they could take into account natural gender information when agreement was discordant.

Karmiloff-Smith (1978, 1979) conducted another test whereby children were encouraged to create a name for a male or female creature, given the name of a similar creature of the opposite sex. This test could elicit spontaneous responses containing the definite article followed by a nonsense noun followed by an adjective. The results showed that children rarely named the creatures based on the article gender. Children of all ages changed the forms of the article to be in agreement with the natural gender around 30% of the time; this was for all ages. From the age of 6 years, and more notably from the age of 8 years, the children's agreement procedure involved the changing of both the article and the suffix to match natural gender. Karmiloff-Smith suggested that the children were initially conducting a suffix-to-natural gender matching procedure, and were then matching the article to the suffix chosen. She noted that the data from the tests that provided discordant agreement add to this argument in that the gender of the articles alone did not carry sufficient semantic information for the children to use that information solely as a cue.

Finally, the children were also asked, as an additional test, to tell a story about the objects they were given. These data indicated that children under the age of 6 years tended to base the gender of the noun on the phonological cue, but the gender of pronouns on extralinguistic factors (i.e., the sex of the referent). Older children base the gender of pronouns on intralinguistic factors (i.e., the gender of the pronoun coincides with the gender of the antecedent noun, irrespective of the sex of the referent).

Karmiloff-Smith (1979) concluded that children up to the age of 9 years attend more to phonological cues, at the expense of both natural gender and the gender of the indefinite article. Developmentally, children seemed to opt for the article gender as a cue as they became older, as shown in the greater consideration of the article gender when faced with discordant agreement. Error analysis also indicated that even younger children made use of the syntactic and semantic cues when noun suffix information was not available. Although older children made

more use of syntactic and semantic cues, they also made changes to the suffixes so that they agreed with the article or the sex of the person; alternatively, they avoided the use of the suffix by producing *la grise* "the grey one" and so on.

It was not unusual for the children in Karmiloff-Smith's (1978, 1979) study to gradually make use of semantic and syntactic cues as they grew older. As Karmiloff-Smith noted, children are in the process of learning syntactic and semantic procedures for use with other parts of language. Moreover, the phonological rules for gender are full of exceptions in French, and children use determiners such as the articles for many different functions, thus becoming more aware of determiners in general and of their phonological changes as they become more experienced with their language.

Karmiloff-Smith (1978) suggested that young monolingual children (due to their lack of linguistic experience) might rely on phonological features (i.e., noun suffixes) as some sort of "local rule" -- rules that are isolated from other semantic and syntactic aspects of the linguistic system they are learning. For the young child, other agreeing elements that do not obey these local rules will not be thought of as useful learning tools or be compiled as part of an integrated system. For the older child, Karmiloff-Smith argues, these phonological procedures are part of an "automatic strategy system" where the child can activate a "stand-by" process of semantic and/or syntactic procedures in the event of conflict.

Martinez and Shatz (1996) conducted a study whereby English- and Spanish-speaking children were asked to take part in a sorting task. The children were given a set of picture-cards containing 4 naturally female beings, 4 naturally male beings, and 6 inanimate (gender-less in English) objects, 3 of which are grammatically feminine in Spanish and 3 of which are grammatically masculine. When the children were asked to sort the objects into "things that go together", 33% (6/18) of the Spanish children automatically sorted stimuli by grammatical gender. When the 15 children who did not sort the stimuli by grammatical gender (3 did not complete the task) were explicitly told to do so (i.e., given examples with inanimate

nouns -- “flower is feminine and banana is masculine”), 73% (11/15) of them sorted the stimuli by grammatical gender. Overall, the results showed that 16 out of the 18 Spanish speakers sorted by grammatical gender at least once out of either two or three trials. This indicates that the children were able to attend to the formal properties even when the more overt possibilities such as animacy and natural gender distinction were possible.

Brisk (1976) compared the acquisition of Spanish gender by native monolingual and bilingual Spanish-speaking children in the first grade at school. She found that the fewest errors were performed on nouns that had phonologically clear suffixes. More unfamiliar nouns that contradicted the gender of lexically familiar substitutes produced more errors. Moreover, even when given pictures of both male and female animals, the children did not change the gender of the nouns to agree with the sex of the referent.

Cain, Weber-Olsen, and Smith (1987) conducted a study that investigated how gender functions with increasing linguistic proficiency. Twenty children learning Spanish as an L1 and twenty adults learning Spanish as an L2 took part. The children ranged from pre-school age up to sixth grade. The adult participants were acquiring Spanish after the age of 15 years and were in four different years of studying Spanish. Participants were given a replication of Karmiloff-Smith’s (1979) study. A set of questions accompanying each task elicited articles and adjectives that are marked for gender. The participants were given 45 nonsense nouns; these consisted of objects, animals, and humans that had male and female attributes. As with Karmiloff-Smith’s study, the colour forms selected illustrated phonological distinctions for gender in Spanish. Some words were inflected with the predominant masculine suffix *-o* and some with the predominant feminine suffix *-a*; others were inflected with a phonologically arbitrary suffix. The results showed that the more proficient adults and the older children (12-year-olds) performed better than the youngest L1 children on all 5 tasks given. Cain et al.’s data also

revealed that the participants performed better overall on tasks where gender was in agreement than where there was gender incongruity.

Cain et al. (1987) concluded that the adults who were learning Spanish as a second language quickly discover patterns for the noun suffixes. The phonological cues seemed to be more useful than the syntactic cue of the noun gender. However, Cain et al. suggested that this could be due to the fact that the articles appeared in pre-nominal position; this made them more redundant.

In sum, there is considerable evidence to suggest that children are efficient early learners of grammatical gender and attend to the formal properties of the systems they are learning to help assign a noun's gender. The obvious sex characteristics that provide overt cues to gender status in many cases do not seem to influence children's judgement of a noun's gender, although this information is useful when the morpho-phonological cues are ambiguous.

Some of the studies reviewed above involved the use of nonsense nouns. However, recently, some researchers have called into question the effectiveness of using nonsense nouns in studies of grammatical gender. This issue is discussed in the next section.

1.6.2 Can we infer productivity of gender knowledge from nonsense nouns?

Nonsense forms have been used extensively in studies to infer productivity of grammar; the most notable earlier work being that of Berko (1958). Maratsos (1988) notes that nonsense word tests allow for an infinite number of associated utterances from a single exposure in one use: "once the speaker hears just one grammatical use of a new word which suffices to identify its membership in a category, he can refer to the whole system of other rules involving that category" (p.31). The central question, in relation to gender, according to Maratsos, is how children acquire gender rules. Do children have to hear individual uses of individual words in meaningful sentences, so that they have to analyse what

semantically different words have in common in order to form a category that can only then be useful for stating grammatical regularities? If this is the case, children must have more than one exposure to a word and its grammatical properties in order to start to form these categories.

Levy and Tolchinsky (1999) argue that, although children show good performance on gender agreement cross-linguistically in their natural speech, and at a young age, gender studies that have looked at the applicability of children's learning procedures to nonsense stimuli consistently show poor performance. This, they argue, is a strange phenomenon since "gender is a lexical property of nouns which marks agreement classes and is thus, morphologically expressed" (Levy & Tolchinsky, 1999; p.3; after Ritter, 1993, and Faussart, Jakubowicz & Costes, in press). And, according to Levy & Tolchinsky, since gender information is lexically encoded, it is by definition applicable to words. However, nonsense words have no lexical status themselves. Because of this, Levy and Tolchinsky argue that children will not apply gender agreement to such nouns under experimental conditions.

As already discussed, children learning different grammatical gender languages seem to be able to acquire gender based on the phonological and/or syntactic regularities in the language at quite an early age. However, as Levy and Tolchinsky (1999) discuss, such uniform results seem to apply only to real nouns. Children's ability to assign gender to nonsense nouns is never as good as their performance with real nouns. Recall from Karmiloff-Smith's (1979) study that young children's (under 6 years) response patterns were mostly influenced by the noun's ending rather than by the form of the article. The article was the only infallible cue to agreement when nonsense nouns were used in combination with a discordant suffix marker. Overall, Levy and Tolchinsky note that good performance was not achieved before the age of 10 years in Karmiloff-Smith's study.

These findings are similar to those of Pérez-Pereira (1991a), who conducted a replication of Karmiloff-Smith's (1979) study with 4- to 11-year-old Spanish-

speaking children. Pérez-Pereira found that, although older children relied more on syntactic information than morphological information when there was conflict between the article and the noun ending, they were, even at 11 years of age, still producing errors with nonsense nouns when given discordant cues.

However, in a recent study, Karmiloff-Smith, Grant, Berthoud, Davies, Howlin, and Udwin (1997) obtained results that contradicted those of Karmiloff-Smith (1979) and Pérez-Pereira (1991a). Karmiloff-Smith et al. found that 5-year-old French-speaking children were using the article gender to help compute agreement. When the inflected article was not in gender agreement with the final syllable on the nonsense noun, the children were able to attend to the article as cue 87-95% of the time. Studies that have used nonsense nouns to look at the mass/count distinction (see Gathercole, 1985) have indicated that children's ability with nonsense nouns is good, and other studies that have looked at gender-marking have indicated that participants respond to nonsense nouns in ways that are similar to their responses on real nouns (Gathercole & Hasson, 1995).

To investigate this issue further, Levy and Tolchinsky (1999) conducted two studies, one in Spanish and one in Hebrew. Both studies were similar to Karmiloff-Smith (1979). Spanish (like all Romance languages) marks gender agreement on articles as well as on adjectives (Levy & Tolchinsky, 1999; Gathercole, 1989, 1985; Cain, Weber-Olsen, & Smith, 1987), although the noun endings in Spanish serve as better predictors of gender than in French, for example.

Children between the ages of 5;5 and 5;11 (mean age = 5;7) took part in this study. Both real and nonsense words were used. For Spanish-speaking children, some nouns were inflected with *-o*, some with *-a*, and some with an arbitrary suffix. The children were shown two drawings that differed in colour; their task was to name the object in the drawing. The experimenter then hid a ring under one of the drawings and asked the child to tell him where the ring had gone. Four agreeing article-noun combinations were given to the child (*-o* and *-a* ending nouns, e.g., *el barco* "the boat") and 4 combinations that did not agree in gender (no

correspondence between final syllable and noun gender, e.g., *la radio* “the radio”). For Hebrew-speaking children, nouns were inflected with the plural forms *-im* (masculine) or *-ot* (feminine). Twenty concordant nonce noun + colour adjective combinations (e.g., *ele sfarim adumim* “those (are) red books”) and fourteen discordant noun + adjective combinations (e.g., *ele mikdonim vrudot* “those (are) pink nonsense (pl)”).

The results showed that when the Spanish-speaking children were given concordant combinations, they performed at ceiling with real words, and above 90% correct with nonsense nouns. When the children were given discordant combinations, they performed just above 70% with real nouns, and at chance with nonsense nouns. Thus, as Levy and Tolchinsky (1999) point out, the Spanish-speaking children did not attend to the endings of the nouns to help determine the gender in any systematic way. Results from the Hebrew-speaking children also revealed that performance with nonsense nouns was between 50% and 60% when given concordant combinations and at 60% when given discordant combinations.

Finally, Levy and Tolchinsky (1999) note that there are other studies that have reported similar poor performance with nonsense nouns by adult participants. They note Haber (1975) who found that correct responses on nonsense nouns by educated adults ranged from 53% to 100% for the various items investigated (see also Ivimey, 1975, and Derwing & Baker, 1977).

Levy and Tolchinsky (1999) concluded that “gender is a lexical property of nouns and not a mere phonological regularity” (p. 24) and that for a nonsense noun to establish a “lemma” (the implicit meaning of a word), a child might have to have multiple exposures to that noun. In fact, studies that have used the “fast-mapping” procedure have indicated that children acquire initial, quick, but incomplete comprehension of nonsense words, and although they learn something after the initial introduction, children do not quickly acquire a full mastery of the noun meaning (see e.g., Carey & Bartlett, 1978; Carey, 1978, 1982; Hoff-Ginsburg & Nagles, 1999; Rice, 1990). Thus, according to Levy and Tolchinsky, if nonsense

words fail to be “proper” words, “automatic linguistic procedures that pertain to words will therefore not be triggered” (p. 24). Accordingly, children might then treat nonsense words as a problem-solving situation by selecting a single default answer, opting for the most frequent forms which for Hebrew is masculine (Levy & Tolchinsky, 1999). Therefore, they conclude, the use of nonsense stimuli to investigate gender may not work as well as for other parts of the language. (However, it could be argued that number is also a property of nouns and Gathercole, 1985, found children to respond well to nonsense nouns here.)

Often, when there are inconsistencies or ambiguities in the system, children might rely on a default procedure; this procedure, as noted above, might involve the overextension of the masculine form in a language like Hebrew. This behaviour (the overextension of one gender or another) is a consistent finding in research; this is dealt with in the next section.

1.6.3 Do grammatical gender languages have a gender bias?

In many studies, children’s errors seem to predominantly involve the overextension of one gender, the masculine form, to the other(s). Clark (1985) notes, for example, that French-speaking children produce errors in their use of the third person singular pronoun; they tend to rely on the masculine singular *il* even beyond 3 years of age. This coincides with Greenberg’s (1966) theory of markedness which states that the masculine is the unmarked form and will therefore be easier to acquire.

In a longitudinal study of her son’s acquisition of Hebrew, between the ages of 1;10 and 2;10, Levy (1983a) found that that he used the masculine verb-form in reference to both males and females until the age of 2;2 years. After 2;2, feminine verb forms became frequent. However, even after 2;2, the plural forms mostly took the masculine form. This is not surprising given that, as Levy (1982) notes, in colloquial speech feminine plural forms are slowly disappearing. After 2;10 Levy’s son’s gender marking improved considerably, although the use of the second person

singular feminine pronoun was erroneous. There were no errors with the second person singular masculine pronoun, although Levy related this to the fact that the first inflected verb form children use is often the one that is used to refer to themselves, and the ratio of males to females in this child's home was biased in favour of males. However, as already noted, the masculine form is the most common in Hebrew (Levy & Tolchinsky, 1999), so the child's responses could also reflect a default strategy.

Results from Karmiloff-Smith's (1979) study (see previous sections) indicated that when the article gender and the noun suffix given to the children were consistent, children's scores were lower with feminine forms (especially among 3-year-olds), although response accuracy was still well above 50%. When the children were given a phonological cue only, and were required to produce the article, the scores were again slightly lower for feminines. Moreover, if there were any unknown words, children over 9 years of age tended to assign masculine gender, despite there being a potential phonological cue denoting feminine gender on the noun suffix.

Furthermore, when children were given a contradiction between semantic information and noun suffix (with no article), the 5- to 8-year-olds had a strong tendency to produce only masculine articles with these nouns, even when they were given a picture of a female; this was also observed in the responses of the 10-year-olds (Karmiloff-Smith, 1979). This biased responding towards the masculine gender appears to be due to a tendency to consider the masculine gender as the unmarked gender form. Children tend to use the masculine form as a "neutral" gender form whenever there is conflict of any kind surrounding a noun's gender. Cain, et al.'s (1987) replication of Karmiloff-Smith's study found that, overall, children and adults produce better scores for the appropriate use of masculine articles and adjectives than for the appropriate use of feminine articles and adjectives.

Pérez-Pereira (1991a) identified yet more evidence to support Greenberg's (1966) notion that masculine forms are used as the default. Pérez-Pereira found that children tended to attribute masculine gender to nouns more often than feminine gender, and tended to perform better when given masculine cues.

Popova's (1973) study revealed somewhat mixed results. In one test, Popova found that 22 children between the ages of 1;10 and 3;2 used the feminine form (70 to 100% feminine) more often than the masculine form (0 to 34% masculine). However, a slightly older group of nine children between the ages of 2;6 and 3;3 produced more masculine forms of agreement (75 to 100% masculine) than feminine forms (0 to 40% feminine). Eleven children between the ages of 2;2 and 3;5 tended to mark both genders in approximately similar ratios (45 to 82% masculine; 40 to 90% feminine). It was not until 3;5 that the children performed the appropriate agreement patterns with both genders (75 to 100% for both genders). Popova concluded that prevalence of agreement with feminine gender declines with age; predominance of agreement with masculine gender increases, and correct agreement remains at an approximately equal level.

The cross-linguistic tendency for children to overextend the use of the masculine form as a default process is not restricted to grammatical gender. As noted above, Ervin-Tripp and Kluwin (in preparation) investigated English-speaking children's ability with semantic gender, and found that the children had a strong preference for masculine forms (16/24 appropriate use of masculine forms) than for feminine forms (4/24 appropriate use of feminine forms) even when the obvious sex of the referents is available.

Not all languages are biased towards the masculine, however. Greenberg (1966, p. 81) notes that Lounsbury (reference not provided) has suggested that Oneida and other Iroquian languages have the feminine as the unmarked gender. Slobin (1981) noted that at 2;8, a child who was tested in a single case study used feminine second person past tense verbs when addressing both males and females. Moreover, Mills (1978, 1985) noted, from a longitudinal study of children learning

German, that children's errors involved the overgeneralization of the feminine form of the article – *die*⁵. Finally, Popova (1973) also found that children, even after they had mastered correct agreement forms, continued to perform agreement errors with nouns like *papa* “father”, *dyada* “uncle”, and *diduska* “grandfather” simply because of their final *-a* being associated with the feminine gender; even the eldest subject, 3;5, seemed to be attending to the phonological properties of the noun and not to the obvious maleness of the referents.

Therefore, a response bias towards one gender class might be a language-specific phenomenon: such a bias might have to do with the distribution of masculine/feminine/neuter nouns in the language or to the value of their respective cues. Thus, for example, in French, there are more masculine nouns than feminine nouns (SurrIDGE, 1989, 1995; Tucker & Lambert, 1977); therefore it is expected that children will hear the marking of masculine nouns more often than the marking of feminine nouns. As noted above, there are also more masculine than feminine nouns in Hebrew (Levy & Tolchinsky, 1999). In any case, this, and previous discussions, strongly suggests that children's construction of their knowledge of grammatical gender is strongly based in the distinct properties of the individual systems they are learning.

1.6.4 Local vs. distant marking.

Some of the studies of grammatical gender suggest that “local” gender constructs (i.e., gender marking that is localised around the noun) are acquired before “distant” gender constructs (i.e., those that appear later in the speech stream and are not restricted within the boundary of the NP). Mulford and Morgan (1983)

⁵ However, it is important to note that, in German, *die* also functions as a plural marker in both the nominative and accusative cases for *all* genders. Therefore it is not clear whether these children's responses reflected their knowledge of *die* as a feminine marker or as a general plural marker. Also, Pérez-Pereira (1991a) notes from Deutsch and Pechman (1978) that the masculine dative form of the pronoun *ihm* was correctly produced before the feminine *ihr* in the German children Deutsch and Pechman studied.

proposed a so-called “Principle of Localness” stating that when an open class item and a closed class item are close to each other, the closed class item is more likely to be the one that predicts the categorical status of the other. Note that much of the research that has already been reviewed in this chapter suggests errors are frequent on the marking of pronouns (e.g., Mills, 1986a, 1986b; Popova, 1973).

For children to perform better on local marking than on distant marking is not surprising if we assume that gender is a lexical property of nouns (Levy & Tolchinsky, 1999; Ritter, 1993; Faussart, Jakubowicz & Costes, in press). Their knowledge of gender agreement could therefore stem from their knowledge of noun gender, highlighting the need to understand local gender more quickly and earlier than pronoun gender.

Karmiloff-Smith (1979) noted that when younger children (under 6 years of age), were asked to create a story about creatures shown in pictures, they tended to base the gender of pronouns on the sex of the referents and the gender of the nouns on the phonological cue. Older children (over 6 years of age) based both their noun gender responses and their pronoun gender responses on the phonological cue. Karmiloff-Smith thus suggested that distant marking is a rather late achievement in the language of French-speaking children.

1.6.5 Article-noun agreement vs. noun-adjective agreement.

There is some suggestion that in some languages children learn to mark nouns before adjectives. This process could be related to the discussion above concerning the greater use of local cues than of distant cues: if gender is a property of nouns, children will learn to mark noun gender before adjective gender. Pérez-Pereira (1991a) described a longitudinal study of one child conducted by Hernández-Pina (1984). In this study, Hernández-Pina found that Spanish-speaking children learn gender marking and gender agreement early, before the age of 4 years. She found that her subject showed a need to mark grammatical concord, even when these elements did not agree in gender (e.g., **mota rota* instead of *moto*

rota “broken motorbike”). Moreover, these errors were applied to nouns that had already been produced correctly. She also noted that gender marking on adjectives appeared together with gender marking on nouns; however, at 2;7, although the child could show full agreement between articles and nouns, errors were still present in gender agreement between inanimate nouns and adjectives until around 2;8. Comparable results were found by Soler (1984) (also noted in Pérez-Pereira, 1991a) who also tested Spanish-speaking children and found article-noun agreement to be in place by the age of 3.

Moreover, Levy (1983b) noted that although adjectives are not prominent in children’s speech at this young age, there were agreement errors between nouns and adjectives, and even with common adjectives such as “good” and “big” in the language of her son.

1.6.6 Multiple cues vs. single cue.

In their study of the acquisition of grammatical gender by Icelandic-speaking children, Mulford and Morgan (1983) found that even at 6 years of age, children performed only at chance level when provided with a single agreeing element as a cue to the noun gender. In fact, for the children’s performance to be almost at ceiling, they required as many as six cues to gender. They found that even 6-year-olds performed only at chance when provided with a single agreeing element. In addition, Pérez-Pereira (1991a) found that Spanish-speaking children performed better on the marking of nonsense nouns when a combination of cues was provided than when a single cue was provided.

1.6.7 Language-specific constraints.

Overall, the data reviewed in this chapter highlight the fact that children are responding to the patterns available in the language they are learning. When a language has morphological forms that can aid a child’s acquisition of gender, they will attend to these forms more than other cues, even if these other cues are

sometimes more salient. Some researchers have specifically attributed children's differential response patterns to differences in the languages. For example, Martinez and Shatz (1996) compared 18 Spanish-speaking children (mean age = 4;2) with 17 English-speaking children (mean age = 4;4). Recall that the children's task was to sort an array of objects depicted in a set of cards into piles. The cards had the picture-referents of two natural gender males, two natural gender females, and six items for which their referents have neuter gender in English but three that have feminine grammatical gender and three that have masculine grammatical gender in Spanish. The children were first asked to sort the cards in piles of things that "belong together". The children were then asked to sort a second set of cards by putting "all the feminine together" or "all the masculine together". In the first sorting task, four of the English children sorted according to the sex of the referent; only one of the Spanish-speakers sorted the stimuli in this way. In contrast, 6 out of the 18 Spanish-speakers sorted according the grammatical gender. In the second sorting task, 82% of the English-speaking children sorted the stimuli according to the sex of the referent and only 55% of the Spanish-speaking children did so. Thus there was a greater tendency for the English speakers to sort by natural gender, whereas the Spanish-speakers tended to sort by grammatical gender. The type of system they were learning seemed to influence children's response patterns.

In a language like German, with its complex gender system, children seem to be able to attend to formal cues to determine the gender of nouns at a relatively early age. Compare this with Icelandic. The data on Icelandic children's acquisition of gender indicated that children rely on semantic information to help determine the gender of nouns. It is strange that two languages that belong to the same family of languages, and have similar gender systems, differ so much in children's acquisition strategies. Mulford (1985) suggested that this difference could be due to the difference in the extent to which a particular ending can indicate gender in the two languages. She noted that *-e* in German is probably a better

overall cue to feminine gender than *-a* is in Icelandic because the Icelandic *-a* is functional in other parts of the language whereas *-e* in German is less so.

Similarly, Smoczyńska's (1985) longitudinal analysis of two children learning Polish indicated that gender agreement in singular nouns was acquired very early, which is in stark contrast to Russian. Smoczyńska noted that there is greater formal regularity in Polish case endings than in Russian.

Such results provide strong evidence that children will respond to the task of learning grammatical gender according to the peculiarities in the system they are learning.

1.6.8 Sociological constraints?

When a language has a complex grammatical gender system that offers no clear indication of noun gender any "late" development or apparent "lack" of systematic knowledge of the system may be attributable to its complexity. For most (or even all) of the languages whose data are reported in the sections above, their gender systems are relatively straightforward. Moreover, for the children who took part in those studies, the language they spoke functioned as the majority language, if not the only language, in their communities. Some languages, like Welsh, do not have majority status in the community. The social status of Welsh is different from that of the other languages noted, and may, therefore, have some effect on the acquisition process. One study that has looked at gender marking in Welsh, with special focus on the effect of the social situation upon usage, is that conducted by Jones (1998).

Although Jones' (1998) study was not designed to look at the acquisition of gender marking in Welsh, it nevertheless provides some interesting information regarding possible processes of *language obsolescence* that may be affecting the language. According to Jones,

Language obsolescence . . . is a process occurring in a specific group of languages, currently undergoing a progressive decline in the number of their speakers, during which gradual reduction in use, due to domain-restriction, may result in the emergence of historically inappropriate morphological and/or phonological forms together with extensive lexical borrowing. (pp. 5-6)

In a naturalistic, observational-style study, Jones (1998) tape-recorded children, young adults, and older adults in groups, or individually, in order to elicit naturalistic conversation data. Instances of the production of feminine nouns after the article and after *un* “one” (this requires a process called the *soft mutation*; see Chapter 2), adjectives after feminine nouns (again, requiring soft mutation), adjectives after masculine nouns (requiring no mutation), nouns after the possessive adjective *ei* (*ei* followed by soft mutation indicates masculine possession; *ei* followed by *aspirate mutation* indicates feminine possession -- see Chapter 2), and instances of the appropriate gender in numerals (the numerals for *two*, *three*, and *four* have masculine and feminine counterparts in Welsh), and for one study, pronoun substitution, were analysed. One study (Study 1) was conducted on a southern dialect where approximately 6% of the community were Welsh speakers (according to the 1991 census data), and the community language was predominantly English. The participants were divided into five age groups, between the ages of 7 and 75+ years. An additional group of 10 children who were from Welsh-speaking homes, but who attended an English-medium secondary school, was also tested. Another, comparative, study (Study 2) was conducted on a northern dialect where approximately 38% of the population were Welsh-speakers (according to the 1991 census data). The results for the two dialects are show in Tables 1.1 and 1.2.

Table 1.1: Percent Correct Gender Marking Data From a Southern Welsh-Speaking Dialect Compiled From Tables by Jones (1998).

Age in Years	Pronoun Substitution	Adjective After Feminine Noun	Feminine Noun After Definite Article	Feminine Noun After <i>un</i> "one"	Numerals	<i>ei</i> as Masculine Possessive
7to19 (N = 31)	37	35	38	72	50	23
20 to 39 (N = 9)	0	69	29		70	100
40 to 59 (N = 13)	0	85	84	79	81	100
60 to 74 (N = 10)	30	90	86	100	83	100
75+ (N = 12)	71	91	92	100	93	100

Table 1.2: Percent Correct Gender Marking Data From a Northern Welsh-Speaking Dialect Compiled From Tables by Jones (1998).

Age in Years	Pronoun Substitution	Adjective After Feminine Noun	Feminine Noun After Definite Article	Numerals	<i>ei</i> as Masculine Possessive
English-Educated		0	13	42	
7 to 19 (N = 20)	5	32	44	77	41
20 to 39 (N = 15)	10	67	62	92	78
40 to 59 (N = 13)	54	93	91	95	100
60 to 74 (N = 12)	59	92	90	100	100
75+ (N = 10)	55	96	96	100	100

Results from Study 1 revealed that for three of the contexts studied (feminine noun followed by an adjective, numerals, *ei* as masculine possessive) the adults (20- to 75+ years) performed much better than the 7- to 19-year-olds. For pronoun substitution, the 75+ year-olds performed better than all of the other ages, whereas for *un* "one" followed by a feminine noun the 60- to 75+ year-olds performed significantly better than all of the other ages, and for the definite article followed by a feminine nouns, the 40- to 75+ year-olds performed better than all the other ages.

Results from Study 2 (northern dialect) revealed that for four of the contexts studied (pronoun substitution, feminine noun followed by an adjective, definite article followed by a feminine noun, *ei* as masculine possessive) the 40- to 75+ year-olds performed better than all the other ages. With the production of the appropriate gender-marked numerals, the 20- to 75+ year-olds performed better than the 7- to 19-year-olds. (Children who attended the English-medium school scored lower than the 7- to 19-year-olds attending Welsh-medium schools on all contexts to which they responded.) Therefore, within the adult group, other than for the production of the numerals, the younger adults (20- to 39-year-olds) scored considerably lower than the older adults.

Since there was a large discrepancy between the 7- to 40-year-olds, and less so in the older age groups, Jones (1998) suggested that language obsolescence was underway in these dialects. Moreover, evidence of historically inappropriate forms for the marking of gender indicated that gender marking in Welsh is showing signs of simplification in these dialects. On a more sociolinguistic note, Jones further argued that since the English-educated children did not mutate any adjectives after feminine nouns, Welsh-medium education might contribute to the maintenance of this feature in the language of Rhosllannerchrhugog in the North.

Such research suggests that when a language is itself in a state of flux, the acquisition of linguistic features may be hampered by the changing status of the language. Moreover, when the language spoken in the community is the minority language, this change seems to be sudden. It is not clear, however, whether such rapid changes occur when the language of the community is balanced more towards the minority language (e.g., in the County of Gwynedd for example; see Chapter 2). I will return to this question below (Chapter 9), after the Gwynedd data, reported in this thesis, have been analysed.

1.7 Summary

Although the grammatical gender systems of many of the world's languages are highly complex, children generally seem to master gender agreement at a very young age. Moreover, they are able to attend to the formal properties of the nouns to determine noun gender, indicating that children's early grammatical knowledge is more formally based than some theorists initially assumed (e.g., Gleitman, 1981; Brown, 1973). Children are often (depending on the language they are learning) better with masculine forms than with feminine forms, at least when the masculine is the unmarked form. Languages differ in the opacity or transparency of their systems, and this will ultimately have an effect on children's ability to construct the gender systems. Parts of the individual systems are acquired earlier and/or better than other parts (i.e., nouns are marked for their gender better than adjectives, and children mark local constructs better than distant constructs), and children have been noted to require multiple cues before they can successfully compute correct agreement. Finally, nonsense nouns seem to show weaker scores than real nouns. This may be due to the nonsense noun's "lemma" deficiency, rendering it impossible for such nouns to trigger the appropriate "automatic" response pattern that children can so easily apply to real words (although other studies disagree). Nevertheless, children have been shown cross-linguistically to master grammatical gender at a very impressive rate, even in languages that have opaque gender systems.

The other language of interest here, Welsh, has an opaque grammatical gender system. In addition to the complexities of the gender system, the Welsh language as a whole is in a state of flux and numerous parts of the grammar are variable. So far, very little is known about children's ability to mark gender in Welsh (although see previous section for some information), and the extent to which the language situation may affect acquisition. The next chapter outlines the grammatical gender system in Welsh, and its intricate involvement with yet another complex system -- the mutation system.

CHAPTER 2

Gender and Mutation in Welsh: An Overview

2.0 Introduction

In Chapter 1, I discussed cross-linguistic studies of grammatical gender acquisition. Cross-linguistic studies provide some answers to issues regarding the complexity or simplicity of acquiring complex grammatical gender systems, and this in turn provides insight into the strategies employed by children learning gendered languages in order to acquire the systems.

But what happens when a language has a particularly complex grammatical gender system, one in which gender marking involves different processes from the types that have been investigated in other languages? A case in point is Welsh. In Welsh, gender is marked by *mutations*, a set of morpho-phonological changes that usually affect the initial consonants of words.

This chapter presents an overview of the gender marking process in Welsh. It begins with a general introduction to the Welsh mutation system. Next, it discusses variation in the use of mutation in Welsh. Finally, this chapter presents an overview of the relationship between mutation and gender marking, noting the variation in the usage of gender mutation in colloquial speech.

2.1 Welsh Background

Cymraeg, Welsh, is one of the two surviving languages that formed the Brythonic branch of the Celtic family of languages. It is currently spoken by over 500,000 speakers, approximately 19% of the population of Wales (Aitchison & Carter, 1994). The county of Gwynedd¹, located in the north-west region of Wales, ". . . forms part of what is termed the heartland of the Welsh language" (Lindsay, 1993, p.1); it is also home to the largest density of speakers (Crystal,

¹ At the time of their publication, Gwynedd included Anglesey.

1994; Aitchison & Carter, 1994; Jones, 1997). However, most native Welsh speakers (excluding infants) are by now Welsh-English bilinguals.

Although Welsh is now confined to the West of Great Britain (now known as *Cymru* "Wales"), a settlement was established in Patagonia (Argentina) in 1865, resulting in about 3000 speakers by 1900. However, there has been very little research on the Welsh spoken in Patagonia since the settlement was established. Although there are no official figures that indicate the number of current speakers in the district, Welsh is still spoken daily in some parts (Davies, 1999), and some estimate the number of Welsh speakers that are currently still living in Patagonia to be as many as 3500 (N. Laporte, personal communication). Nevertheless, many assume the language to have died along with the Welsh-speaking generations of direct descendants of the Welsh-speaking settlers. Others wrongly assume that "the language has all but disappeared [in Patagonia] today, under the influence of Spanish" (Crystal, 1994, p. 418).

All of the four modern Insular Celtic languages -- Welsh, Breton (Brythonic), Irish Gaelic, and Scottish Gaelic (Goedelic) -- survive precariously. Centuries of political and social pressures from the English and French have contributed to their decline, both in status and usage (Dalby, 1998). Such pressure has led to the near-obliteration of Manx and Cornish. Manx is a Goedelic language for which only a few hundred speakers remain, most of whom learned it as adults (although some claim to have learned it as an L1 from their grandparents). Cornish is a Brythonic language that died out in the 18th Century; however, it has since undergone a revivalist movement (Crystal, 1994). The languages that have survived -- Welsh, Breton, Scottish Gaelic, and Irish Gaelic -- have retained most of their Celtic characteristics, one of which is their unique² mutation system.

²The uniqueness of the mutation systems of the Celtic languages has been challenged, however. For example, Ternes (1977) noted from Timm's (1985) work that proto mutations can be found in a variety of other languages, including several dialects of certain Romance languages (p. 106). Ball and Müller (1992) state that other languages demonstrate initial consonant mutation, but not as a grammaticalised feature; they suggest that West Atlantic languages show initial consonant mutation that is not phonologically conditioned. According to Willis (1990), Spanish has a rule

2.2 The Mutation System

Gender marking in Welsh and the other Celtic languages is complex. This is partly due to its relation to the mutation system, a process that conditions a set of morpho-phonological changes to the initial segments of words. Although mutation is a phonological process (Hannahs, 1996) -- that is, it results in a phonological change -- mutations are not triggered by phonological factors (however, originally, phonological alternations that happen within a mutation system were phonetically conditioned -- see below); rather, mutations are conditioned by lexical, morphological, and syntactic factors (Tallerman, 1990; Willis, 1990). The sound changes that are triggered by the various environments for mutation vary from language to language within the Celtic group (Ball, 1993); however, I will only be concerned with the changes involved in the Welsh mutation system for this thesis. Factors other than mutation that make gender marking complex in Welsh will be discussed later in this thesis.

During the historical development of Welsh from its parent language, British, certain consonants assimilated to their surrounding vowels (Watkins, 1993, p. 304). For example *merka teka* "fair girl" (British) became *merka dega* (Late British); note that /k/ became /g/³ and /t/ became /d/ in the adjective *teka* "fair" by voicing assimilation with the surrounding vowels. The same assimilation process did not take place for /t/ in *donjos tekos* "fair man" (British) that became *donjos tegos* (Late British); this is because the preceding word *donjos* ended in a consonant and therefore /t/ did not occur between two vowels (Watkins 1961; 1993; Jackson, 1959). However, subsequent phonological changes resulted

whereby voiced stops are spirantized in intervocalic position, even when the sequence is spelled as two words. Willis argues that this process is similar to the original Celtic situation; however the Spanish form retains the phonological environment for the rule and involves no underlying syntactic or morphological basis for the change. This cannot therefore be an example of mutation. Rather, it is a simple rule: the voiced stop becomes fricative (e.g., /cada domiŋo/ becomes /caða ðomiŋo/). Oftedal (1985) has also attempted to show similar mutation processes in other languages, particularly Spanish. Moreover, Willis (1990) has also suggested that mutations based on morphological or syntactic environments are not unique to the modern Celtic languages; she notes that spoken Italian employs an initial consonant gemination rule that is probably conditioned by syntax, although she provides no examples for this.

³Throughout this thesis /g/ will be used as the symbol for /g/.

in the loss of British endings; this caused these respective forms to become *merch deg* and *dyn teg*. With the loss of the nominal endings, the alternation *teg/deg* was no longer phonetically conditioned: both *merch* and *dyn* ended in a consonant (Watkins, 1961, 1993; Jones, 1997). I will return to gender distinctions marked by mutations in Section 2.9.

2.3 The Phonology of Mutations

Traditionally, there are three types of mutation in Welsh: Soft Mutation⁴(SM); Aspirate Mutation⁵(AM); and Nasal Mutation⁶ (NM). The sound changes are as follows:

Under SM:

- | | | |
|--------------------|---|-----------|
| 1. Voiceless Stops | } | Voiced |
| and | | |
| Liquids | | |
| | | |
| 2. Voiced Stops | } | Fricative |
| and | | |
| Labial Nasal | | |
| | | |
| 3. /g/ | | → ∅ |

The sounds affected under SM are shown in Table 2.1:

⁴Soft Mutation is also sometimes referred to as "Lenition" (e.g., Stephens, 1993, 1996; Willis, 1990; Kibre, 1995).

⁵Although some linguists use "Spirant Mutation" to refer to this particular mutation type (e.g., Thomas, 1984; Stephens, 1996), Aspirate Mutation will be used throughout in this thesis because it is the conventional term for this process within Welsh linguistics.

⁶Awbery (1986a) notes that Pilch (1958) argues that NM is not a true mutation and should not therefore be grouped with SM and AM.

Table 2.1: The Sound Changes Under SM.

Underlying Sound	Surface Sound
/p/	/b/
/t/	/d/
/k/	/g/
/b/	/v/
/d/	/ð/
/g/	∅
/tʃ/	/l/
/r/	/r/
/m/	/v/

An example of the SM process is shown in Examples 1 to 3:

1. *dy gath* /də ga:θ/ "your cat", from /ka:θ/ "cat"
2. *dy ddanedd* /də ðanɛð/ "your teeth", from /danɛð/ "teeth"
3. *dy wely* /də uɛli/ "your bed", from /guɛli/ "bed"

Under NM:

Stops → Nasal

The sounds affected under NM are shown in Table 2.2:

Table 2.2: The Sound Changes Under NM.

Underlying Sound	Surface Sound
/p/	/m/
/t/	/n/
/k/	/ŋ/
/b/	/m/
/d/	/n/
/g/	/ŋ/

An example of the NM process is shown in Examples 4 to 6:

4. *fy nhŷ* /və nɪ:/ "my house", from /ti:/ "house"
5. *fy mhêl* /və mɛ:l/, "my ball", from /pɛ:l/ "ball"

6. *fy nghi* /və ŋi:/, "my dog", from /ki:/ "dog"

Under AM:

Voiceless Stops → Fricative

The sounds affected under AM are shown in Table 2.3:

Table 2.3: The Sound Changes Under AM⁷.

Underlying Sound	Surface Sound
/p/	/f/
/t/	/θ/
/k/	/x/

An example of the AM process is shown in Examples 7 to 9:

7. *ei phêl* /əi fɛ:l/ "her ball", from /pɛ:l/ "ball"

8. *ei throed* /əi θrɔ:ɛd/ "her foot", from /trɔ:ɛd/ "foot"

9. *ei chlust* /əi xli:st/ "her ear". from /kli:st/ "ear"

Examples 1 to 9 indicate that mutation is conditioned by specific triggers, although the actual mutation (if any) caused cannot be inferred by the shape of the trigger; for example, *ei* followed by SM indicates masculine possession, whereas *ei* followed by AM indicates feminine possession (Kibre, 1995). Mutations are therefore, using Kibre's term, *phonologically opaque*.

⁷ Orthographically, these sound changes are represented as follows:

Word- Initial Consonant	SM	NM	AM
p	b	mh	ph
t	d	nh	th
c	g	ngh	ch
b	f	m	
d	dd	n	
g	-		
ll	l		
rh	r		
m	f		

Most of the sounds that result from each of the mutation types are phonemes that are available in minimal pairs in other parts of the language (Ball, 1993). For example, /b/, /d/, and /g/ can appear both as basic forms for some nouns and as the mutated form of other nouns in mutable contexts. However, this is not a phenomenon that affects the whole of the system. Voiceless plosives are one such exception. The three voiceless plosives /p/, /t/, and /k/ can only occur as underlying sounds; they cannot occur as mutated approximants of any sounds. I will return to issues concerning the potential ambiguity of such forms in certain gender mutation contexts in Chapter 6.

2.3.1 Pre-vocalic aspiration.

The colloquial language of Welsh speakers in North Wales shows an extension of the *aspiration* process to word-initial vowels and glides (Awbery, 1986a). This related phenomenon has been termed *Pre Vocalic Aspiration* (PVA) (Ball & Müller, 1992), where /h/ is added in front of vowel-initial words in some contexts.

Some researchers consider PVA to be part of AM (e.g., Albrow, 1966) while others treat it as a different, but related, process (Ball & Müller, 1992). Awbery (1973) even views PVA as an initial mutation process, treating the /h/ as the surface phonetic realisation of a vowel-devoicing process (cited in Ball & Müller, 1992).

In addition to the extension of the aspiration process to vowels and glides the northern dialects extend this process to the nasals /n/ and /m/ (Awbery, 1986a; Thomas, 1996). This process involves the devoicing of /m/ and /n/. Jones (1988) discusses this point clearly:

For "her mother", dialects over a wide area will say "*i mham*",
[i məm/, from /i mam/]; likewise *i mhath hi* [i məθ hi/, from /i

maθ hi/], "her type"; *i mhalu nhw* [/i m̥ali̯ ηu/, from /i mali̯ ηu/], "breaking them". (p. 161)

As early as 1884, Henry Sweet noted the aspiration of /m/, /n/, and /w/ (see below for a discussion on /w/) in the colloquial language of speakers in the area in North Wales known as Dyffryn Gwynant. Traditionally, however, the aspiration of the nasals /m/ and /n/ after some of the triggers for AM (see Table 2.7 below) has not been accepted into the literary standard (Jones, 1988).

Moreover, Thomas (1996) notes that in those dialects that retain voicelessness as an aspiration for some sounds (dialects in the south-east of Wales are losing the voiceless versions of some sounds -- for example, voiceless aspirated trill /r̥/ is replaced by /r/ -- Watkins, 1993; Ball, 1993) there is a slight tendency to devoice /l/-, /r/-, and /w/- initial words after the third person singular feminine possessive adjective *ei* (feminine possessive), and also after the third person plural possessive *eu* "their". For example:

'i lhamp "her lamp" /i ɭamp/, from /i lamp/

eu rhas "their race" /i̯ ɾas/, from /i̯ ras/

ei whats "her watch" /i w̥atʃ/, from /i watʃ/ (Thorne, 1993).

Watkins (1993), Thorne (1993), and Jones (1967) also note the extension of aspiration to /j/- initial words, the phonomorphemic variant being /ç/ after *ei* (feminine possessive). For example:

ei hiaith /i çaiθ/ "her language" from /jaiθ/ (Watkins, 1993).

However, the extension of aspiration to liquids and glides is not as widespread as the extension to nasals. As Awbery (1986a) points out:

. . . it appears that the extension of Aspiration to nasals is found over a wide area, extending down into mid Wales and even further South, whereas the extension to liquids occurs only in the north-west. (p.422)

Albrow (1966) reanalysed the data from the dialect study conducted by Sweet (1884) and suggested that /v/-initial English loan words are also subject to aspiration in the dialect of Dyffryn Gwynant in North Wales (e.g., /i f*h*inεgr/ < /vinegr/ "her vinegar"). However, there are no other suggestions that aspiration extends to /v/-initial words other than this (Ball & Müller, 1992).

With the above in mind for the spoken standard, which is the concern of this thesis, the phonetic changes under the AM process could be revised to include the following:

Under AM:

1. Voiceless Stops → Fricative
2. Nasals → [- voiced]
3. Vowels → /h/ + vowel
4. Sometimes /r/, /l/, and /v/ → Devoiced

The sounds affected are shown in Table 2.4:

Table 2.4: The Sound Changes Under AM.

Underlying Sound	Surface Sound
/p/	/f/
/t/	/θ/
/k/	/x/
vowels	/h/ + vowel
/m/	/m̥/
/n/	/n̥/
/r/, /l/, /v/	/r̥/, /l̥/, /v̥/

2.4 The Linguistic Environments for Initial Consonant Mutation

These sound changes in the Welsh mutation system (and in the other Celtic languages) are triggered by various morpho-syntactic environments. Most are lexical (i.e., the mutation is triggered by a particular word), though some are purely syntactic (i.e., the mutation is applied to a word when it occurs in a particular syntactic position) (Ball, 1993; Ball & Müller, 1992). Lexical triggers (also called *contact mutations* -- Thomas, 1996; King, 1993 -- and *projected mutations* -- Oftedal, 1962⁸) fall into three sub-types. These are:

1. *Pure lexical triggers* (Ball & Müller, 1992). Here, the triggers always "cause" a particular mutation of any word that follows them. For example, *fy* /və/"my" is a pure lexical trigger in that it always triggers NM; thus *cath* /ka:θ/"cat", for instance, becomes *fy nghath* /və ŋa:θ/. Pure lexical triggers tend to be grammatical morphemes (Awbery, 1986a).

2. *Categorical lexical triggers* (Ball & Müller, 1992; Awbery, 1975, 1976). Here, instead of a single lexical item acting as a trigger, a whole class of lexical items acts as the trigger. For example, feminine nouns trigger SM of following adjectives, although the mutation is not triggered by a specific lexical item but by the morpho-syntactic feature [+ feminine] (Tallerman, 1987). (Further examples of this type of gender mutation will be discussed in Section 2.9.)

3. *Restricted lexical triggers* (Ball & Müller, 1992). Here, a single lexical item acts as the trigger, but it only affects a sub-class of lexical items. For example, the definite article triggers SM, but only of feminine nouns. (Again, further examples of this type of gender mutation will be discussed in Section 2.9.)

"Syntactic" triggers involve cases in which the conditioning environments for mutation cannot be defined in purely lexical terms. In some cases the morphological features number and gender are the conditioning factors for mutation (cf. *incorporated mutation* -- Oftedal, 1962). In other cases, the grammatical function of the mutated word in the syntactic structure acts as the

⁸However, see Cram (1975) for objections to Oftedal's distinction between his projected and incorporated mutations.

conditioning factor for a particular mutation -- for example, soft mutation of the direct object of inflected verbs when in phrase-initial position (Ball & Müller, 1992; Tallerman, 1990).

2.5 Internal Mutations

Mutations are word-internal in some cases. The word-initial morpheme prefix acts as a trigger for a change to the stem. For example, the prefix *am-* followed by *cau* “close” produces *amgáu* “enclose” (Thomas, 1996). However, since this mutation is not my concern, the remainder of this thesis focuses on *initial consonant mutation*.

2.6 The Triggering Environments of the Mutations

The environments of these mutations are varied. SM is triggered by lexical triggers and syntactic triggers; both NM and AM triggers are restricted to single morphemes or specified lexical items (Tallerman, 1990; Awbery, 1986a; also see Ball & Müller, 1992). SM is the most prevalent mutation; this is because it is triggered in more linguistic contexts than NM and AM. SM also affects more word-initial sounds than NM and AM (traditionally, nine sounds are affected by SM, six are affected by NM, and three sounds are affected by AM).

Table 2.5 shows examples of triggers for SM. The examples are taken from Thomas, 1996; all English translations are mine:

Table 2.5: Examples of Triggering Items for SM.

Triggering Class	Lexical Items	Example Target Word	Mutation Examples
Demonstrative Verbs	<i>dacw</i> "there is (are)" <i>dyma</i> "here is (are)" <i>dyna</i> "that is"/ "what" <i>wele</i> "behold"	<i>tyddyn</i> "dwelling" <i>cyfle</i> "chance" <i>cwestiwn</i> "question" <i>rhywun</i> "someone"	<i>Dacw dyddyn bach</i> "There's a small dwelling" <i>Dyma gyfle</i> "Here's a chance" <i>Dyna gwestiwn</i> "That's a question" or "What a question" <i>Wele rywun yn dod</i> "Behold someone coming"
Prepositions	<i>am</i> "for" <i>ar</i> "on, about to" <i>at</i> "to" <i>gan</i> "by, with" <i>heb</i> "without" <i>hyd</i> "till" <i>i</i> "to" <i>o</i> "of" <i>tan</i> "under" <i>tros</i> "over/ for, across" <i>trwy</i> "through/ by" <i>wrth</i> "by"	<i>popeth</i> "everything" <i>penderfynu</i> "to decide" <i>dau</i> "two" <i>merch</i> "girl" <i>dinistrio</i> "destroy" <i>diwedd</i> "end" <i>denu</i> "attract" <i>glud</i> "glue" <i>llach</i> "lash" <i>rhyddid</i> "freedom" <i>lleddfu</i> "to soothe" <i>calon</i> "heart"	<i>Diolch am bopeth</i> "Thanks for everything" <i>Yr wyf ar benderfynu</i> "I'm about to decide" <i>Cyfeiriwyd at ddau</i> "two were referred to" <i>Darlun gan ferch</i> "[A] picture by a girl" <i>Cloddio heb ddinistrio dim</i> "Digging without destroying anything" <i>Hyd ddiwedd y byd</i> "Till the end of the world" <i>Hysbysebu i ddenu twristiaid</i> "Advertising to attract tourists" <i>Potelaid o lud</i> "[A] bottle of glue" <i>Dan lach</i> "under a lash" <i>Pleidleisio tros ryddid</i> "Voting for freedom" <i>Gwella trwy leddfu poen</i> "To improve by soothing the pain" <i>Calon wrth galon...</i> "Heart upon heart..."
Degree Markers	<i>cyn</i> "as" <i>mor</i> "as"	<i>coched</i> "red(comparative)" <i>gwyn</i> "white"	<i>Cyn goched â than</i> "As red as fire" <i>Mor wyn â'r galchen</i> "As white as limestone"
Conjunctions	<i>neu</i> "or" <i>pan</i> "when"	<i>gweiddi</i> "shout" <i>goresgyn</i> "to invade"	<i>Sgrechian neu weiddi</i> "Scream or shout" <i>Pan oresgynnodd y gelyn...</i> "When the enemy invaded..."

Particles	<i>a</i> - interrogative particle <i>fe</i> - pre-verbal particle <i>mi</i> - pre-verbal particle <i>o</i> - vocative particle	<i>pleidleisiodd</i> "voted" <i>baglodd</i> "to trip" <i>dysgi</i> "to learn" <i>Duw</i> "God"	<i>A bleidleisiodd?</i> "Did he/she vote?" <i>Fe faglodd</i> "He/she tripped" <i>Mi ddysgi ryw ddydd</i> "You'll learn one day" <i>O Dduw!</i> "O God!"
Possessive Adjectives	<i>dy</i> "your" <i>ei</i> (masculine possessive)	<i>cysur</i> "comfort" <i>byddin</i> "army"	<i>Dy gysur</i> "Your comfort" <i>Ei fyddin</i> "His army"
Numerals	<i>dau</i> "two" (masculine) <i>dwy</i> "two" (feminine)	<i>tymor</i> "term" <i>caseg</i> "mare"	<i>Dau dymor</i> "Two terms" <i>Dwy gaseg</i> "Two mares"
Continuous Aspect	<i>yn</i> "is"	<i>maethlon</i> "nourishing"	<i>Yn faethlon</i> "[is] nourishing"
A Small set of Pre-Head Adjectives and Adverbs	<i>hen</i> "old" <i>gwir</i> "truly"	<i>cadair</i> "chair" <i>penderfynol</i> "determined"	<i>Hen gadair</i> "old chair" <i>Gwir benderfynol</i> "truly determined"
Direct Objects	-	<i>cath</i> "cat"	<i>Gwelais gath</i> "I saw (a) cat"

Tables 2.6 and 2.7 show examples of triggering environments for NM and AM:

Table 2.6: Triggering items for NM.

Triggering Class	Lexical Item	Example Target Word	Examples
Possessive Adjective	<i>fy</i> "my"	<i>car</i> "car"	<i>fy nghar</i> "my car"
Preposition	<i>yn</i> ⁹ "in"	<i>gofal</i> "care"	<i>yn ngofal yr heddlu</i> "In the care of the police"

⁹The preposition *yn* "in" assimilates to the place of articulation of the following consonant.

Table 2.7: Triggering Items for AM.

Triggering Class	Lexical Item	Example Target Word	Examples
Preposition	<i>â</i> <i>gyda</i> "with" <i>tua</i> "towards, about"	<i>poeri</i> "spit" <i>ti</i> "you" <i>cant</i> "hundred"	<i>Peidiwch â phoeri</i> "Don't spit" <i>gyda thi</i> "With you" <i>tua chant</i> "Towards a hundred" or "about a hundred"
Conjunctions	<i>a</i> "and"- relativizer <i>na</i> "than"- standard marker in comparatives <i>na</i> "neither, nor"- relativizer	<i>pys</i> "peas" <i>tywydd</i> "weather" cath "cat", ci "dog"	<i>ffagots a phys</i> "fagots and peas" <i>gwell na thywydd ddoe</i> "Better than yesterday's weather" <i>Na chath na chi</i> "Neither a cat nor a dog"
Possessive Adjective	<i>ei</i> (feminine possessive)	<i>teledu</i> "television"	<i>ei theledu</i> "her television"
Numerals	<i>chwech</i> "six" <i>tri</i> "three"	<i>plât</i> "plate" <i>cosyn</i> "a cheese"	<i>chwe phlât</i> "six plates" <i>tri chosyn</i> "three cheeses"
Adverb	<i>tra</i> "very"	<i>cyfrinachol</i> "confidential"	<i>tra chyfrinachol</i> "very confidential"

The following items trigger PVA (the triggers are taken from Ball & Müller, 1992

-- also see Thomas 1996 -- some examples are provided by me):

Table 2.8: Triggering Items for PVA.

Triggering Class	Lexical Item	Example Target Word	Examples
Possessive Adjectives	<i>ei, 'i, 'w</i> (feminine possessives) - when in possessive or objective position; <i>ein, 'n</i> "our, us"; <i>eu, 'u</i> "their, them"; <i>'m</i> "my, me";	<i>afal</i> "apple" <i>addysg</i> "education" <i>ôl</i> "after" <i>enaid</i> "soul"	<i>ei hafal</i> "her apple"- possessive <i>gollyngodd ei hafal</i> - objective <i>ein haddysg</i> "our education" <i>ar eu hôl</i> "after them" <i>I'm henaïd</i> "to my soul"
Preposition (restricted usage)	<i>ar + hugain</i> (in compound numbers)	<i>ugain</i> "twenty"	<i>un ar hugain</i> "twenty one"

The above "rules" for mutations have been discussed in terms of their "prescriptive" nature. In colloquial speech, however, things are not so simple. There is considerable variation in adherence to the mutations in adult speech (e.g., Ball, 1988c; Thomas, 1984; Watkins, 1993; Jones, 1998) and sometimes even in written language. Variation exists between, and within, speakers in that some do not mutate consistently, some not at all, and some use different mutations from those the standard requires (sometimes by overextending SM into the areas where NM and AM are the required mutations). The following section presents an overview of the variation observed in colloquial Welsh mutation.

2.7 Variation in Welsh ICM

2.7.1 Variability in usage across mutations.

A number of Welsh grammarians have noted, and a few studies have indicated, differences in the usage of mutations (see Ball & Müller, 1992, for a concise review). Generally, they show that SM is used similarly to that in the literary standard. For example, Ball (1984, 1988b) found categorical use of SM for most of the triggering environments he studied. The next most extensively used mutation he found was NM, followed by AM. Data from part of an investigation into 14-year-olds' ability with the Welsh language, conducted by Jones (1992) produced corroborative data. As part of the study, the children were given five sentences. Their task was to fill in the blank space(s) in each sentence by choosing one of six words provided, and writing the word in the blank space. Each of the blank spaces was preceded by a lexical item that triggered a particular mutation. Four of the blank spaces were preceded by a lexical trigger for SM, one of the blank spaces was preceded by a lexical trigger for NM, and one was preceded by a lexical trigger for AM. Jones found that SM was the mutation used most "correctly", that is, nearest to the literary standard (83.33 - 86.87% "correct" use of SM). However, contrary to Ball's (1984) findings, this study indicated that NM, not AM, was the least extensively used mutation (55.67% vs. 75.25%).

Jones attributed this difference in their findings to the different types of data collected: Ball's data involved adult colloquial usage whereas Jones' data reflected literary competence (see Chapter 3 for further discussion of Jones' data).

According to Watkins (1993), in contemporary colloquial language SM is becoming increasingly arbitrary, and both NM and AM have been almost lost. Against this, it could be that specific lexical items cease to be mutation triggers for NM and AM in dialects of colloquial Welsh (Tallerman, 1990). A number of dialect studies have noted similar trends (see below). The following review illustrates adults' usage of mutations.

Many studies show that SM generally follows the patterns set out by the literary standard, and that this applies across dialects -- Davies (1934) found this in the dialect of Ceinewydd, Davies (1955) for the dialects of Dihewyd and Llandygydd, Davies (1968) for the dialect of Merthyr Tudful, Samuel (1970) for the dialect of Rhigos, Bevan (1970) for the dialect of two areas in Bro Morgannwg, and Thorne (1971) for the dialect of Llangennech. NM and AM, on the other hand, were generally realised less consistently than SM in these studies. Jones (1998), however, challenges this, noting that in one of the dialects she studied NM after *fy* was as good as AM after *ei* and slightly better than a variety of triggers for SM. In another dialect she found that NM after *fy* was as good as SM after *ei*. However, most of the triggers she examined had what others have termed a *high functional load*.

The prevalence of SM in the colloquial language across dialects is not surprising considering its prominence in the language. The number of triggering environments for SM and the number of initial sounds it affects are much more frequent than for NM and AM. Neither is it surprising that SM seems to be productive in the sense that it seems to be realised in some contexts that are not conditioned for it, and at the expense of NM and AM. This productivity is also shown in the application of SM to new sounds (see Section 2.8.3 below).

In addition to the dialectal differences that condition the use and non-use of devoicing as an aspirated feature of some word-initial sounds (see above), acculturation can also play its part in its use. In a study of the speech of Welsh-speaking adult descendants of the Welsh settlers now living in Gaiman, Y Wladfa (Patagonia), Jones (1976) noted a difference in the usage of devoicing in PVA and NM. Adults in an older group were divided into two sub-groups: those who had a Welsh culture affiliation and those with a Spanish culture affiliation. The results showed that the Welsh-affiliated adults produced devoicing 50% of the time in environments for PVA, and produced devoicing 75% of the time in environments for NM as reflexes of the voiceless stops. The Spanish-affiliated group produced no devoicing in environments for PVA or NM. For the Welsh-affiliated speakers, therefore, environments for NM retained the aspirated nasals; in contexts for PVA, by contrast, although the sounds did undergo a process of aspiration, they did so less often.

2.8 Variation Within Each Mutation Type

2.8.1 Lexical variability.

Much of the research that has been conducted on the mutation system also shows that, within a given mutation type, some triggers are more likely to cause mutation than others. Tallerman (1987) discussed such usage as possible exceptions to the rule. In particular, she noted two types of such exception; these were (a) *predictable exceptions*, and (b) *idiosyncratic exceptions*. According to Tallerman, the difference between such exceptions is this: predictable exceptions include those items that have some features that regularly prevent them from undergoing mutation (e.g., /t/- and /r/-initial nouns in specific contexts; see below). Idiosyncratic exceptions, on the other hand, must merely be marked as such in the lexicon (although some of these can also be predicted to be likely exceptions to a certain extent; see Tallerman, 1987). Examples of idiosyncratic exceptions are personal and place-names, /g/-initial loanwords, and a set of odd

lexical items that always resists mutation or is an exception to certain environments (Tallerman, 1987). In what follows I will attempt to illustrate such lexical variability, looking at how it affects each of the three mutations in turn.

1. *Soft Mutation (SM)*. Ball (1984) found that prepositions trigger SM virtually categorically on ordinary nouns, but not on place names. In another study designed to look specifically at variation in mutations, Thomas (1984) analysed 16 taped interviews of speakers between 1953 and 1980 that he had obtained from the Welsh Folk Museum. The speakers were from South Glamorgan and were "the last surviving speakers of Welsh in their . . . communities" (p.210); they were all of rural background, and had received minimal formal education. Although at the time of recording the youngest of these speakers was about 43 years of age, the data from the transcripts provide information about the variation in the dialect. The speakers were divided into four groups as follows: (a) Group 1, which included four speakers, all of whom were lay preachers and were therefore familiar with archaic Welsh; (b) Group 2, which included four speakers who habitually used Welsh with peers and elders; (c) Group 3, which included two speakers who spoke Welsh with older members of their families only; and (d) Group 4, which included four speakers who, like those in Group 3, spoke Welsh with older members of their families only, but who were a generation younger than those in Group 3. From the data, Thomas found that SM after *ei* (masculine possessive) was categorical for two types of speakers; those in Group 1 and 2, and that SM after prepositions was variable. He also found that SM after prepositions was used more often with common nouns than with proper nouns (cf. Rees, 1936). Rees (1936) also found that negative particles trigger SM but not the AM element of the mixed mutation. (The *mixed mutation* is whereby a linguistic item can trigger one mutation onto a particular set of sounds and another mutation onto the remaining set of sounds that can undergo mutation: for example, the negatives trigger AM onto /p, t, k/-initial nouns but SM onto /b, d, g, ʈ, ʀ, m/-initial nouns.)

In addition to variation in the use of triggers, some items resist mutation in particular contexts; this is due to properties peculiar to the items themselves. The contexts I refer to here are gender-marked contexts (see below for full description).

2. *Aspirate Mutation (AM)*. Many dialect studies of adult usage show that AM is frequently avoided in speech (e.g., Davies, 1968; Roberts, 1972, 1988; Evans, 1930); however, many of these studies also show that AM is frequent after the feminine possessive adjective *ei* (feminine possessive) (e.g., Evans, 1930; Davies, 1955; Davies, 1968; Ruddock, 1969; Bevan, 1970; Samuel, 1970; Griffiths, 1974; Rhys Jones, 1977; Jones, 1998). As early as 1913, Fynes-Clinton found that the basic form of nouns was often heard after the AM triggers *â* and *tri*. Moreover, the use of AM after AM triggers (other than *ei*) seems to depend on the formality of the setting. After such triggers, AM is rarer in the spoken form than in the written form, and rarer in informal settings than in formal settings (Thomas, 1996).

A study by Ball (1984, also reported in Ball, 1993) looked at the usage of some triggering items for AM by speakers from the Cwmtawe region in South Wales. The triggering items for AM chosen were as follows: *a* "and"; *â*, *gyda* "with"; *tri* "three"; *chwe* "six"; *na* "than", *tua* "towards"; *ei* (feminine possessive); and the negative particles *ni*, *na*, or \emptyset + inflected verb.

To test the patterns of usage of AM two interview styles were used.

First, a more formal method of data collection was employed; these were (a) a formal interview session and (b) a reading task. In the formal interview, the participants were asked ten questions about their backgrounds. In the reading tasks, the participants were required to read out a set of 16 sentences that had numerals or pictures as the target items. For example:

Mae 7 [picture of cat] *a 4* [picture of a dog] *gyda John*

"John has 7 [picture of a cat] and 4 [picture of a dog]¹⁰"

Second, adults participated in a non-formal task. These were (a) a casual interview, and (b) a test in which they had to describe another person's actions or manipulation of stimuli (i.e., a *reporter's test* -- Ball, 1984, 1993). The informal task procedures were as follows: the casual interview continued the background questions, but included such methods as the "emotive" questions technique to promote more casual speech. The reporter's test required the participant to describe a set of actions performed on specific objects by another person; this was designed to elicit the triggers for AM reported above.

The subjects fell into one of three age groups: (a) Group 1, consisting of two male and two female participants between the ages of 20 and 39 years; (b) Group 2, consisting of five male and five female participants between the ages of 40 and 59 years; and (c) Group 3, consisting of four male and four female participants between the ages of 60 and 79 years of age. All participants were grouped according to their scores on an adapted version of an acculturation index (originally used by Jones, 1976, to measure the acculturation of Welsh- and Spanish-speakers in Patagonia). This allowed the grouping of speakers into either a linguistically Welsh dominant or a linguistically English dominant group. All of the participants in Group 1 were English-dominant. Two of the participants in the Group 2 were English-dominant and three were Welsh-dominant; however, four of the participants were between the extremes of English-dominant and Welsh-dominant. One participant in Group 3 was English-dominant and three were Welsh-dominant; four of these speakers were somewhere between being English-dominant and Welsh-dominant.

The results were consistent with those of earlier dialect studies. AM was realised after *ei* (feminine possessive) 74% of the time; this was different from the

¹⁰Note that in Welsh, numerals are followed by the singular, not the plural form of the noun. The plural form is only used in this context if preceded by *o* "of" after the numeral; for example, *saith o gathod* ("seven of cats" < *cath* "cat") where the construction is partitive, but the form of the noun plural. (See e.g., Williams, 1980, and Thorne, 1993, for information on such forms in Welsh.)

results for the other triggers (*a* 30%, *â/gyda* 22%, *tri* 15%, *chwe* 15%, *nal tua* 18%).

Ball (1985) found similar results. His study took the form of an error-recognition test; this involved what he termed *error sentences* which cover the usage of AM. The AM errors were no AM realisation (i.e., the basic form after the trigger) and the substitution of SM for AM in negative verbs (e.g., **ges i ddim* instead of *ches i ddim*, "I didn't get"). The triggers for AM involved in the sentences were *a* "and", *tri* "three", *â* "with", *na* "nor, than", *ei* (feminine possessive) (these were followed by the basic form rather than the AM form of the modified noun) and negative verbs (these were followed by SM rather than AM on the modified noun). An example of a sentence provided was as follows:

*yn yr ardd roedd criw o blant a *cŵn yn chwarae*

"In the garden was a group of children and dogs playing"

In his example, the basic form for "dogs" *cŵn* followed the conjunction *a* "and"; however, traditionally *a* "and" is a trigger for AM (therefore the AM form of the noun should have been realised, i.e., *a chŵn*). The sentences were pre-recorded and played back to the participants on an audio machine. The participants' task was to note down on an answer sheet whether they thought the sentence they heard was correct or incorrect (in which case, they were requested to mark the incorrect item on the sheet).

Eight adult participants took part in this task. All participants were first-language Welsh speakers, their ages ranging from 30 years to 40 years. All spoke a similar dialect and all were educated in standard Welsh.

The results indicated that the participants could detect errors in sentences when AM was replaced by the basic form 65% of the time overall. However, when they separated *ei* (feminine possessive) from the other AM triggers in the analysis, no errors after *ei* were detected; again this was different from the

percentage error detected after the other triggers (the combined score for the other triggers was 56%). Moreover errors in the forms of the negative verbs were only noted 50% of the time.

Thomas' (1984) study, looking at data from tape-recorded interviews of native speakers from South Glamorgan found similar results (see above). He found that the use of AM was low after *a* "and". In his data sample, the overall incidence of *ei* (feminine possessive) was very low; however, in every context where *ei* (feminine possessive) was followed by a noun, AM was produced on the noun. Interestingly, in these contexts, if *ei* (feminine possessive) was followed by a verbal noun, AM was not realised every time. Jones (1998) also found 100% responding on the production of AM after *ei* in all adult participants (20 to 75+ years of age) tested in a northern dialect.

Davies (1984) found from data she observed for the use of AM in children's speech (see Chapter 3) that AM was realised the most after *ei*; she suggested that this was due to it being "functional" -- it is necessary to use AM after *ei* to show feminine possession, and SM for masculine possession. Ball and Müller (1992) and Ball (1985) suggest a similar reason for their results: *ei* carries a heavy semantic load (either it carries the grammatical feature of gender -- Ball & Müller, 1992 -- or there is a grammatically conditioned mutation for *ei* -- Thomas, 1966) compared to the other triggers for AM, and as such, it is rigorously observed (Rhys Jones, 1977). Moreover, according to Tallerman (1987), "it appears that the greater the functional load of a particular environment for mutation, the less likely it is to disappear from Welsh dialects" (p. 73). Davies further suggested that AM after *a* "and" might be realised more often than after any of the remaining triggers for AM (see also Ball, 1984, for information on the use of AM after *a* "and") due to it being a co-ordinating conjunction. As such, it occurs often in speech, and this might have preserved the mutation here. Alternatively, Ball (1988a) suggested that the high incidence of "fossilised"

idioms involving *a* + AM could account for the reported higher performance on adherence to AM after *a* "and" than of the other triggers.

In Breton researchers have also found evidence for the extension of SM to contexts traditionally reserved for AM (Hennessey, 1990). For example, Dressler (1972) found variable usage of AM after some particular triggers in the Breton of Buhulien (Lannion, Côtes-du-Nord). Moreover, the use of the spirantizing triggers differed with age. In particular, he found that for speakers in their teenage years (born around 1955), the spirantizing numerals 3, 4, and 9, and the possessives *ma* "my", *i* (feminine possessive), and *o* "their", tended to trigger either lenition or no mutation (e.g., *ma benn* "my head" rather than *ma fenn*, Dressler, 1972, p. 450). However, for the older speakers, lenition was optionally realised after the numeral 9 whereas the teenagers never assigned a mutation after the numeral 9. For the numerals 3 and 4, the older speakers -- born prior to the first world war -- either produced the inherited spirantization or they produced the lenited form whereas the teenagers only produced the lenited form (Dressler, 1972, p. 452). Hennessey (1990) also noted the work of Favereau (1984) and reported similar findings for the Breton spoken at Poullaouen (Finistère). Generally, the lenited form prevails after the numerals for almost all speakers at Poullaouen. However, there seems to be the following progressive development of the use of the lenited form after the possessives: first, for the older speakers, AM was realised after the possessives; second, speakers born between 1920 and 1940 tended to use lenition here, especially after the third singular feminine *hi* and the first singular *ma*; and third, for those speakers born between 1940 and 1960, the lenited form was the predominant pattern in these environments (Hennessey, 1990). (See also Jones, 1998, for information regarding the differences in adherence to mutation across ages in Welsh.)

3. *Nasal Mutation*. Many of the dialect studies have shown lexical variability in the application of NM. To begin, as Williams (1959) suggests, place-names usually resist NM after both *fy* "my" and *yn* "in" (see also Griffiths,

1974); similarly Evans (1930) noted the resistance of NM on place-names after *yn* "in". This tendency to avoid NM on place-names was noted by the early dialectologist Fynes-Clinton (1913). His work on the dialect of the Bangor area indicated that younger speakers tended to retain the basic form of place-names in NM contexts. Thorne (1971), Davies (1934), Davies (1955), Roberts (1972, 1988), and Bevan (1970) noted that NM was realised after *fy* "my" but not after *yn* "in" (unless in formal contexts -- Roberts, 1972, 1988; see also Hatton, 1988 for information on child usage, reviewed in Chapter 3). Instead, NM was replaced either by the basic form of nouns after *yn* "in" (Davies, 1934; Davies, 1955), or by the SM form (Bevan, 1970; this has also been suggested by Thomas, 1996, and Rhys Jones, 1977); alternatively Roberts (1972, 1988) found examples of both the radical form and SM here. Moreover, Davies (1968) and Ruddock (1969) found both NM and SM after both *fy* "my" and *yn* "in"; Samuel (1970) also found examples of NM, SM, and the radical form after *yn* "in". Samuel also noted that in some dialects (usually in the South), there is a tendency to use SM after *fy* as in the context sentence *yn fam i /əɪn vəm j/ < fy mam i /və mam j/* "my mother". Jones (1992) also observed this. However, Jones (1998) found 100% usage of NM after *fy* in all adults tested in two different dialects.

Awbery (1986b) noted that what the changes described above reflect is not the expansion of the mutation system; rather, they reflect gradual simplification. She proposed that the mutation system is gradually being reduced from the original four-way alternation of the standard language (i.e., the basic form, SM, NM, and AM) to a binary alternation between the basic form and SM. (Others even suggest that a process of language obsolescence is underway and that this is affecting the mutation system; see Jones, 1998.)

The use of SM where NM is the appropriate mutation may be due to "a variable relexification" process (Thomas, 1984, p. 225) where the nouns have developed an initial sound equivalent to the SM form. Thomas (1984) gives examples such as *fenyw /vɪɪu/* "woman" (from */bɪɪu/*); *ford /vɔrd/* "table" (from

/bɔrd/); *gegin* /gɛkɪn/ "kitchen" (from /kɛkɪn/); *bobol* /bobol/ "people" (from /pobol/).

4. *Mutation of proper nouns.* Although place names usually undergo mutation in literary use of the language (Thorne, 1993) there is a tendency to refrain from mutating people's names in colloquial use, regardless of the requirements of the context (Thorne, 1993; Awbery, 1986a). Place names are not affected by this trend and undergo the mutation appropriate to the context (e.g., *i Fangor* "to Bangor", *ym Mangor* "in Bangor"). Foreign place names can undergo mutation, for example *o Blymoth* "from Plymouth" (Gwyn Thomas, 1971, p. 71) where "Plymouth" has undergone SM after the preposition *o*; *ynghaliffornia* "in California" (*Y Faner*, 7 Hydref 1988, p. 16) where "California" has undergone NM after the preposition *yn*; and *Prydain a Phortiwgal* "Britain and Portugal" (Marian Henry Jones, 1982, p. 124) where "Portugal" has undergone AM after the conjunction *a* (all examples taken from Thorne, 1993). Nevertheless, a number of foreign place-names do commonly resist mutation, and this depends on the speaker and dialect more often than not.

As a final point, like person and place-names, brand names can sometimes undergo mutation -- for example, *Ga' i gôc plîs?* "Can I have a coke please?"

2.8.2 Phonological variability.

Not all phonemes that are susceptible to a given mutation type are equally affected in every triggering context. The following section provides examples.

1(a). *Soft Mutation (SM): /θ/ and /r/.* Under SM, all the nine mutable sounds are usually effected. However, there are numerous restrictions on SM for /θ/- and /r/- initial words. For example, although the predicative particle *yn* usually affects all nine mutable consonants, /θ/ and /r/ often resist mutation (Awbery, 1986c; Thomas, 1996; Thorne, 1993); however, Rhys Jones (1977) notes that all mutable consonants tend to conform to the rule in colloquial Welsh. /θ/- and /r/- initial adjectives can resist mutation after the comparative forms *mor* "as" and *cyn*

"as" (Thomas, 1996; Thorne, 1993), and after the adverb *pur* "quite" (Thorne, 1993). The SM of /ʃ/ and /ʒ/ is also restricted in gender-marked contexts; see below, Section 3.1.1. However, Willis (1986) suggests that these exceptions to standard SM are eliminated from spoken Welsh; that is, the mutation of /ʃ/ and /ʒ/ to /l/ and /r/ is observed by some speakers.

The extent of this restriction to /ʃ/ and /ʒ/ sounds that are usually susceptible to SM in other contexts has led researchers to reconsider the distribution of the behaviour of some sounds to particular types of mutation processes. Ball and Müller (1992) suggested extending the traditional three-way mutation system to include "Restricted SM", with a view to specifying restrictions of SM on /ʃ/ and /ʒ/.

1 (b). *Soft Mutation (SM): /g/*. The deletion of /g/ under SM seems to be applicable only to native words; recent borrowings retain their basic forms (Thomas, 1996; Ball & Müller, 1992; Awbery, 1986a; Tallerman, 1987). Willis (1986) accounted for the non-mutation applied to the adjectives *go* "rather" and *gan* "false" in SM contexts by suggesting that such short words would be unrecognisable without their initial segments. Tallerman (1987) suggested that the same argument could also be used to explain why the /g/-initial English borrowings often resist mutation in Welsh.

2. *Aspirate Mutation (AM) and Soft Mutation (SM): The Mixed Mutation*. Whereas AM affects /p/-, /t/-, /k/-initial and vowel-initial nouns, the triggers *a* "and" and *na* "than" can only affect /p/, /t/, and /k/. However, as already noted, the negative particle *na* "than", the negative particles *ni* and *na*, the conjunction *oni* "until", and the particle *oni* "if not" are unique in that they trigger the mixed mutation (Thomas, 1996; King, 1993). Similar to the provection processes in Cornish and Breton (Timm, 1985), under the mixed mutation, different mutation types affect different sounds: /p/, /t/, and /k/ undergo AM, whereas /b/, /d/, /g/, /ʃ/, /ʒ/, and /m/ undergo SM (Watkins, 1993). This irregularity in the system suggests

again the need for a further addition to the traditional three-way mutation system (Ball & Müller, 1992).

Ball and Müller (1992) note that there are other restricted forms following *saith* "seven" and *wyth* "eight"; these items trigger only SM on /p, t, k/ (e.g., *saith bunt* "seven pounds", from *punt* "pound"). However, Ball and Müller consider such forms to be archaic.

3. *Restrictions of SM to all susceptible initial sounds.* The numerals *saith* "seven" and *wyth* "eight" trigger SM; however, it is only /p/-, /t/-, and /k/-initial nouns that undergo this change (Watkins, 1993; Thorne, 1993), and in southern Welsh, even these sounds resist mutation in this context (Williams, 1980, p.44). According to Tallerman (1987), Fynes-Clinton (1913, p.563) noted that all of the mutable consonants underwent SM after *wyth* "eight", although only the voiceless stops underwent SM after *saith* "seven".

4. *Nasal Mutation (NM): restricted triggers.* Some numerals, for example *naw* "nine", require NM on a highly restricted set of nouns (Awbery, 1986a). This set includes *blynedd* "years" (e.g., *naw mlynedd* "nine years"). Other nouns after *naw*, for example *bachgen* "boy", remain in their basic form. Consistent with Ball and Müller's (1992) position on *saith* and *wyth* (see above), the mutation of this restricted class of nouns after "nine" might also be considered archaic.

5. *Regional and stylistic variation.* Added to the above variations is the variation between and within speakers. This includes variation in dialect, region, and style (see e.g., Ashton, 1950; Watkins, 1961; and pedagogical grammars -- e.g., Rhys Jones, 1977; Uned Iaith Genedlaethol Cymru, 1976).

2.8.3 The expansion of mutations.

Colloquial use of SM has been expanding in both Welsh and Breton (Willis, 1990). According to Thorne (1993), the adverbs *sut* "how?", *pryd* "when/ what time?", *faint* "how much/ how many?", that were not traditionally triggers of

SM, may now trigger SM of the following verb in some colloquial varieties and in some informal texts. For example:

Faint all plentyn dan bump ei gofio?

How much-can-child-under-five-object marker-remember

"How much can a child under five remember?"

where *gall* "can" has undergone SM into *all* (Humphreys, 1981, p. 39, cited in Thorne 1993).

SM has also been expanded in some dialects to both /tʃ/ and /dʒ/. For example, instead of /tʃɔːklad/ "chocolate" after the possessives *fy* "my" and *dy* "your", some dialects have /ən nʃɔːklad/ "my chocolate" (NM) and /də dʒɔːklad/ "your chocolate"¹¹ (SM) (Thorne, 1993).

2.8.4 Summary

Welsh, like the other Celtic languages, operates an extensive mutation system, a set of morpho-phonological changes that affect the initial segments of words. These phonological changes are based on morpho-syntactic rules. Three types of sound changes occur in Welsh -- soft mutation, nasal mutation, and aspirate mutation. The environments that trigger these mutations are vast, and the number of contexts that require each mutation type varies. However, the system is not coherent: it consists many gaps (e.g., one cannot assume that every sound susceptible to a given mutation type undergoes that mutation in all triggering contexts) and there is much variation in speakers' adherence to the use of mutations.

I now turn our attention to one specific grammatical function of mutation: its role in gender marking.

¹¹Casual observation of the stories told by participants in Study 1 (Chapter 4) suggests that SM has been extended for some child speakers into yet another context. The predicative particle *yn*, although traditionally not a trigger for any mutation on verb-nouns, nevertheless triggered SM for *cael* "to have" for many of the children (e.g., *dwi'n gal < cael* "I'm having", the standard form being *rwyf yn cael*; *mae o'n gal < cael* "he's having", the standard form being *mae o yn cael*). One possible explanation for this would be that the SM is the resulting sound change of an invisible trigger, *ei* (masculine possessive), as in *'dw i'n ei gal* "I'm having it".

2.9 Mutation and Gender

2.9.1 Grammatical gender: noun and adjective.

Welsh operates a two-gender system, in which nouns, animate and inanimate, are generally marked for either masculine or feminine gender. The gender of a noun cannot be inferred from the basis of noun form, and the assignment of a noun to a particular gender is often arbitrary. Both SM and AM play a crucial role in the way gender is marked in the language. A noun's gender is indicated as follows. In theory, both these happen:

1. The initial consonant sound of feminine singular nouns undergo SM after the definite article *y(r)*¹² "the"¹³ and after the numeral *un* "one".

Adjectives that are used nominally in place of feminine singular nouns may also undergo SM in this context (Tallerman, 1987). For example:

y lonnaf < *llonnaf*

"the happiest (female)"

y fechan < *bechan*

"the little (girl)"

2. The initial consonant sounds of adjectives (or nouns behaving adjectivally) undergo SM when modifying feminine singular nouns. This applies to all adjectives that occur in a sequence.

¹²There are three allomorphs of the Welsh definite article: *yr*, *y*, and *r*. In what follows, *y* will be used wherever there is mention of the definite article (according to Watkins, 1993, "despite being chronologically the most recent variant to emerge, *y* is regarded as the citation form", p.313).

¹³ There are also two specified lexical items that undergo SM after the definite article. These are the two forms of the numeral "two": *dau* (masculine) and *dwy* (feminine). For these items, this context does not distinguish between the genders of the numerals by mutation since both undergo SM, although gender is determined by the choice of numeral.

The extent to which children mark, and attend to gender marking, as shown under points 1 and 2 above, is the main subject of this thesis; this subject is explored in the experimental chapters. Table 2.9 provides examples of gender-marked contexts.

Table 2.9: Examples of Gender-Marked Contexts.

	Feminine	Masculine
Basic Form	<i>cath</i> "cat" <i>basged</i> "basket" <i>cathod</i> "cats" <i>basgedi</i> "baskets"	<i>ci</i> "dog" <i>bwrdd</i> "table" <i>cŵn</i> "dogs" <i>byrddau</i> "tables"
Feminine Noun After Definite Article	<i>y gath</i> "the cat" <i>y fasged</i> "the basket" <i>y cathod</i> "the cats" <i>y basgedi</i> "the baskets"	<i>y ci</i> "the dog" <i>y bwrdd</i> "the table" <i>Y cŵn</i> "the dogs" <i>y byrddau</i> "the tables"
Feminine Noun After <i>un</i> "one"	<i>un gath</i> "one cat" <i>un fasged</i> "one basket"	<i>un ci</i> "one dog" <i>un bwrdd</i> "one table"
Adjective After Feminine Noun	<i>cath fawr</i> "big cat" <i>cath fawr ddu</i> "big black cat" <i>basged felen</i> "yellow basket" <i>basged felen wag</i> "empty yellow basket"	<i>ci mawr</i> "big dog" <i>ci mawr du</i> "big black dog" <i>bwrdd melyn</i> "yellow table" <i>bwrdd cadarn melyn</i> "solid yellow table"
Numerals	<i>dw y gath</i> "two cats" <i>dw y fasged</i> "two baskets"	<i>dau gi</i> "two dogs" <i>dau fwrdd</i> "two tables"
Ordinals	<i>y drydedd gath</i> "the third cat" <i>y bedwaredd fasged</i> "the fourth basket"	<i>y trydydd ci</i> "the third dog" <i>y pedwerydd bwrdd</i> "the fourth table"

Although a noun's form provides no indication of its gender (although it is reported that there are some regularities in the endings of some abstract nouns, see Surridge, 1989, and below) there are small sets of quantifiers and adjectives that have marked feminine forms that do agree with the gender of the co-occurring noun.

First, there are distinct feminine forms for some numerals:

<i>dau</i> (masculine)	"two"	<i>dwy</i> (feminine)
<i>tri</i> (masculine)	"three"	<i>tair</i> (feminine)
<i>pedwar</i> (masculine)	"four"	<i>pedair</i> (feminine)

Second, the ordinals "third" and "fourth" have distinct feminine forms:

<i>trydydd</i> (masculine)	"third"	<i>trydedd</i> (feminine)
<i>pedwerydd</i> (masculine)	"fourth"	<i>pedwaredd</i> (feminine)

Third, a few adjectives have distinct feminine forms:

<i>trwm</i> (masculine)	"heavy"	<i>trom</i> (feminine)
<i>melyn</i> (masculine)	"yellow"	<i>melen</i> (feminine)
<i>brith</i> (masculine)	"speckled"	<i>braith</i> (feminine) ¹⁴

However, the use of these feminine forms is minimal even in literary Welsh (Watkins, 1993). According to Thomas and Thomas (1989), *gwen* "white (feminine)" is the only marked feminine form (masculine unmarked is *gwyn*) that is currently used in colloquial speech (besides specific units whose forms are somewhat "fossilised" -- e.g., *buwch goch gota* "ladybird", where *gota* is the mutated feminine form of *cwta* "short"). Watkins (1993) also noted *trom* and *dofn* (< *twfn* "deep") as frequently used feminine forms in colloquial speech.

Therefore, more often than not, it seems that the gender distinctions inherent in some adjectives are being lost in Welsh. Because of the reduction in usage of the feminine forms of adjectives, researchers such as Jones note that "treigladd yw'r unig arwydd sydd ar ôl o gytundeb â'r enw" (Jones, 1993, p. 147) (the only remaining sign of agreement with the noun is mutation). (However, as noted

¹⁴These are usually formed by the exchanging of internal vowels to create a feminine form. Adjectives that have -w - /-u-/ and -i- /-i-/ as the vowel nucleus have a feminine form with -o- /-ɔ-/ and -e- /-ɛ-/ as the vowel nucleus, while some adjectives with -i- /-i-/ as their vowel nucleus have a feminine form with -ai- /-ai-/ as their vowel nucleus.

below in Section 2.9.2, gender distinctions as shown by mutation can only be shown for those nouns whose initial consonant sounds are part of the class of sounds that undergo SM.)

Pronouns that are co-referential with the nouns can also aid in the marking of gender (see below). However, it is not uncommon for a masculine pronoun to refer to a feminine noun (see also below).

2.9.2 The opacity of the gender system

The Welsh grammatical gender system is very opaque. This is reflected in the fact that there are no one-to-one form-function mappings, there are gaps in the system, and there are differences in the sounds that can undergo mutation in gender-marked contexts, among other things. The following outlines the opacity of the system.

1. *Form-function mapping.* The mapping between mutation and gender in Welsh is opaque. There is no one-to-one correspondence between a particular gender and a certain mutation type. For example, although there is a strong association between SM and feminine gender, it is the masculine form of the possessive adjective that conditions SM of the modified word (see Section 3.0). Moreover, in most other contexts for SM, all nouns with an initial mutable consonant undergo mutation, regardless of the nouns' gender. For example, adjectives undergo SM when following feminine singular nouns only; however, when an adjective precedes the noun (which is a marked word order), the noun will always undergo SM, regardless of its gender (Tallerman, 1987) (e.g., *glas lanc < llanc* "young lad").

2. *Gaps in the system.* Gender marking is constrained to singular forms. Gender distinctions are neutralised in the plural.

3. *Number of word-initial sounds that can undergo mutation.* Gender distinctions (as expressed in nouns modified by the definite article and adjectives modifying nouns) can be expressed only on the surface for nouns and adjectives

that have mutable initial consonant sounds. Consider the feminine nouns *fffenest* "window" and *ysgol* "ladder", for example. When these nouns are preceded by the definite article, their [+ feminine] status is not easily distinguished from the [+ masculine] status of such nouns as *ffrwyth* "fruit" and *ysbyty* "hospital".

Regardless of their gender, all these nouns appear in their basic form after the definite article:

y ffenest (feminine) "the window"

y ffrwyth (masculine) "the fruit"

yr ysgol (feminine) "the ladder"

yr ysbyty (masculine) "the hospital"

If these nouns co-occur with an adjective, however, provided that the particular adjective with which they occur has an initial consonant sound that undergoes SM, one can distinguish between the genders of the nouns:

y ffenest fawr (feminine) < *mawr* "the big window"

y ffrwyth mawr (masculine) "the big fruit"

yr ysgol ddu (feminine) < *du* "the black ladder"

yr ysbyty du (masculine) "the black hospital"

However, if these nouns co-occur with adjectives whose initial consonant sounds are not from the class of sounds that undergo SM, then it is impossible to distinguish between the genders of all of these nouns:

y ffenest newydd (feminine) "the new window"

y ffrwyth newydd (masculine) "the new fruit"

yr ysgol hir (feminine) "the long ladder"

yr ysbyty hir (masculine) "the long hospital"

4. *Ambiguity of form.* The gender of a noun can be ambiguous in gendered contexts, even if the noun has an initial sound that undergoes mutation (see Chapter 6).

5. *Contradictory triggers.* According to Thorne (1993), both feminine and masculine proper nouns can trigger SM onto adjectives when referring to a particular individual; for example, *Arthur Fawr* < *mawr* "Arthur the Great", *Hywel Dda* < *da* "Hywel the Good", *Selyf Ddoeth* < *doeth* "Solomon the Wise". However, many of these examples are possible fossilisations (Tallerman, 1987), and many exceptions exist, for example, *Ieuan Du* "Ieuan the Black", and *Gwilym Tew* "Fat Gwilym" (Williams, 1980, p. 39).

6. *Lexical Variation.* Some lexical items seem to frequently resist mutation in gendered contexts -- most notably *bach* "small" (see Section 3.1.2). In many northern dialects, *bach* frequently resists mutation after the definite article (Thorne, 1993; and see Chapter 4). Another such exception is *da* "good" in *nos da* "good night". *Nos* "night" is feminine, so *da* "good" should, if it behaved as the other adjectives in this context, undergo SM.

7. *Variation in usage.* As with mutations in general, there is considerable variation in speakers' adherence to gender mutation (see below).

8. *Variable inherent gender.* There is a very small tendency (for historical reasons) for words with core vowels *-w- /-u-/* and *-y- /-ə-/* to be masculine, and those with *-o- /-ɔ-/* and *-e- /-ɛ-/* to be feminine; for example, *cwch* "boat" and *drych* "mirror" are masculine, and *pêl* "ball" and *cloch* "bell" are feminine (Watkins, 1993). However, many exceptions exist. For example, both *llwy* "spoon" and *hwch* "sow" are feminine, *hyd* "length" and *dysgl* "dish" are feminine, *corff* "body" and *bol* "stomach" are masculine, and *mêl* "honey" and *pres* "money" are masculine. There are no regular phonological features that determine the gender of a given noun, although some noun endings provide partial

prediction of gender. The following may serve as a guide to the gender of some nouns:

- The only reliable class of nouns that show gender status consistently are verbal nouns, which are always masculine (Watkins, 1993).
- The gender of animate nouns is usually dictated by the biological sex of their referents. However, Welsh has both masculine and feminine epicenes; this is where the sex of the referent can either relate to the gender of the noun or bear no formal correspondence to it. For example, *plentyn* "child", *babi* "baby", and *eryr* "eagle" are masculine, whereas *colomen* "dove", *bronfraith* "thrush", *cath* "cat" and *cwningen* "rabbit" are feminine.
- Some nouns that share a given semantic feature are assigned a particular gender (although many exceptions occur). The following provide some examples (see e.g., Thomas, 1996; Williams, 1980; Surridge, 1989):
 - i. Names of days, months, and seasons are masculine.
 - ii. Names for main holidays are masculine and feast days with *Gŵyl* "festival" are feminine (e.g., *Gŵyl Fair* "Saint Mary's Festival" -- Surridge, 1989).
 - iii. The wind and compass points are masculine.
 - iv. Names of substances or materials are often masculine (although there are numerous exceptions e.g., *gwlanen* "flannel", *diod* "drink" are feminine; Williams, 1980).
 - v. Names of rivers and streams are feminine (although old place-names with *Nant-* are often masculine, Williams, 1980 -- e.g., *Nantglyn* "brook-valley").
 - vi. Trees and names of trees are usually feminine (although those forms used with *pren* "wood" are often masculine; e.g., *ffigysbren* "fig-tree",

pren afalau "apple tree", *pren eirin* "cherry tree" (SurrIDGE, 1989), although these forms can be used with *coeden* "tree" and become feminine).

vii. Names of countries, cities, towns, and villages are usually feminine (although some names for land and area are masculine; e.g., *tir* "land", *cyfandir* "continent" are masculine, Williams, 1980)

viii. Names of mountains are usually feminine (although *y Berwyn* and *y Moelwyn* are exceptions, and any combinations with the masculine forms *bryn* "hill" and *mynydd* "mountain" are masculine -- Thomas, 1996; Williams, 1980).

ix. Different names for roads are feminine (although *llwybr* "path" is an exception -- Thomas, 1996).

x. Names of clothing are usually feminine (although *trowsus* "trousers", *cap* "cap", and *crys* "shirt" are some exceptions -- Thomas, 1996).

xi. The letters of the alphabet are feminine.

xii. Many collective nouns are feminine (although many are masculine, e.g., *côr* "choir", *undeb* "union" are masculine).

xiii. Names of fruits and vegetables are often feminine (although many masculine examples exist; e.g., *grawnffrwyth* "grapefruit", *lemon* "lemon", *nionyn* "onion". Note *afal* "apple" and *oren* "orange" can be either gender -- SurrIDGE, 1989).

xiv. Languages and names of languages are feminine (although when denoting an example or specimen or particular piece of a language -- i.e., if the name of the language is qualified -- it is masculine. Thus *Cymraeg da* "good Welsh", and *Gwyddeleg Diweddar* "Modern Gaelic" are masculine; Williams, 1980; Griffiths & Jones, 1995).

- Some derivative nouns (mostly abstract nouns -- Williams, 1980; Jones, 1965) can be classified as masculine or feminine according to

their termination. For example, nouns ending in the following terminations are usually masculine (although there are exceptions):

-ad, -aint, -awd, -od, -dod, -deb, -der, -ter, -did, -tid, -dra, -dwr, -edd, -had, -i, -iad, -iant, -ineb, -ni, -ioni, -id, -rwydd, -wch, -yd, -yn, -cyn, -we.

Similarly, nouns ending in the following terminations are usually feminine (although there are exceptions):

-aeth, -iaeth, -as, -fa -ach, -en, -ell.

SurrIDGE (1989) analysed the phonological "endings" of the lexical entries found in *Yr Odliadur* (1978), a Welsh rhyming dictionary. Most of the words in the book are uncommon and are mostly abstract nouns, and SurrIDGE confined her analysis to nouns with endings that predominantly signalled feminine gender. Some of these endings are the same as those noted above, others different. Her findings show that nouns ending in *-a* signal feminine gender 63% of the time (this is above the 60% criteria level set by Tucker, Lambert, & Rigault, 1970, for French; see SurrIDGE, 1989). However, just over 60% of masculine derivatives in *-dra* are masculine. Nouns ending in *-aeth* signalled feminine gender 93% of the time. 90% of nouns ending in *-en* and *-eg* were feminine. 87% of nouns ending in *-ell* were feminine. There were seven examples of feminine nouns ending in *-ern* and eight examples of feminine nouns ending in *-orch* (and no examples for masculine or variable gender nouns). And there were 13 examples of feminine nouns ending in *-ordd* and ten feminine examples ending in *-isg* (both types had one masculine exception). From her calculations, the most consistent phonological marker for gender was *-aeth*. However, as SurrIDGE pointed out, the pronunciation of *-aeth* is uncertain; some dialects might pronounce it /-aθ/, others as /-εθ/. Thus, she conducted a further analysis of all phonological endings in

/-θ/. In this sample, the masculine form predominated¹⁵. Nouns ending in *-th* other than *-aeth* are 66.7% masculine, 34.2% feminine. However, when she combined the scores for all of the nouns ending in *-th* (including *-aeth*), these nouns were still feminine 81% of the time. Therefore her calculations suggest that nouns ending in *-aeth*, *-en*, *-eg* and *-ell* could be considered as predictive markers for feminine gender.

Variable gender nouns (i.e., nouns that can be either masculine or feminine and nouns that can act as epicenes) are a comparatively frequent occurrence in Welsh (although Watkins, 1993, suggests that they are rare in Modern Welsh). Many grammarians agree variable gender nouns occur due to the following three conditions:

1. *The sex of the referent* (Williams, 1980). For example, many unmarked forms such as *prïod* "spouse", *wŷr* "grandchild", and *ysgrifennydd* "secretary" refer to both males and females, and are therefore of "common gender" (Morris-Jones, 1921). In Middle Welsh, *dyn* was used to denote a man or a woman and *cath* was used to denote a male and a female cat. The sex distinction was shown in the mutation or non-mutation of the nouns after the definite article: *y dyn* "the man", *y ddyn* "the woman" (Williams, 1980; Watkins, 1993; Morris-Jones, 1921); *y cath* "tom-cat", *y gath* "female cat" (Watkins, 1993). Morris-Jones (1921) noted that the use of *dyn* to denote a woman was mostly confined to poetry, and that older speakers still used it occasionally in South Wales. Moreover, speakers in North Wales evolved a "new" feminine counterpart, *dynes*, and "some late writers have used this inelegant provincialism" (Morris-Jones, 1921, p. 60). This form has not been completely adopted into the literary standard (Williams, 1980) in which the appropriate form for woman is *gwraig*; in the colloquial language of many northern dialects, *dynes* presides. Other nouns in the "common gender"

¹⁵She found 17 masculine nouns, two feminine nouns, and one variable gender noun ending in *-arth*; eight masculine, ten feminine, and one variable gender noun ending in *ath*; 12 feminine, 12 masculine, and one variable gender noun ending in *-eth*; 11 masculine, five feminine, and one variable gender noun ending in *-erth*; 15 masculine, eight feminine, and two variable gender nouns ending in *-ith*; two masculine and two feminine nouns ending in *-oth*; two masculine, two feminine, and one variable gender noun ending in *-orth*; four masculine nouns ending in *-uth*; and nine masculine nouns ending in *-wth*.

class have evolved feminine forms that are in common usage, usually by the addition of *-es* or by the exchange of the masculine endings *-ydd* and *-wr* with *-es* and *-wraig*, for example, *wŷr/wyres* "masculine/feminine grandchild", *ysgrifennydd/ysgrifenyddes* "masculine/feminine secretary", *myfyriwr/myfyrwraig* "masculine/feminine student" (Thomas, 1996; Williams, 1980; Morris-Jones, 1921). In Modern Welsh, *cath* has the status of a feminine epicene (Watkins, 1993).

According to Morris-Jones (1921), nouns of "common gender" are assigned a particular gender randomly:

The term "common gender" applies to a word generally; it means that in one sentence the word may be m.[sic], in another f. [sic]. In any particular sentence it must be one or the other; and in parsing the gender should be given. Thus in *fy nyn wen . . .* (rad. *dyn*) *dyn* is f.[sic], the adj. [sic] *wen* agreeing with it. (p. 61)

By this, Morris Jones implies that within any one idiolect there is room for variation in the assignment of gender to "common gender" nouns.

2. *Dialect / local custom and taste or choice of the speaker* (e.g., Thomas, 1996; Williams, 1980; Thorne, 1993; Morris-Jones, 1921). Some nouns vary in gender according to dialect. The following nouns are masculine in the standard language, but feminine in parts of the north: *castell* "castle", *cwch* "boat", *cwpan* "cup", *emyn* "hymn", *pennill* "verse", *piano* "piano", *saflle* "place", *tei* "tie", *trên*, "train", *tywydd* "weather". The following nouns are masculine in the standard language, but feminine in parts of the south: *cinio* "lunch", *cyflog* "wage", *cyngerdd* "concert", *gwniadur* "thimble". The following nouns are feminine in the standard language, but masculine in parts of the south: *canolfan* "centre", *clust* "ear", *cornel* "corner", *poen* "pain", *porfa* "pasture", *tafarn* "tavern". The

following nouns are feminine in the standard language and masculine in parts of the north: *breuddwyd* "dream", *crib* "summit", *eiliad* "second (in time)" (examples taken from Thomas, 1996; translations mine). Although these nouns tend to be marked for a given gender in the colloquial speech of the different dialects, it appears that some nouns do not seem to be fully integrated into the gender of choice. For example, although *munud* "minute" is masculine in the north, it is feminine in *y funud hon* "this minute"; and sometimes nouns like *tei* are marked for feminine on the adjective, but the noun itself is marked for masculine after the article: *y tei ddu* "the black tie" where *du* has undergone SM after the noun.

3. *Meaning* (e.g., Williams, 1980; Thomas, 1996; Thorne, 1993; Morris-Jones, 1921). Some nouns have different grammatical functions in different lexical contexts. For example, *math* "kind" is masculine in *y math hwn* "this kind", but is feminine in *y fath beth* "such a thing" (Williams, 1980).

On the other hand, some pairs of homonymic nouns that have similar forms have different grammatical functions and different meanings in different lexical contexts. For example, *gwaith* can mean both "work/ workplace" and "occasion", and *yn y gwaith* "in work" is masculine, and *dwywaith* "twice" is feminine (Thomas, 1996, translations mine).

4. *Uncertainty regarding the gender of fairly recent borrowings* (Williams, 1980). Some borrowings have been assigned both genders due to uncertainty about their usage. However, many other recent borrowings have been incorporated into either the masculine or the feminine gender. According to Watkins (1993), in early borrowing, nouns were assimilated to some extent to the native system; however, the assignment of masculine gender to nouns is dominant in almost all recent borrowings. Moreover Williams (1973), in his preface for the *Geiriadur Termau/ Dictionary of Terms*, noted:

When the editor was in doubt as to whether a term should be regarded as masculine or feminine there was more than a tendency to adopt the masculine gender. Adopting the masculine form reduces the demands on mutation in Welsh and is also in line with natural development in other languages where there is a gender pattern somewhat similar to that of Welsh. (p. x)

This is not at all surprising considering the proportion of masculine to feminine nouns in the language. In her study on the possible gender-indicating properties of Welsh noun endings, Surridge (1989) found that 27.5% of nouns in Welsh are feminine. When she excluded variable gender nouns from the calculations, she found that the proportion of feminine nouns increased to 28.3%. This proportion is lower than that of some other two gender systems (e.g., Tucker et al., 1970, found that 38% of nouns in French are feminine).

2.10 Pronoun Gender: Grammatical vs. Natural System

The feminine gender of the (homonymic) possessive adjective *ei* "his, her, its" is marked by AM on the modified word, whereas the masculine gender is marked by SM on the modified word. The plural form of the possessive adjective *eu* "their" is not distinguished for gender and does not trigger any mutation. Examples 1 to 3 below illustrate the difference in the mutations triggered:

Basic form

1. *car* /kar/ "car"

Mutated form

ei gar /i gar/ "his car"

ei char /i xar/ "her car"

eu car /i kar/ "their car"

Moreover, the gender distinction after *ei* also applies to inanimate nouns. For example:

Basic form

cefn /kɛvɨ/ "back"

Mutated form

syrthiodd y gadair ar ei chefn

fell-the-chair-on-its (feminine)-back

"the chair (feminine) fell on its (feminine)

back"

syrthiodd y bwrdd ar ei gefn

fell-the-table-on-its (masculine)- back

"the table (masculine) fell on its (masculine)back"

Pronouns that are co-referential with inanimate nouns also agree in gender:

syrthiodd y gadair ar ei chefn, a nath hi dorri

fell-the-chair-on-its (feminine)-back-and-did-it (feminine)-broke

"the chair (feminine) fell on its (feminine) back, and it (feminine) broke"

syrthiodd y bwrdd ar ei gefn a nath o dorri

fell-the-chair-on-its (masculine)-back-and-did-it (masculine)-broke

"the table (masculine) fell on its (masculine) back and it (masculine) broke"

However, the extent to which inanimate nouns are marked for gender in this way in colloquial speech is unclear (see Section 3.1.3 below). It is not uncommon for a noun to be marked as feminine, but to occur with a masculine pronoun (Jones, 1993). For example,

Lle mae'r gadair? Dyma fo

Where is the chair? Here is it (masculine)

"Where's the chair (feminine)? Here it (masculine) is"

In a study that investigated the language of speakers of East Sutherland, a moribund Scottish Gaelic dialect, Dorian (1976) noted similar trends as regards pronoun gender. She found that for some of the younger speakers (between 40 and 60 years of age) the pronoun replacement was invariably /a/ "he, it" regardless of the gender of the noun. She also noted that it was common for younger speakers (and even occasionally for the older speakers) to "have a mutation marking a feminine after the article and yet a pronoun replacement appropriate to a masculine within the same sentence" (Dorian, 1976, p. 280). Jones (1998) also found, for Welsh, that feminine nouns are very often referred to by a masculine pronoun, although masculine nouns are never referred to by a feminine pronoun.

Study 3 (Chapter 7) provides some information on the marking of gender after *ei* when the possessive pronoun refers to an inanimate object.

2.11 Variation in the Use of Gender Mutations

From the above, it appears that gender is not robust in Welsh. There are numerous reasons to suggest why. However, it could be argued that gender distinction is in fact robust whereas it is the mutation that is variable. All nouns (depending on dialect area, etc.) that are masculine would always be masculine and all nouns that are feminine would always be feminine. That is, all nouns would have an invariable inherent gender. This could be a valid point if we were dealing with a prescriptive language and if inherent gender was shown in any other way apart from mutation. However things are very different in the spoken language. For the system to be robust, all feminine nouns would have to undergo SM after the definite article and all adjectives would have to undergo SM after feminine nouns. All masculine nouns would have to retain their basic form after

the article and all adjectives would have to retain their basic form after masculine nouns. This would be the only way in which noun gender could be shown to reflect the stringent nature of the system.

However, these facts are not quite the same in spoken language. In spoken Welsh, mutation of feminine nouns and of adjectives following feminine nouns is often eluded, and there is evidence that minimal errors can also occur with masculine nouns (see Chapters 4, 6, and 7). What this means, from the language-acquiring child's point of view, is that nouns with inherent feminine gender are not always mutated after the article nor are adjectives after feminine nouns. Masculine nouns may sometimes (but vary rarely) undergo SM after the article and adjectives may sometimes (but very rarely) undergo SM after masculine nouns (see Jones, 1998). Thus, bearing in mind that mutation is the only way in which the gender of a noun is shown, children will hear nouns marked for both genders (nouns mutated and not mutated after the article and adjectives mutated and not mutated after nouns). Therefore, if the mutation in these two gender-marked contexts is variable, then it follows that gender is also variable. For the child, it would be reasonable to believe that *cath* "cat" is equally likely to be feminine as it is masculine if the child is constantly exposed to both *y cath* and *y gath*, and to *cath du* and *cath ddu*, for example. However, all this presumably depends on the frequency of input. If the masculine nouns were marked for their genders as variably as the feminine nouns, this would strengthen the case. However, masculine nouns are only slightly prone to variation. Therefore, it is more likely to assume that, if a child hears, on a relatively frequent basis, both mutated and non-mutated nouns after the definite article, he or she could assume, given that masculine nouns will almost invariably resist mutation in this context, that the noun is feminine. Similarly, if a child hears both mutated and non-mutated forms of adjectives after particular nouns, then they could assume, with equal certainty, that the noun is feminine.

However, the above discussion holds true only for those nouns that can undergo SM and for nouns marked by adjectives that can undergo SM. The Welsh gender system is laden with irregularities of different types that render the system still more variable to the language-acquiring child. This next section outlines some of the variation exhibited in the gender system.

2.11.1 Restrictive mutation of /ʃ/ and /r/.

The restrictive aspect of /ʃ/ and /r/ under SM also applies to gender mutation (although Rhys Jones, 1977, notes that this exception is confined to North Wales dialects). Although all nine sounds susceptible to SM usually undergo this mutation in a triggering context, /ʃ/ and /r/ often resist such a change. This applies to the definite article followed by a feminine singular noun context. Feminine singular nouns with initial /ʃ/ and /r/ resist SM when modified by the article *y*. Therefore a child will hear *y llygoden* "the mouse" and *y rhaw* "the spade" and not *y lygoden* and *y raw* (Uned Iaith Genedlaethol Cymru, 1976; Evans, 1981; Hughes, 1984; Thorne, 1993; Williams, 1980; Watkins, 1993; Ball & Müller, 1992). This also applies to feminine singular nouns modified by the numeral *un* (see e.g., Hughes, 1984; Evans, 1981; Thomas, 1996). However, according to Thomas (1996) and Awbery (1986a), although /ʃ/ and /r/ resist SM after *y* in the standard language, it is not uncommon for some dialects to mutate these sounds, for example, *y lygoden* "the mouse", *y raw* "the spade".

2.11.2 Selective mutation of adjectives.

In many of the northern dialects, the adjective *bach* "small" resists mutation after feminine singular nouns (see e.g., Thomas, 1996; Griffiths & Jones, 1995; Thorne, 1993). For example, in some dialects children will hear *hogan bach dda* "good little girl", where the noun *hogan* "girl" is feminine, and *da* "good" has undergone SM into *dda* but where *bach* "little" has retained its basic form (cf. *hogyn bach da* "good little boy"). Similarly, children will hear *pêl bach*

goch "little red ball", where *pêl* "ball" is feminine and *coch* "red" has undergone SM into *goch* but where *bach* has retained its basic form (cf. *car bach coch* "little red car"). This difference in usage of *bach* in the northern and southern dialects is clearly shown in an example of place-names: *Eglwysbach* "Little Church" exists in Denbighshire in the North, whereas *Eglwysfach* exists in the South (Thomas, 1996).

The non-mutation of *bach* in the northern dialects may behave in the same way as adjectives whose initial consonant sounds are not part of the class that undergo SM. If one considers the feature [+ feminine singular] as the trigger for SM, then in the case of sequential adjectives, the feature triggers SM as far as the boundary of the NP or until another trigger interrupts the original trigger (Ball & Müller, 1992). Tallerman (1987) suggested that those adjectives that have non-mutable initial sounds "break" the sequence; the mutating properties of the trigger must "jump over" such adjectives. However, Ball and Müller (1992) suggested that in such cases, it would be better to assume that the morphological feature [+ feminine singular] does trigger SM on all adjectives; only those without the initial sounds to show this effect retain their basic form. Although the adjective *bach* can "show" the effect of SM, it usually retains its basic form in northern dialects. So, for those speakers who never mutate *bach* after feminine singular nouns, *bach* probably shares the same features as those adjectives whose initial consonant sounds cannot "show" "the necessary structural description for the input to the phonological part of mutation" (Ball & Müller, 1992, p. 162). Alternatively, it could be argued that *bach* is becoming a diminutive suffix in the northern dialect (see Chapter 4).

2.11.3 Irregular marking for gender.

Gender mutations, as are mutations in general, are prone to variation both between, and within, speakers. As noted, variation exists in consistency; a noun might be marked for one gender in one sentence, and subsequently marked for the

other gender in another sentence; for example, "*Ma' na ddafad yn gweld y dent, a ma'r ddafad yn mynd am y dent. . . Mewn â'r ddafad drost y tent, malu'r dent. . .*" "A sheep sees the tent (feminine), and the sheep goes for the tent (feminine). . . In goes the sheep over the tent (masculine), breaking the tent (feminine). . ." (extract from a story told by an adult participant in Study 1). In this example, the speaker alternates between SM and no mutation of *tent* (which, in standard descriptions, is treated as feminine). For nouns that are used as either masculine or feminine in a given dialect, variation of this type provides the language-learning child with an extremely complex system of gender marking. Variation also occurs in agreement; the noun may be marked for feminine gender but the adjective marked for masculine gender. For example, it is common to hear such constructions as *y pêl goch* "the red ball" in which *pêl* is feminine, but has not undergone SM after the article *y* into *bêl*, but in which the colour adjective *coch* has undergone SM into *goch*; *y gath du* "the black cat" in which *cath* "cat" has undergone SM into *gath*, but in which the colour adjective has not undergone SM into *ddu*.

2.12 Conclusion

The Welsh gender system is a highly opaque system. There are no regularities in the form of the nouns that can indicate membership to one of two gender classes -- masculine and feminine. Rather, gender is marked by mutation. The same types of variability as is subjected to the mutation system in general exist here too, adding to the opacity of the system. There is no one-to-one correspondence between form and function within the system; SM is used to mark both feminine nouns and masculine possessors. There are also gaps in the system, variable inherent gender for some nouns, and variable marking of gender in colloquial speech.

Although reduced to having minority status within the community, the Celtic languages have survived in competition with the stronger English and French languages. Although subjected to constant threat from such strong

majority languages, the Celtic languages have nevertheless retained a feature that is unique to them, namely the mutation system. The morpho-phonological sound changes of the mutation system affect the initial segments of words, and this plays an integral part in the marking of gender. However, due to its constant state of flux, the Welsh language exhibits many examples of variability in the use of mutations; adherence to mutations varies across dialects, and speakers, and within idiolects. This renders the Welsh grammatical gender system in a more precarious state than other grammatical gender systems, particularly Indo-European languages. Due to the complexity of the mutation system, gender marking in Welsh is subjected to less regularity than that of other languages, producing gaps in the system, and a lack of a clear form-function mapping. This provides the language-acquiring child with a very complex task to master.

CHAPTER 3

Research on the Acquisition of Mutation: An Overview

3.0 Introduction

In this chapter, I present an overview of the growing body of research that has recently emerged in the study of Celtic mutation. No large scale studies have focused extensively on the Welsh gender system; the only information about local gender marking exists as small parts of larger studies that either looked at children's naturalistic speech, but do not present the full data, or looked at children's ability to mark feminine nouns in the written form. In the absence of such data, a review of studies that have looked at the acquisition of mutation (for both the Welsh, and other Celtic languages) will be presented. Although the data on the Welsh language are often limited to a small number of studies, they nevertheless form an initial picture of the developmental progress of the Welsh mutation system. Since mutation plays a crucial role in the marking of grammatical gender, any information regarding children's acquisition of mutation may be useful in determining the route to acquisition of grammatical gender in Welsh. Together, they can help examine these four issues:

- How easily, and at what point in development, do Welsh-speaking children acquire the mutation system?
- Is one mutation type acquired earlier, and/or with more ease?
- Are some triggers to mutation acquired earlier than others both within, and across, mutation types?
- To what extent are mutations prominent in children's speech?

This chapter begins with a general review of the research to date. Each study will be reviewed in turn, and its theoretical implications highlighted to create an initial outline of what is already known about the acquisition of

mutations in Welsh. The possible ways in which this information can be tied in with research on grammatical gender in Welsh will then be discussed.

3.1 General Overview

Although little work has been conducted on the acquisition of mutation, what work has been done covers a range of different aspects of the system (see Ball & Müller, 1992, for a concise review). Some studies have looked specifically at the phonology of Welsh (e.g., Bellin, 1984, 1988; Hatton, 1988), and others have looked specifically at variation in Welsh mutation (e.g., Thomas, 1984; Ball, 1988b). Those that have investigated the acquisition of mutations will be reviewed along with other studies that provide additional information about mutations, in adult usage, where necessary. (This type of information provides information about mutation usage in different dialect areas, reflecting the system that the children are aiming to master.)

Some of the studies have investigated the development of mutation in spoken language; others have looked at the development of mutation in written contexts. These represent two types of knowledge, the former being less formal than the latter. Due to the limited number of studies that have looked at mutation in spoken Welsh, I will attempt to provide a clear overall picture of what the data from all these studies indicate in terms of the following two issues:

- What is the current usage of mutation in spoken language?
- What are the possible developmental paths that children may follow in their efforts to gain mature competence of the system they are learning?

3.2 Naturalistic Data

One study that has looked at children's naturalistic use of Welsh is that by Ogwen and Jenkins (1978). The aim of their study was to gain insight into children's interests -- this with the view to producing children's books. In order to

do this, written and spoken language examples were collected from over 900 children between the ages of 4 and 8 years who attended 30 Welsh-medium schools across Wales. Three data collection methods were employed, two of which were of greatest interest, namely (a) a recorded ten minute conversation between one of the researchers and each of the children individually, and (b) a recording of the same children over three sessions in a group situation. During the conversation between the researcher and the child, the child was urged to talk about his or her interests outside school. In the group situation, the children were urged to talk about things they were currently learning about in the classroom.

From the transcripts for the individual conversations, Ogwen and Jenkins (1978) noted many examples of the lack of mutation in the children's speech, the most common being after prepositions. The examples they provided were as follows:

*mynd ar *ceffyl < geffyl* "going on (a) horse"; *mynd i *tŷ nain < dŷ nain* "going to granny's house"; *mynd i *capel < gapel* "going to chapel"; *mael [sic] mynd i *twll < dwll* "going into (a) hole"; *lluchio fo i *dŵr < ddŵr* "throwing him/ it into water"; *stori am *ceffyl < geffyl* "story about a horse"; and *gorfod cael chwech i *dechre < ddechre* "having to have six to start" (p. 11).

Although not designed to investigate the acquisition of Welsh per se, these data suggest that errors persist at ages 4 to 8 years, indicating that children do not fully master the system by this age. In fact, much of Welsh research supports the notion of a protracted acquisition of the mutation system. The following section describes studies that support this view.

3.3 Protracted Acquisition

Contrary to recent research that indicates rapid and easy acquisition of language structures (see e.g., Pinker, 1994), usually by the age of about three years, some of the research on the mutation system in Welsh indicates that the system is not learned until much later in development. Recall from Chapter 1 that

children learning other gender languages often acquire the system quickly, at a very early age. This is especially so for children learning more transparent systems that allow them to construct, or learn, the systems largely on the basis of distributional privileges (e.g., Karmiloff-Smith, 1978, 1979; Cain, Weber-Olsen, & Smith, 1987; Levy 1983a, 1983b; Berman, 1985; Mills, 1986a, 1986b; Popova, 1973; Smoczyńska, 1985). For other languages that have more opaque systems, the acquisition of gender seems more difficult and more protracted (e.g., Maratsos & Chalkley, 1980; Mulford, 1985). As described in Chapter 2, the Welsh mutation system, and in particular the way in which it is associated with the marking of gender, is variable in the input. This, and the fact that there is lexical and phonological variability integral to the system, makes both the Welsh mutation system, and the Welsh grammatical gender system, opaque. It is thus not surprising that the research reviewed below indicates protracted development of mutations. If mutations are protracted, one could argue that the acquisition of gender mutations would also be late; this is provided we expect both systems to be acquired simultaneously, or concurrently, since they are interrelated.

Data from some Welsh studies indicate that the acquisition of mutation is not complete until well after the age of 5 years (Bellin, 1984, 1988), and not even by the age of 11 years (Hatton, 1988; Jones, 1992). In Bellin's (1984, 1988) study, children were tested on their knowledge of direct-object mutation in Welsh. Direct-object mutation requires the object of a finite verb to undergo SM, where the trigger appears in the syntactic aspect of the environment in which the target noun occurs (e.g., *cath welodd gi < ci* cat-saw-dog "(a) cat saw (a) dog"). A sentence repetition task was designed to include 16 sentences with potential direct-object mutation; half of these sentences contained errors in the application of the SM on the direct object of the sentence, the remaining half of the sentences contained no SM errors on the direct object. The children's task was to repeat the sentences that the experimenter orally presented to them. Two types of sentences were presented: the first type employed a noun as the target of the mutation, and

the second type involved a verb as the target. Examples of the stimuli were as follows:

wneith mam dê (target noun *tê* → *dê*)

will make-mother-tea

"Mother will make tea"

wneith mam dalu (target verb-noun *tal* → *dal*)

"Mother will pay"

Five children participated in the study -- 3;10 to 6;8 years of age. All the children attended Welsh-medium schools in South Wales and came from Welsh-speaking homes. The phonological alternations investigated on the target nouns and verb-nouns were /p/ → /b/, /t/ → /d/, /k/ → /g/, and /g/ → ∅, in conjunction with the forms of *gwneud* "to do".

The results showed that, when the two youngest participants (3;11, and 4;4 years of age) repeated the sentences, they tended to convert them into a more periphrastic form, common to their dialect. For example, when the children were asked to repeat *Wneith Mam dân*, they produced the following:

Neith mam neud tân

Will-mother-make-fire

"Mother will make fire"

In the adult language, when the verb *gwneud* is inserted after the subject *mam* "mother", it takes the mutation instead of the noun *tân* "fire". While these children's periphrastic constructions correctly marked the main verb form *gwneud* (/g/ deleted to produce *neud*), the noun *tân* correctly resisted mutation. These children only mutated *gwneud*, but when such sentences involved other verbs in this position, these children did not regularly mutate those.

The other three children (5;2, 5;11, and 6;8 years old) produced fewer periphrastic forms than the younger children, retaining the elicited direct-object mutation in their productions. Moreover, when given ungrammatical sentences, these three older children corrected the examples to include SM of direct objects. This performance was strongest in sentences that had a verb as the potential target, although their performance varied across the sentences. Only one of the children, the 5;11 year old, was consistent in the correctness of her productions across all examples.

From the analysis of his data, Bellin concluded that it was not until around the age of five years that children acquire a strong linguistic intuition about the rule for direct-object mutation in Welsh (Bellin, 1984).

Along with the methodological criticisms that have been directed towards imitation tests (e.g., the elicited imitation behaviour might simply reflect rote behaviour, reflecting performance rather than grammatical competence -- Lust, Flynn, & Foley, 1996 -- and imitation tests can only be taken as partial evidence of children's language knowledge -- Smith & van Kleeck, 1986) one should take Bellin's conclusions cautiously for the following reasons:

First, the sample of children in this study was small (the results were based on the data of only five children). Second, only one child at each of the significant age thresholds was investigated (i.e., just under 4 years; 4 years; 5 years; just under 6 years; just under 7 years old). A difference in the general linguistic competence of any of these children could have aided, or disrupted, their performance on the task, subsequently pointing the development of mutation towards any age threshold. In other words, any extreme respondent in this small group of children could have diverted the data to one conclusion or another.

Although one must be careful when interpreting such results, they nevertheless indicate children's inability with this particular type of mutation rule until well after the age of 5 years.

Hatton's (1988) study focused on the development of mutation by 26 children from South Wales. The children were of junior school age (class 1, 7- to 8-year-olds; class 2, 8- to 9-year-olds; class 3, 9- to 10-year-olds; and class 4, 10- to 11-year-olds). They were assigned to one of four groups according to their linguistic backgrounds. Group 1 contained ten children whose parents (mother and father) were L1 Welsh speakers, and originated from the Tywi-Neath area. Group 2 contained seven children for whom one of the parents was L1 Welsh, and originated from the Tywi-Neath area. Group 3 contained four children whose parents were either monolingual English but with a Welsh background, or monolingual English and no Welsh background at all. Group 4 contained five children for whom either both their parents were L1 Welsh, but who originated from outside the Tywi-Neath area, or one L1 parent originated from outside the Tywi-Neath area.

Two types of testing methods were used in this study. Both investigated the children's spoken language.

First, the children were administered a linguistic questionnaire. This involved having the children provide Welsh translation equivalents for English examples that they were given, and asking them to complete patterns. These methods were used to ascertain whether there are differences in the children's patterns in instances when they are dealing with only one language compared with two languages. The following triggers for NM were included in the questionnaire. First person singular possessive form *fy* "my", and the preposition *yn* "in" were used as triggers for a variety of nouns. Some numerals (e.g., *pump* "five", *saith* "seven", *wyth* "eight", *pymtheg* "fifteen", *deunaw* "eighteen", *ugain* "twenty") were used as triggers for the lexical items *blwydd* "year", *blynedd* "years", and *diwrnod* "day" only.

Second, the children participated in five "conversation" sessions. In one of these sessions Hatton used a story-telling technique in which the child was

provided with pictures and asked to relate the story depicted in his or her own words.

The results from the linguistic questionnaire (i.e., the translation task) indicated that the use of NM after *fy* "my" increased with age (although even the younger children produced NM in this context over 50% of the time). From this, Hatton (1988) suggested that NM was established in 7-year-olds' speech, and that linguistic development occurred between the ages of 7 and 11 years. The results on the pattern completion task were slightly higher (although probably not significant) than for the translation task. From this, Hatton suggested that the children were more likely to produce NM when dealing with one language (i.e., their performance on the pattern completion test) than when using two languages (i.e., their performance on the translation task).

Conversely, the data from the conversation sessions indicated that the children's performance across age groups was less consistent than it was in the questionnaire. Individual analysis of the children's conversation data indicated that the initial development on NM after *fy* "my" was more or less in place by the age of 7 years, and that the mutation stabilised between the ages of 8 and 10 years (Hatton, 1983). Moreover, consistent with what has been found in dialect studies (see Chapter 2), Hatton's data indicated that NM after *yn* "in" was far less established than after *fy* "my". However, contrary to the findings of other research (see Chapter 2), the replacement of NM by SM in this context was not a strong factor for the lack of NM in these contexts. Alternatively, for each age group, the children tended to substitute the basic form of the noun following *yn* "in" for the "correct" NM form (the 7- to 8-year-olds produced NM only 4.94% of the time, the 8- to 9-year-olds produced NM 3.33% of the time, the 9- to 10-year-olds produced NM 19.84% of the time, and the 10 to 11-year-olds produced NM 37.03% of the time). These results again indicate development with age (although even by 11 years of age NM occurred only 37.03% of the time after *yn* "in").

Interestingly, the children's production of NM after *yn* was better in the questionnaire session than in the conversation session. This was possibly due to the questionnaire session eliciting more formal language than the conversation session. However, for the children whose parents did not speak Welsh, the incidence of NM after *yn* was higher than it was for children in the other language groups. This indicated, similar to Bellin's (1988) findings (see below), that the children's performance was based on the language input they received; that is, those children whose parents spoke Welsh were very likely to pick-up their dialectal influences, which may involve the substitution of the basic form for the NM form after *yn* as the dialect studies have pointed out (see Chapter 2). On the other hand, children whose parents did not speak Welsh might have relied on the formal teaching practices they were exposed to at school, thus explicitly exposing them to NM rules.

From her data, Hatton (1988) concluded that NM began to develop in these children's language at distinct times. NM after *fy* initially developed during the ages of 7 and 9 years, reaching an established pattern of usage by the age of 10 years. However, it was not until 10 years of age that the initial development of NM occurred after *yn*. This late development of the production of NM after *yn* "in" could have something to do with the fact that *yn* is a homonymic form. One use of *yn* as a predicative particle triggers SM whereas *yn* as a preposition triggers NM. It could also have to do with the fact that, in some southern dialects, *fy* is colloquially pronounced in the same way as *yn* and takes SM instead of NM here (e.g., Thomas, 1996; Jones, 1992).

Bellin's (1984) and Hatton's (1988) studies indicate protracted development of the mutation system in spoken language. Children seem only to acquire a good knowledge of direct-object mutation (SM) after the age of 5 years. Moreover, an established pattern for NM seems to have developed in the context *fy* + NM by the age of 10 years, but not in the context *yn* + NM until after 10 years of age.

Another study that indicated a protracted path to the development of mutations in Welsh is that by Davies (1982; also reported in Davies, 1984). In her study, Davies investigated Dyfed children's perception and production of AM and NM in written texts. Two groups of children, aged between 9;7 and 11;6 years of age, participated in her study. The first group consisted of 10 boys and 4 girls (11;0 to 11;6 years of age); the second group included 11 boys and 3 girls (9;7 to 10;5 years of age).

The children took part in two tests. One of the children's tasks was a so-called Recognition Test (Davies, 1982). In this test, the children were provided with a sentence that contained three possible forms of a word, one being the basic form, another the SM form, and the other the NM form. The sentences were presented in the following way:

	(1) <i>farn</i>	
<i>yn fy</i>	(2) <i>barn</i>	<i>i, ofn yr hen ddyweddiad sydd arnynt</i>
	(3) <i>marn</i>	

"In my opinion, the fear of the old saying is on them" (Davies, 1982, Appendix 4).

The child's task was to select one of the three forms of the target noun highlighted (the SM form -- (1), the basic form -- (2), or the NM form -- (3), in this example).

A second test, named the Generation Test (Davies, 1982), required the children to produce the appropriate mutation on a piece of text. The children were provided with an English sentence and a Welsh translation of the sentence. All the words in the Welsh translation were jumbled up and none of the mutations were marked. The children's task was to unscramble the translation and to subsequently mark the correct mutation.

The results showed that, overall, children from both age groups scored better on their production and perception of NM than of AM, contrary to information gathered from studies of spoken adult language (see Chapter 2), but in agreement with Ball (1984).

Interestingly, an analysis of the children's performance across genders suggested that, for both age groups, girls performed better than boys. A further analysis of the children's performance across triggers coincides with what many of the dialect studies have found (see Chapter 2). For NM, the numerals were less effective than *yn* and *fy* as triggers in both tests, and for both age groups. For AM, *tua*, *tra*, *tri*, *ni*, *na*, and *oni* produced low scores in both tests; no AM was produced after *tri* in the generation test. In agreement with dialect studies (see Chapter 2), Davies (1982) found that the most effective triggers for AM were *ei*, *a*, *â*, and *gyda*. Davies suggested that, for *ei* (feminine possessive), AM was prevalent after this trigger simply because it is functional; that is, the choice of the "correct" mutation after it -- SM or AM -- is vital in defining the gender of the referent referred to by the possessive adjective. For *a* "and", Davies suggested that the prevalence of AM after this trigger was due to the high frequency of this co-ordinating conjunction in the language (although some of these constructions tend to be fossilised idioms, see Chapter 2 for discussion).

Finally, analysis of the children's errors revealed that AM after *ni*, *oni*, and *na* tended to be substituted by SM. The AM triggers after *tra* and *tua* also triggered SM; however, Davies suggested that most of the children appeared to be unfamiliar with either of these two triggers. After *ei*, *a*, *â*, and *gyda*, AM was substituted by both the basic form and the SM form in the recognition test. In the generation test, however, the majority of the substitutions contained the basic form. For all children, after *ni*, *na*, *oni*, *tra*, and *tua*, AM was substituted by SM in the recognition test. In the generation test, the older age group tended to substitute SM after *ni*, *na*, *oni*, *tra*, and *tua*, whereas the younger age group tended to substitute it by the basic form. The supplanter for NM in the recognition test was

the basic form, whereas, in the generation test, both the basic form and SM supplanted NM about equally. This data replicates what other researchers have found, namely that SM is used at the expense of NM and AM (see Chapter 2).

From these data Davies (1982) concluded that by the end of their primary education, children have, more-or-less, mastered mutations in the literary standard. But here again, the conclusions must be treated tentatively if we are to take on board the children's performance on this test as indication of the acquisition of mutation. Methodological problems (e.g., children could perform at chance -- Ball & Müller, 1992-- children's conception of what exactly they had to do, and the task of re-arranging the stimuli taking precedence over linguistic accuracy in the re-arrangement task -- Davies, 1982) and a generally low performance by the children indicate that what knowledge the children have about NM and AM in written form is not strong, although they differ in adherence to one mutation type more than another, and to some triggers more than others, in accordance with the norm for the spoken language of their dialect. However, regardless of these design problems, it seems that, in the written language, children are still having problems at the age of 11 years with the correct form of nouns after certain triggers to NM and AM.

3.4 The Amount and Type of Linguistic Input

In accordance with other studies that indicate that the type and amount of language children are exposed to plays an important role in the development of certain language features (e.g., Gathercole, 1986, in press a, in press b, in press c; Gathercole, Sebastián, & Soto, 1999) studies of Welsh suggest that this might be an important feature in the development of the mutation system. For example, Hatton's (1988) data on the acquisition of NM (see above) suggests that children whose parents are not Welsh speakers produce more NM after *yn* than children whose parents are L1 Welsh; this suggests that the L2 speakers rely on more

formal teaching of particular rules than the L1 speakers who learn it more naturalistically.

Another study that addresses this issue is that of Bellin (1988). His study involved children whose parents both spoke Welsh, those for whom both parents did not speak Welsh, and a small group of children who attended the Welsh-medium school in London and who were all addressed in Welsh at home. The children's ages ranged from 5 to 9 years.

Bellin (1988) designed an elicitation test where a short piece of text was read out to the children, the final word of the text being missing. The missing final word was preceded by the homonymic possessive adjective *ei* "his" (triggering SM), *ei* "her" (triggering AM), or *fy* "my" (triggering NM). The child's task was to supply the missing word after each of the triggers, thereby completing the sentence.

An example of the stimuli presented is as follows. The child was shown a picture of Dafydd and Siân in which Siân was holding a broken doll. The linguistic information to accompany the picture was:

*Mae Dafydd a Siân yn cweryla. Mae Dafydd wedi torri tegannau Siân.
Mae Siân yn gweiddu [sic]: "paid a chwarae gyda fy . . ."*

"Dafydd and Siân are quarrelling. Dafydd has broken Siân's toys. Siân shouts "Don't play with my . . ." (1988, p. 222).

For the above example the target word was *tegannau* "toys"; the target form was *nhegannau* (NM).

What Bellin (1988) found was that children from Welsh-speaking homes in both Wales and London performed slightly better than children from non-Welsh-speaking homes on this task (this was across all ages tested). Moreover, the performance of all children, regardless of language background, improved with age.

Item by item analysis separated two items, *tê* "tea" and *cap* "cap", as items for which there was a difference in performance between those children who spoke Welsh at home and those who did not. Both nouns are lexical borrowings from English. In an attempt to explain the differences in performance on these nouns compared to the other "native" nouns, Bellin (1988) drew on a suggestion made by Dressler (his personal communication) in which he referred to work he conducted on Breton. Dressler noted that for those speakers whose use of the language is confined to specific situations, the mutated forms of loan words are less likely to be produced (cf. Dressler & Wodack-Leodolter, 1977; see Bellin, 1988). Bellin thus noted that because *tê* and *cap* are loan words, children from non Welsh-speaking backgrounds might be reluctant to fully integrate such items into the mutation system. Similarly, from a pool of recorded utterances, Stephens (1996) found that the basic form was only produced with two items by L2 Breton-learning children; these were the French borrowings *karotez* (in French, *carotte* "carrot"), and *krokodil* (in French, *crocodile* "crocodile"). Breton is the only Celtic language to have developed a singular indefinite article. Both the definite and the indefinite articles trigger the same mutation; this allows for very few contexts in which the basic form can occur (these include indefinite plural noun phrases, head noun in possessive constructions, and after a few prepositions -- Stephens 1993, 1996). Indeed, Stephens reports that the mutated form of nouns are more common than the basic form of nouns in the speech of children who are acquiring Breton in an immersion Breton-speaking environment; this also applies to adult speakers. The mutated form presides over the basic form even when the article is elided in speech; for example '*wrac'hell, urwrac'hell blouz* < *gwrac'hell* (An Abad, 1993, p. 32, cited in Stephens, 1996). Similarly, for Welsh, there are some contexts in which SM occurs even when the triggering context is no longer present, or is present only at some underlying level (e.g., negative verbs can undergo SM as in *Wnes* (< *gwneud*) *i ddim byd* "I didn't do anything"). Thorne (1993, p.44) suggests that this occurs due to the influence of an initial particle *ni*

that does not surface. In these studies on Breton, children are reported to produce the mutated form of nouns more often than the citation forms, and, as such, any noun that can take the basic form in young children's speech must be nouns that are not fully integrated into their mutation system like the borrowings *karotez* and *krokodil*.

In a follow-up study Bellin (1988) collected spontaneous speech productions from four of the Welsh children (aged 6 to 9 years) who participated in the elicitation task. A game-playing situation, involving three pairs of identical objects -- two Ping-Pong balls (used to elicit SM from *pêl* to *bêl* and NM to *mhêl*), two small cars (used to elicit SM from *car* to *gar* and NM to *nghar*), and two bus tickers (used to elicit SM from *tocyn* to *docyn* and NM to *nhocyn*) prompted the children to use the lexical items following possessives in a child-to-child situation.

The 6-year-olds' performance in the formal elicitation test was better than in the spontaneous situation. This trend was reversed for the older children. (This finding is similar to that of Hatton (1988), whose data indicated that children performed better on NM after *yn* "in" in a formal questionnaire session than in a more naturalistic conversation session.) To account for this, Bellin (1988) suggested that young children may be developing a "tacit strategic knowledge" (p.227) of the mutation system, which is triggered by the formal situation of the elicitation test. The older children, on the other hand, are already producing the mutated forms in spontaneous speech, and may rely on their conscious knowledge of the mutation rules in production rather than on any tacit knowledge (Bellin, 1988).

This progression with age found by Bellin (1988) has also been found for Irish- (Ó Baoill, 1992) and Breton-speaking children (Stephens, 1996), although the proposed progression from the basic form to the mutated variants are reversed in Breton (Stephens, 1996; see above).

Parts of a study conducted by Ascot and Ball (1987) allowed for "error-analysis" of mutation usage and other structures. The data came from children's

story-telling. One English story and one Welsh story were initially read to the children and each child's task was to "re-tell" the English and the Welsh stories using the illustrating pictures as a guide.

Nine children participated, aged between 6;7 and 7;6 years. All the children were from a Welsh-medium school in an urban area of south-east Wales. The children were further divided into three groups according to their linguistic background (i.e., the first language of their parents).

Error-analysis showed that most errors occurred with mutations. Mutations were frequently omitted, some were unnecessary, and other non-mutated words were de-mutated (e.g., *drws* "door" was interpreted by one child as being the mutated form of the non-existent form **trws*, since /t/ undergoes SM into /d/). Moreover, the children with English-speaking parents performed at an error rate of only 35.6% -- slightly ahead of the children with Welsh-speaking parents, who performed at a 38.6% error rate. Those children who had one Welsh-speaking and one English-speaking parent produced a staggering 58% error rate. Drawing on Bellin's (1985, 1988) interpretation of the children's performance in his study, it could also be the case that the English dominant children are relying on their tacit knowledge of the mutation rules whereas the Welsh dominant children can rely on their knowledge from spoken situations, and treat the task as a more naturalistic exercise (Ball & Müller, 1992). Alternatively, this phenomenon might be explained in terms of the children's learning exposures. Children with English-speaking parents might reflect a classroom language model, that is, the teacher's stress on correctness in written prose; children with at least one L1 Welsh parent might reflect a more vernacular model of learning (Ascot & Ball, 1987).

3.5 Gender Mutations

I now turn to what information we have regarding the acquisition of gender mutations. Only one study has looked specifically at gender in Welsh, although other studies have looked at Welsh gender in passing.

A study of first language acquisition of Irish by two young children conducted by Ó Baoill (1992) revealed interesting information on the acquisition of a particular gender mutation. His data present some information on the development of mutation after the article. Irish is also a two gendered language (Siadhail, 1998; Ó Sé & Sheils, 1993). In Irish, masculine vowel-initial nouns undergo a process whereby a *t*- is added (e.g., *an t-athair* < *athair* “the father”, *an t-eolas* < *eolas* “the information”); feminine nouns that have initial consonants are lenited (e.g., *an mháthair* < *máthair* “the mother”, *an bhileog* < *bileog* “the leaflet”), and *sl*-, *sn*-, *sr*-, and *s*-initial feminine nouns become “*ts*” (e.g., *an tsráid* < *sráid* “the street”) (although *t*- and *d*-initial feminine nouns resist lenition here, Siadhail, 1998). From naturalistic observation, Ó Baoill found a developmental route for the appropriate use of the mutation rule. There were no examples of mutation after the article in the speech of the two children followed, between the ages of 1;6 and 1;9 years. Between 1;9 and 2;0 years of age, the children began to produce mutations, but not consistently. This represented a period of variation between the appropriate and non-appropriate use of the rule, thus indicating that a learning process is taking place (Stephens, 1996). Finally, between the ages of 2;0 and 2;2 years, the mutation became stabilised and was used in the appropriate environments. Once the rule was acquired, appropriate mutation was applied throughout. This indicates an early command of the mutation rule as a marker for gender for Irish-speaking children.

Stephens (1996) also reports on some initial information regarding children’s naturalistic use of the mutation rule in gender marked contexts. In Breton, the gender of a noun can be acquired only if it undergoes or causes SM in specific contexts; this shows if the noun is masculine or feminine (Hemon, 1975).

Feminine singular nouns undergo SM after the article (definite and indefinite); masculine singular nouns do not. However, there is one exception: masculine nouns undergo SM alternation of *k* -> *c'h*. Stephens' data comes from the linguistic productions by 20 children aged between 2;8 and 6;0 years.

Stephens' (1996) results indicated that the under 4-year-old children produced SM on feminine nouns after the article 87% (26/30) of the time, the 4- to 4;11-year-olds 91% (33/36) of the time, and the over 5-year-olds 93% (43/46) of the time. For the mutation of masculine nouns from *k* -> *c'h*, the children's performance increased with age from 74% (40/54) to 97% (36/37). Comparing these performances with the children's performance on SM in all contexts, the children seem to have established the rules for all SM contexts concurrently (correct SM in all contexts 88% of the time for the under 4-year-olds, 92% of the time for the 4-to 4;11-year-olds, and 87% of the time for the over 5-year-olds).

Jones and Jones (1984) looked at two grammatical correlates of gender marking in written Welsh. These were namely (a) the marked forms *dwy* "two (feminine)", *tair* "three (feminine)", *trydedd* "third (feminine)", and *gwen* "white (feminine)", and (b) SM (where gender realisation would require the replacement forms *ddwy* < *dwy*, *drydedd* < *trydedd*, and *wen* < *gwen*).

Children from a Welsh-medium school in Cardiff took part in a Cloze-type procedure test. A sample of 28 children took part, aged 10 and 11 years (14 boys and 14 girls). However, the only information about the children's language backgrounds was acquired by the children's form mistress, who judged that they included 19 (68%) L1 speakers (11 boys and 8 girls), and 9 (32%) L2 Welsh-speakers (6 girls and 3 boys).

The test took the form of a short story (112 words). The story described three white mice that two girls put in the third drawer of a table. The children were asked to read the text first and then to fill in the gaps. There were 10 such gaps in the text. Each response was scored for the expected filler as well as for other responses (this included semantically acceptable as well as unacceptable

responses and no responses). For *gwen*, *dwy*, and *trydedd*, the insertion of marked forms and observation of the SM rule were scored separately.

The results for the insertion of marked forms were as follows:

For *tri*, L1 speakers substituted this with the marked form *tair* 84% of the time, whereas L2 speakers did this 78% of the time. In both L1 and L2 groups, the girls performed better than the boys, although not much difference was found between the boys and the girls in the L1 groups (L1 group, 87% girls vs. 82% boys; L2 group, 83% girls vs. 67% boys). All the L2 children produced *dair* (SM form), whereas only two of the L1 children did this. Jones and Jones (1984) suggested that it is not unusual for L2 children (or even L1) to use a mutated form (particularly SM as it has a high frequency of occurrence in speech) as the basic form (see Ball & Müller, 1992, for a discussion of SM as the default form). Therefore it is possible that the children's production of the mutated form here may be interpreted as an example of a habitual vernacular style rather than as the wrong application of the rule (Jones & Jones, 1984).

L1 speakers produced *dwy* 89% of the time whereas this task created more difficulties for the L2 speakers who produced *dwy* only 44% of the time. Again, girls performed better than boys in both language groups (L1, 100% girls vs. 82% boys; L2, 50% girls vs. 33% boys). The production of the unmarked form *dau* was again rare, occurring only once in the whole study.

This suggests that the children's knowledge of the gender of the antecedent noun, to which these two numerals refer, is very good, as is their knowledge of a feminine form for numerals. However, when they looked at the results for the replacement of *gwen*, Jones and Jones (1984) noted that the children did not seem to have the same type of gender knowledge when dealing with this specific adjective form. They found that the children were generally poor at producing this form. Again the L1 children performed better than the L2 children (L1 37% vs. L2 0%) where none of the L2 children produced *gwen*, and again, the girls performed better than the boys (L1: 63% girls vs. 18% boys). (However, see

Thomas & Thomas, 1989, and Chapter 2, for discussion of the use of marked adjective forms.) Only two children (11% of the sample population) were able to produce *trydedd*.

The results for the observation of mutation rule were as follows:

For *dwy*, the children's observation of the mutation rule was not as good as their production of the marked form; that is, they failed to mutate the nouns that occurred after *dwy*. Here again, L1 children performed better than L2 children (L1 68% vs. L2 11%). The co-occurrence of a marked form and subsequent SM was observed by 76% of L1 speakers compared to 25% of L2 speakers. Again, girls performed better than boys (L1, 75% girls vs. 64% boys; L2, 17% girls vs. 0% boys).

For *gwen*, the same trend in language groups' and genders groups' behaviours was observed: L1 children observed the mutation rule 47% of the time whereas L2 children did not observe the rule at all; L1 girls produced the mutation 63% of the time compared to the L2 children 36% of the time. Generally, when the marked form had been replaced, the mutation rule was observed; where the unmarked form had been replaced the mutation rule was not observed.

For *trydedd*, the children were very poor at observing the mutation rule (L1 16% vs. L2 0%). Only two instances of the marked form were replaced, and of these two instances, the mutation rule was observed.

Therefore, the marking of gender by the appropriate choice of item (*dwy*, *tair*, *gwen*, *trydedd*) and the production of mutation was best with the numerals (i.e., best for *dwy*, then *tair*), then with the adjective (*gwen*); performance was worst with the ordinal (*trydedd*). Jones and Jones (1984) suggested that, since the children scored progressively worse from numeral to adjective to ordinal, the grammatical correlate of the gender marking did not account for the rank order, but rather the particular word-class of the modifier involved. Moreover, this could also have been due to the frequency of occurrence of these forms in spoken Welsh.

One study that has indirectly looked at the gender-marked contexts *y* + noun and feminine noun + adjective is that by Jones (1992). As part of a larger study, Jones provided 212 14-year-olds with a written task. This task comprised two sets of linguistic stimuli: (a) a set of sentences, each with at least one blank position; and (b) a selection of possible words as fillers. The participants were asked to choose words from the second set and to place them in the blank positions provided on the sentences in the first. They were also told to make any necessary changes to the nouns selected. Each was preceded by one of the following triggers: *ei* in reference to a feminine noun (AM); *ei* in reference to a masculine noun (SM); *yn* "in" (NM); *y* "the" (SM); and a singular feminine noun (SM). This task required knowledge of the structure of mutation (i.e., that the preceding contexts provided caused a mutation) and of the mutation type that the particular context caused (Jones, 1992). Five sentences were given as follows:

1. *Mae hi wedi gyrru ei ----- dros y mynydd* "She has driven her ----- over the mountain" (target noun *car* "car"; target form *char* -- AM).

2. *Mae'r awdur yn son am ei-----* "the author is talking about his -----" (target noun *llyfr* "book"; target form *lyfr* -- SM).

3. *Mae hi'n aros yn----- un o'i chyfeillion* "She's staying in one of her friends -----"(target noun *tŷ* "house"; target form *nhŷ* -- NM).

4. *yr oedd hi'n eistedd ar y -----* "She was sitting on the -----" (target noun *cadair* "chair"; target form *gadair* -- SM)

5a + b. *Mae hi'n chwilio am gôt ----- i fynd gyda'r sgert -----* "She's looking for the ----- coat to go with the ----- skirt" (target adjectives *coch* "red" or *du* "black"; target forms *goch* or *ddu* -- SM).

Overall, Jones (1992) found that children produced the correct mutation type in these contexts 73.04% of the time; the wrong mutation type was used only 7.31% of the time, and the basic forms 6.60% of the time. Across the different mutation types, the children performed better on SM than on AM, and better on AM than on NM. This is different from what Davies (1982) found for NM and

AM; she found that children performed better on NM than on AM (cf. Ball, 1984, 1988a, 1988b for adult usage). Consistent with other research on both adult and child language, the children here performed well with the AM trigger *ei* “her” and less well with the NM trigger *yn* “in”. They produced the correct mutation after *ei* “her” 75.25% of the time, and after *yn* “in” only 55.67% of the time. For *yn* “in”, children responded with the basic form 21.65% of the time (compared with 9.60%, 13.13%, 9.09%, 13.13%, and 15.66% for the other triggers) and with the wrong mutation 22.68% of the time (compared with 15.15%, 7.58%, and 2.02% for some of the other triggers).

The children’s performance with mutation in gender-marked contexts was high. In the context of an article followed by a feminine noun, the children produced the correct SM form of the noun 83.33% of the time, producing errors of basic form only 9.09% of the time and of the wrong mutation only 7.58% of the time. For the context of feminine noun followed by an adjective, the adjective was produced in its SM form 84.85% and 84.34% of the time; however, the replacement with the basic form was higher than for the noun following the definite article (13.13% and 15.66% replacement with the basic form). Therefore gender marking in the written work of 14-year-olds seems to be well established.

3.6 Naturalistic Use

Ogwen and Jenkins' (1978) study (see under "Naturalistic Data" above) indicated that the gender of nouns is frequently confused by 4- to 8-year-old children; this is especially the case when a noun was associated with a numeral. These findings do not correspond fully to Jones and Jones' (1984) findings for numerals, however (see above). Recall that the authors found children’s performance on the replacement of numerals to be better than their performance on the replacement of adjectives, and better than the replacement of ordinals.

The following provides examples of instances, given by Ogwen and Jenkins (1978), in which the children failed to use the possible forms of the

numerals *tri* "three" and *dau* "two", observing the gender mutation rule, with particular nouns.

1. Some of the children used the unmarked numeral with a feminine noun.

For example:

a tri cath "and three cats". Here, the unmarked form of the numeral *tri* "three" precedes the feminine noun *cath* "cat", the appropriate form being *tair* (feminine) in this context.

a dau lygoden "and two mice". Here, the feminine noun *lygoden* "mouse" is preceded by the unmarked form of the numeral *dau* "two", the appropriate form being *dwy* (feminine) in this context.

a dau cath fawr "and two big cats". Although the adjective *mawr* "big" has undergone SM into *fawr* after the feminine noun *cath* "cat" in this example, the speaker failed to associate the feminine form of the numeral *dau* "two" (i.e., *dwy*) with the noun.

2. There was an example of a marked numeral co-occurring with a masculine noun:

tair llo newydd "three new calves". Here, the feminine form of the numeral *tri* "three" (i.e., *tair*) has been used in conjunction with a masculine noun, *llo* "calf".

Ogwen and Jenkins (1978) also found errors in the usage of the pronouns *hi* "her" and *fo/o* or *fe/e*¹ "his/him". Although they provide only three examples to illustrate such errors, the error probably occurred in the overextension of *fo* or

¹*Fe* /vɛ/ is the standard southern pronunciation for "him", and /vɔ/ the standard northern pronunciation.

fe in contexts that require *hi* "her" (see Chapter 2 for discussion of the overextension of the masculine form in distant contexts). The examples given were as follows:

greyey 'dan ni'n galw o "we call it (masculine) Greyey", where the referent of the pronoun was a rabbit. *Cwningen* "rabbit" is feminine in Welsh. Therefore, the pronoun that should have been selected to refer to the rabbit was *hi*.

Dad nath ladd o "Dad killed it (masculine)", where the referent of the pronoun was a mouse. *Llygoden* "mouse" is feminine in Welsh. Therefore, the pronoun that should have been selected to refer to the rabbit was *hi*.

Cicio fe "Kicking it (masculine)", where the referent of the pronoun was a ball. *Pêl* "ball" is feminine in Welsh. Therefore, the pronoun that should have been selected to refer to the ball was *hi*.

Therefore children seem not to have mastered the distant marking of gender pronouns, and the marking of gender numerals, even by the age of 8 years.

3.7 Summary and Conclusion

The studies reviewed in this chapter help build up the following picture about children's knowledge and use of mutations:

First, data from some of the studies indicate a protracted route to development, noting that children learning Welsh even as a first language proceed in their development of the system through age 10 years in some cases. Such data suggest that the development of the Welsh mutation system is a long, drawn out process. Moreover, data for Breton and Irish indicate children's initial learning as having a single form per noun, and this indicates a possible piecemeal, item-by-item learning process.

Second, across mutation types, it seems that SM is used most consistently. This is in accordance with the adult data (see Chapter 2). Moreover, some of the triggers are acquired earlier and with more ease than others, both within, and across, mutation types.

Third, the amount and type of linguistic input can influence mutation usage in some children. Children whose parents are not L1 speakers seem to be less productive with some triggers to mutation than those of L1 parents (Hatton, 1988; Bellin, 1988). However, some L2 children may perform better than L1 children on some of the less consistent triggers (e.g., *yn* “in” for NM). This could be because of the style of instruction -- L2 children acquire Welsh largely through Welsh lessons where the correct form is often stressed; L1 speakers, on the other hand, may acquire Welsh more naturalistically, and are exposed to the habitual marking of mutations of the dialect they are acquiring (e.g., the basic form or SM instead of the NM form after *yn* “in”; Davies, 1982).

Fourth, children’s performance also varies according to the style of conversing (e.g., Bellin, 1988) and to the type of test (e.g., Davies, 1982; Hatton, 1988). Using data that indicated children’s better performance on a formal task than a more natural task, Bellin (1988) suggested that some tacit strategic knowledge may develop before productive use. Moreover, bilingualism may affect acquisition; different lexical sets may or may not equally be incorporated into the mutation system. For example, children seem to perform better with mutations on “native” than on borrowed vocabulary (Bellin, 1988; cf. Stephens, 1996).

Fifth, some of the data suggests that children are acquiring specific forms for particular nouns (e.g., borrowings -- *cap* “cap” and *tê* “tea” -- Bellin, 1984). This suggests possible piecemeal, item-by-item learning.

But what can this information tell us about the possible ways in which children acquire gender mutations? Although the information that we have is limited, it seems that the gender mutation rule is acquired early in Irish (Ó Baoill,

1992) and is produced relatively accurately between the ages of 4 and over 5 years in Breton (Stephens, 1996). Children also seem to acquire the rules for all mutation contexts concurrently by the age of 4 years in Breton (Stephens, 1996), although the SM form does seem to be the default in Breton (see previous discussion), and by the age of 14 years, for the written language, in Welsh (Jones, 1992).

Although there is limited data on the production of gender mutations in spoken language, the data suggest that children acquire local gender marking (article followed by the noun and feminine noun followed by the adjective, see data by Jones, 1992 above) better than gender pronouns (see data by Ogwen & Jenkins, 1978 above), and better than numerals and ordinals (see Jones & Jones, 1984, and Ogwen & Jenkins, 1978, above). Moreover, since gender mutation rules seem to be learned at the same time as other mutation rules (see Jones, 1992, and Stephens, 1996, above), the acquisition of local gender marking in Welsh will probably follow the same developmental pattern: the Welsh mutation system may be acquired in a protracted fashion.

The next section describes a set of studies that were designed to allow a concise investigation of the Welsh grammatical gender system. The section will first report on a semi-naturalistic study of children's production of gender-marked forms. This report will be followed by a report on an experimentally-controlled set of tests that looked at children's ability to attend to cues to determine noun gender in local gender constructs; this is followed by a report of children's ability to mark distant gender constructs. Finally, I will report on a study that was designed to look at children's ability to produce SM and AM in gender-free contexts.

The Experimental Chapters:

An Introduction and Research Questions

In what follows, I present studies that investigated the acquisition of grammatical gender in Welsh. The studies were conducted over a period of time in local primary schools in North Wales, some on Anglesey and others in the adjacent *Ogwen* area. The aim was to present a general picture of the grammatical gender system in Welsh in as clear and detailed a way as possible given the time scale of the project and the state of flux of the language. As shown in the previous two chapters, limited work has been conducted on the acquisition of the Welsh language in general; work done on northern dialects is especially scarce. Considering that the Welsh language is spoken by a greater density of speakers in Gwynedd than in any other area in Wales, this is surprising. This project would therefore present extremely valuable information first, on both northern adult and child speakers' productive use of both the mutation and grammatical gender system, and second, on their knowledge and understanding of mutations as cues to gender status.

Collectively, the four studies designed for this project were aimed to answer the following questions:

- How easily do children acquire the complex grammatical gender system of Welsh?
- To what extent do Welsh-speaking children approach the acquisition process by constructing abstract representations of the system they are learning?
- Or to what extent will their course of development be protracted and variable, reflecting more piecemeal, item-by-item learning?

The studies were designed to elicit children's (and adults') productive command of grammatical gender and two mutation types: Soft Mutation (SM) and Aspirate

Mutation (AM). The studies fell into two types: semi-naturalistic speech (Study 1) and formal, experimentally controlled, test items (Studies 2 to 4). All studies were administered concurrently, and most of the participants took part in all studies. Half of the child participants were given the semi-naturalistic speech study first (Study 1) followed by a pre-determined random application of the tests for each of Studies 2 to 4. The remaining half of the children were initially given a pre-determined random presentation of the different tests for Studies 2 to 4, followed by the semi-naturalistic test (Study 1). (All adult participants completed the test item for Study 1 first; a selection of the same adult participants later took part in the remainder of the studies. These were always randomly presented to each participant.)

Throughout the experimental chapters for Studies 1 to 4, adults' control of mutation in a variety of contexts was examined with a view towards identifying the nature of the input to the child. A full understanding of children's acquisition of gender mutations cannot be achieved without also examining the adult input to the child; this had not been previously examined in Welsh. For this reason, all chapters will first present the adult data; this will then be followed by the child data.

The experimental section of this thesis opens with a chapter that describes the data obtained from the semi-naturalistic study. These data would help provide information about children's productive command of the gender of nouns. This will be reported in Chapter 4.

Because Welsh survives as a minority language, and it is also subject to English influences such as lexical borrowings, and because there is considerable variation in the language, an initial test was conducted to ensure that the nouns that we selected for Study 2 were appropriate for the children that were to be included in the study. Therefore, Chapter 5 describes a noun- and adjective-recognition test that was designed and administered to the children. Any differences between nouns in the data would later be distinguished in the analyses of the data in Study 2.

The next experimental chapter describes data from a set of formal tests (Tests 1 to 6, Study 2). For these tests, a Cloze procedure was used to elicit children's production of masculine and feminine forms of both real words and nonsense forms, in a variety of linguistic contexts. This is reported in Chapter 6. Some of these contexts provided cues to gender status, some did not. The tests were designed to test knowledge of gender marking on the noun itself or on its modifier (i.e., "local" gender constructs). The data from Study 2 would provide answers for the following questions:

- To what extent and at what phase in development do Welsh-speaking children rely on specific cues for gender categorisation available in the input?
- Is one type of contextual information more useful as a cue than another? That is, would the mutation of nouns modified by the definite article be more useful as a cue than the mutation of adjectives modifying nouns, or vice versa?
- And to what extent is children's knowledge of gender productive? Children's ability to extend gender mutation to nonsense nouns would help provide answers for this.

The next chapter, Chapter 7, presents data from Study 3. Here, children's command of possessive adjectives coreferential with nouns ("distant" gender constructs) was investigated. A Cloze-type procedure was used to elicit the production of gender-marked possessives. Half of the nouns were introduced to the children in a context that provided a cue to the gender status of these nouns (i.e., noun provided with a definite article). The remaining nouns were not introduced with a cue to gender status (i.e., nouns produced by the experimenter in an indefinite NP). For masculine referents, SM was elicited after *ei* "his"; for feminine referents, AM was elicited after *ei* "her". A comparison of the data from this study with those of Study 2 would provide answers for the following question:

- Do Welsh-speaking children acquire gender constructs that are localised around the noun before those that are more distant, or vice-versa?

These data would be compared to data from other languages that typically show children to master local gender marking before distant gender marking.

Finally, the last experimental chapter, Chapter 8, describes data from Study 4 in which children's productive command of both SM and AM in non-gendered contexts was investigated. A Cloze-type procedure was used to elicit the production of SM and AM in a series of triggering contexts, unrelated to grammatical gender. The juxtaposition of these data with data for gender mutation (Study 2) would provide information about children's use of mutations in gender-free contexts, parallel to their use of gender mutations, and at concurrent points in development. This would provide answers to the following question:

- To what extent does children's productive command of gender mutation (Study 2) correspond to their productive command of mutation in general? That is, if the children are not mutating feminine nouns in gender marked contexts, is this a product of their inability with mutation in general, or due to a specific problem with gender?

At the end of each experimental chapter I will present a short discussion of the results; a comprehensive discussion of the whole of the results from all these chapters will be presented in the final chapter of this thesis -- Chapter 9.

CHAPTER 4

Study 1: Picture -Story

Introduction

As a measure of semi-naturalistic production of grammatical gender a story depicted in a series of pictures was given to each participant. The participant's task was to "tell" the story he or she saw in the pictures.

The study was designed to look for the effects of animacy, gender, and age on the marking of gender within the dialect area of Anglesey, Bangor, and Ogwen in North Wales. This chapter presents data obtained from adult and child participants on the production of nouns and adjectives. In each case, adult data will be presented first, children's data second. A comparison of the children's and the adults' data will then be presented followed by a discussion of all the data.

Aims

The purpose of this study was to gain information about native Welsh-speaking adults' and children's productive use of the gender system in their language to provide answers to these two questions:

- To what extent is gender marking evident in the spoken language of native Welsh-speaking children?
- To what extent have 4 1/2- to 9-year-old children acquired an adult-like system, reflecting abstract representation of the system?

Rationale

Many techniques used to elicit naturalistic speech do not always guarantee the production of the elicited variables (Ball & Müller, 1992). The absence of such variables can lead to problems of interpretation: does the absence of a particular variable indicate a lack of linguistic ability, a lack of exposure to the

construction, or a lack of appropriate discourse context in the sample (Demuth, 1996)? Some such data collection techniques have required speakers to concentrate on the semantic content of their own dialogue rather than on its grammar. The aim is to distract the speaker from closely monitoring his or her speech output (e.g., Labov, 1966, employed the *shoelace test*, in which participants were required to provide a detailed description of the mechanisms involved in tying a shoelace; this interfered with their ability to monitor their speech). Some have used the so-called *emotive questions* technique; in this the speaker is asked to tell the experimenter of an amusing story or an embarrassing event (cf. Trudgill's, 1974, *amusing story question*). Others have engaged the speakers in group speech (Ball & Müller, 1992).

Commonly, the linguistic context of these types of tests cannot be controlled. This has led some researchers to adopt other techniques in order to gain what would be more “semi-naturalistic” speech. For example, Ball (1984) adopted the *reporter's test*, originally used to investigate the comprehension abilities of aphasics (e.g., DeRenzi & Faglioni, 1978; see Ball, 1984). In the reporter's test, the participant's task is to describe the actions of the experimenter to an imaginary third person, thus allowing for some manipulation of the linguistic variables that were of interest to the researchers (Ball & Müller, 1992).

For the collection of specific linguistic constructs from “naturalistic” speech in this study, a story illustrated by a set of pictures (henceforth called the *picture-story task*) was designed. The goal was to obtain information regarding native Welsh-speaking children's and adults' production of the gender system in their language. Since no large-scale study of children's acquisition of grammatical gender in Welsh has previously been conducted, the information gathered from this study would provide invaluable information regarding children's productive command of gender marking in Welsh. Because this type of data has not been previously collected, a semi-naturalistic study of this sort would allow some form of control over the variables produced. The hope was that by

allowing some control of the variables a good initial set of data could be elicited, enough to provide some initial answers to the questions of interest. The task was also designed to provide as good a balance as possible between masculine and feminine nouns; this allowed the comparison of participants' treatment of different groups of words (i.e., those with different initial sounds that undergo mutation). The intention was that the information gathered from adult participants in this study would provide information about the type of grammatical gender constructions children hear in the input, and that data from the children would provide information as to the children's basic knowledge of the gender of words.

Method

Participants

Adults.

Thirty adult participants, aged between 16 and 60+¹ years, took part in this study. They were all L1 speakers of Welsh and had been brought up in homes where the language spoken was 80 to 100% Welsh². Appendix 4.1 provides an example of the questionnaire given to each participant. All participants had lived either on Anglesey or in the Bangor area for most of their lives. The adults were divided into three age groups: Group 1 adults were between the ages of 16 and 30 years ($N = 8$, mean age = 20 years, age range = 17 to 25 years); Group 2 adults were between the ages of 31 and 50 years ($N = 10$, mean age = 38 years, age range = 32 to 49 years); and Group 3 adults were 51+ years old ($N = 12$, mean age³ = 56 years, age range = 52 to 60+).

¹This is the age supplied by one of the participants.

²In fact, three of the participants indicated on the questionnaire that their home language was 50/50 Welsh-English until the age of 18, and one maintained that their home language was always 50/50. However, each of these participants indicated that their L1 was Welsh.

³Since one of the participants supplied 60+ as an age, the mean age for this group was calculated using 61 as her age.

Children.

Forty-five children⁴ took part in this study. The children were divided into four age groups. Group 1 children were 4 1/2⁵ years old ($N = 11$, age range = 4;1 to 5;5 years, mean age = 4;9 years); Group 2 children were 6 years of age ($N = 11$, age range = 5;9 to 6;7 years, mean age = 6;1 years); Group 3 children were 7 1/2⁶ years of age ($N = 12$, age range = 6;9 to 7;9 years, mean age = 7;2 years); and Group 4 children were 9 years of age ($N = 11$, age range = 8;3 to 9;7 years, mean age = 8;9 years). The children were divided into these specific age groups such that it was possible to look at their linguistic abilities at specific and clear-cut times in their development. All children attended primary schools either on Anglesey or in the Bangor and Ogwen area. Consent forms were received from all parents, accompanied by a completed language background questionnaire outlining the parents' and the child's language. Most parents judged that their child received 100% Welsh input at home (two of the completed questionnaires stated that the children's Welsh home language input was 80%). Appendix 4.2 provides an example of the questionnaire parents were given. This questionnaire asked about the children's language as well as that of the parents. All of the children were selected based on the answers provided in each of the questionnaires; this ensured that each child's language background (in terms of use and input) was similar.

Linguistic Design and Linguistic Stimuli

The aim was to design a story that would have an approximately equal number of animate and inanimate nouns, and within these, an approximately equal number of masculine and feminine nouns. The nouns elicited had to have the

⁴ All 48 children who took part in Studies 2 and 4 were asked to participate in this study. However, two of the children refused to "tell" the story themselves, insisting that the experimenter told the story, and one refused to "tell" the story at all.

⁵ The aim was to find a group of children with a mean age of 4;6. Since the mean age was not 4;6 exactly, 4 1/2 will be used throughout this thesis to name this group of children.

⁶ The aim was again to find a group of children with a mean age of 7;6. However, since the mean age was not 7;6 exactly, and to coincide with the younger age group, 7 1/2 will be used throughout this thesis to name this group of children.

initial mutable sounds /p, t, k, b, d, g, ʃ, ʒ, m/. Across animacy and gender, these word-initial sounds had to be balanced as well as possible, and the number of nouns balanced across the sounds. However, in some cases, such a clean balance was not possible: for example, there are no /p/-initial feminine animate nouns in Welsh that would have been appropriate for use in this study⁷; and likewise, whereas some of the word-initial sounds have ample examples of possible nouns, others do not. Therefore as good a balance as possible had to be sought. To be able to examine the participants' knowledge of noun gender mutation the basic story given to them reflected the "typical" events found in children's stories (see Berman & Slobin, 1994, p. 20). These typical events were:

1. *A hero and his or her companion.* This story involved three protagonists, a boy (masculine), a girl (feminine), and a cat (feminine) as their companion.
2. *A problem.* The ongoing problem maintained throughout the story was that the wind had carried away a set of clothing (a mixture of masculine and feminine nouns) from the clothesline.
3. *An attempt to rectify the problem.* The boy, the girl, and the cat ran through a village and a local farm after the clothing, collecting those few items of clothing that had come to rest on certain objects (a mixture of masculine and feminine inanimate and animate nouns) on their way.
4. *Solving the problem in a happy manner.* With the help of some characters that the boy and the girl met on their journey (a mixture of masculine and feminine animate nouns), the children gathered all the missing items of clothing into a basket (feminine), to their mother's delight, and returned home. An

⁷ There are, however, names of types of species of birds, for example, that have an initial /p/ (e.g., *pioden* "magpie"). Nevertheless, it was decided not to include such nouns in the story. This was because this was a production task and not a task whereby the name of a given object was provided to the participants; the participants were most likely to refer to any birds as *aderyn* "bird". In fact, because of the paucity of /g/-initial words, *gwennol* "swallow" was included among the elicited forms, but participants usually called this *aderyn* "bird". In a follow-up task, reported later in this chapter, children were unable to provide an alternative to *aderyn* for the swallow.

example of the type of story that the participants could have told is shown in Appendix 4.3.

The choice of theme for the story was made on the basis that it could involve various kinds of animate beings and inanimate objects. However, the choice of nouns had to be carefully selected so that the story could operate as a coherent whole (see Table 4.1 for a list of nouns used). The nouns (i.e., names for the items of clothing, animals, etc.) were chosen such that the story would follow logically from one scene to the next. For this reason, the nouns that could be selected for the story were limited. Also, the story was designed such that characters and objects were deliberately repeated; this was to set up contexts in which the use of the definite article was pragmatically felicitous (the effectiveness of which was shown in pilot data from both adults and children). In a story-completion task, Maratsos (1976) found that children as young as 3 years of age are able to distinguish between indefinite and definite reference. Karmiloff-Smith (1979) cited research by Warden (1973) and Bresson, Bouvier, Damequin, Depreux, Hardy, and Platone (1970) who found that 4- and 5-year-olds are able to use definite expressions to refer back to items when the test involved visible objects rather than when the test involved a verbal story with no material support.

The objects and characters were coloured in their typical colours. These colours were *piws* "purple", *pinc* "pink", *coch* "red", *brown* "brown", *du* "black", *glas* "blue", *gwyn/gwen* "white", *gwyrdd/gwerdd* "green", *llwyd* "grey", and *melyn/melen* "yellow".

Table 4.1: Nouns Elicited in the Picture-Story Task.

Initial Sound	Animate Noun		Inanimate Nouns	
	Masculine	Feminine	Masculine	Feminine
/p/	-	-	<i>parc</i> "park" <i>polyn</i> "pole"	<i>pais</i> "petticoat" <i>pedol</i> "horseshoe" <i>pabell</i> "tent" <i>padell ffrio</i> "frying pan"
/t/	<i>tad</i> "father"	<i>tylluan</i> "owl"	<i>trowsus</i> "trousers" <i>tŷ</i> "house" <i>tân</i> "fire"	<i>teisen</i> "cake" <i>trol</i> "cart"
/k/	<i>ci</i> "dog" <i>ceffyl</i> "horse"	<i>cath</i> "cat" <i>cwningen</i> "rabbit"	<i>cyrtan</i> "curtain" <i>cae</i> "field"	<i>coeden</i> "tree" <i>côt</i> "coat" <i>coets</i> "pram"
/b/	<i>brawd</i> "brother" <i>babi</i> "baby"	<i>buwch</i> "cow"	<i>bwrdd</i> "table" <i>boncyff</i> "tree trunk" <i>brat</i> "apron"	<i>basged</i> "basket"
/d/	-	<i>dafad</i> "sheep" <i>dynes</i> "woman"	<i>drws</i> "door"	<i>deilen</i> "leaf"
/g/	<i>glöyn byw</i> "butterfly"	<i>gwiwer</i> "squirrel" <i>gwennol</i> "swallow"	<i>gwynt</i> "wind"	<i>gardd</i> "garden"
/t/	<i>llwynog</i> "fox"	<i>llygoden</i> "mouse"	<i>llwybr</i> "path"	<i>llif</i> "saw"
/r/	-	-	<i>rhosyn</i> "rose"	<i>rhaw</i> "shovel"
/m/	<i>melinydd</i> <i>/melinwr</i> "mill man"	<i>mam</i> "mother" <i>malwen / malwoden</i> "snail"	<i>mat</i> "mat" <i>mysiarwm</i> "mushroom"	<i>maneg</i> "glove" <i>mainc</i> "bench" <i>melin</i> "mill"

Table 4.1 shows the potential nouns, and their genders, that were elicited in the story. However, because of the naturalistic style of this test, a given participant might not use all of the nouns elicited; alternatively, he or she might also include nouns that were not deliberately elicited at all, or both. For example, there were other characters (feminine and masculine) and objects (feminine and masculine) in the story that did not have an initial mutable consonant but nonetheless could be used in conjunction with an adjective by a participant. There was also the possibility that some participants might name the elicited object as something other than the elicited form. For example, the male and female characters might be given a name -- for example *Mair* "Mary" and *Siôn* "John" -- which do not undergo SM after the definite article. Other participants might name an object by a semantically related (or a different) noun, or by a familiar noun borrowed from English; thus it was not anticipated that the participants would necessarily employ all the nouns given in Table 4.1: it was expected only that

they would employ most of them (e.g., *tent* "tent" might be used instead of *pabell* "tent", *cert* "cart" instead of *trol* "cart", *cadno* "fox" -- a form more associated with southern dialects -- instead of *llwynog* "fox"). The situation was similar with adjectives. Of course, the participants could employ adjectives not on the target list (e.g., *bach* "small", *mawr* "big").

Analysis of the nouns will first be conducted on the production of elicited forms (because we might expect the greatest comparability across subjects here); subsequent analysis will look at the production of all forms that are subject to gender mutation rules (to obtain a fuller account of subjects' abilities). Analysis of the adjectives will be conducted on all productions; this is because the adjectives were not consciously elicited or balanced in the story (see below for discussion).

The picture-story was preceded by a warm-up story, this time told by the experimenter. Pilot results from three children indicated that some of the children had difficulty knowing what to say at the initial parts of the story. Subsequently this restricted them from getting into a story-telling mode until late in their narratives, and this necessitated more prompts to be given at the beginning. It was therefore decided to provide an example to the children of the type of story that the experimenter wanted to hear prior to the administration of the picture-story.

All characters in this warm-up story, apart from the central character *tedi* "teddy", were animals that had word-initial sounds that do not undergo mutation. Although *tedi* "teddy" has an initial mutable sound, it was nevertheless used in the warm-up story since it is a noun with which children are familiar, and it does not appear elsewhere in the studies reported in this thesis. Adjectives were also words with non-mutable onsets.

A pre-determined narrative was created to accompany the pictures in order that each child would hear the same story. The basic story was that of a teddy going to the zoo to see some animals. The story that was told as an accompaniment to each picture was as follows:

Picture 1: *Un tro, aeth y tedi i'r sŵ. Ac yn y sŵ, roedd o am gael gweld sebra streipiog, jiràff sbotiog, neidr efo gwyrdd a brown, hippopotamws, ac eliffant. Roedd y neidr yn dringo ar hyd arwydd "Y Sŵ", ac roedd y sebra'n edrych ar y blodau, gan feddwl eu bwyta nhw 'dw i'n meddwl*⁸.

"Once upon a time, the teddy went to the zoo. And at the zoo, he was going to see a striped zebra, a spotted giraffe, a snake with green and brown (colouring), a hippopotamus, and an elephant. The snake was climbing the sign 'The Zoo', and the zebra was looking at the flowers, thinking of eating them, I think."

Picture 2: *Y tu mewn i'r sŵ aeth y tedi at yr eliffant. A dyma'r tedi'n dechrau chwerthin! Dyma fo'n dechrau chwerthin yn wirion. Roedd o 'di gweld rhywbeth od iawn yn dringo ar hyd drwnc yr eliffant. Y neidr oedd yna! Roedd y neidr wedi symyd o'r arwydd "Y Sŵ", ac wedi dringo ar hyd drwnc yr eliffant. Wel, roedd y tedi'n chwerthin, a 'dw i'n siwr fod yr hippopotamws yn chwerthin hefyd, ond ei fod o'n cuddio o dan y dŵr, a 'dw i'n siwr fod y sebra'n chwerthin hefyd. Wel, dyna ni ddiwrnod helyntus yn fana i'r tedi.*

"At the zoo the teddy went to the elephant. And the teddy started to laugh! He started to laugh himself silly. He'd seen a very odd thing climbing across the elephant's trunk. It was the snake! The snake had moved from the sign 'The Zoo', and had climbed across the elephant's trunk. Well, the teddy laughed, and I'm sure that the hippopotamus was laughing too, only he was hiding beneath the water, and I'm sure that the zebra was laughing too. Well, that was an eventful day for the teddy."

⁸ Throughout the thesis all quoted examples of verbal instructions are written in the colloquial form in which it was heard.

Non-Linguistic Materials

The picture story consisted of 28 A4 sized coloured pictures (see Appendix 4.4); these were presented in a book format -- A4 plastic envelope pockets in a thin snap folder. The warm-up story similarly consisted of a set of two A4 sized coloured pictures; these were also presented in a thin snap folder to create the appearance of a book (see Appendix 4.5 for the pictures used).

Procedure

Both adults and children participated in this study. All participants were seen individually. The difference in procedures used with each are described below.

Adults.

The participants were initially told that the purpose of the study was to look at children's understanding of stories as told by adults. For this, they were given the folder containing the pictures and asked to "tell the story" they saw in the pictures as they would to a child, describing the characters, objects, and events as they unfold. While concentrating more on presenting the story in this way, it was hoped that they would pay minimal attention to their own linguistic output, producing more naturalistic speech, and concentrating more on the semantic content of the story.

Once the initial instructions were given to the participants, they were asked if they had any questions regarding their task. When they indicated that they were happy with these instructions the experimenter switched on the video recorder and allowed them to begin their task. After they had completed their task, the video recorder was switched off and the participants were thanked for their participation. All participants were subsequently debriefed as to the real purpose of the study -- that is, to look at aspects of their spoken language. During debriefing, each participant was asked to sign a written declaration. This declaration outlined that

they understood the aims of the study and the types of analyses that would be performed on their data. If they were willing for such analyses of their data to be conducted, they were asked to sign the declaration.

Children.

Each child was seen individually. The children were first given the warm-up story by the experimenter. After the story was shown and told to the children, they were told that it was their turn to tell a story. For most of the children the experimenter showed the picture-story book to the child, and the child was told the following:

Mae gen i stori yn fama. Wyt ti eisiau gweld y stori? 'Dw i eisiau dy glywed di'n dweud y stori. Wyt ti eisiau dweud y stori?

"I have a story here. Do you want to see the story? I want to hear you tell the story. Do you want to tell the story?"

Once the child indicated that he or she was willing to tell the story, the experimenter gave him or her the picture book, and the child was told:

'Dw i eisiau clywed am bopeth sy'n mynd ymlaen yn y stori, iawn? Felly 'dw i eisiau i ti ddisgrifio popeth ti'n weld yn y stori. Reit ta, sut 'da ni'n dechrau stori fel arfer? Un tro⁹, ia?

"I want to hear about everything that's going on in the story, okay? So I want you to describe everything you see in the story. Now then, how do we usually start a story? Once upon a time, yes?"

For the younger children, however, the instructions differed in that a teddy bear was introduced as a listener to their story, and thus the child was told:

⁹ The children were asked to start their story by using the Welsh equivalent of "Once upon a time. . ." in order to prompt them into a story-telling mode.

Mae gen i stori yn fama. Wyt ti eisiau gweld y stori? Mae'r tedi eisiau dy glywed di'n dweud y stori. Wyt ti eisiau dweud y stori wrth tedi?

"I have a story here. Do you want to see the story? The teddy wants to hear you tell the story. Do you want to tell the story to teddy?"

Once the child indicated that he or she was willing to tell the story, the experimenter gave him or her the picture book, and the child was told:

Mae'r tedi eisiau clywed am bopeth sy'n mynd ymlaen yn y stori, iawn? Felly 'dw i eisiau i ti ddisgrifio popeth ti'n weld yn y stori. Reit ta, sut 'da ni'n dechrau stori fel arfer? Un tro, ia?

"The teddy wants to hear about everything that's going on in the story, okay? So I want you to describe everything you see in the story. Now then, how do we usually start a story? Once upon a time, yes?"

Throughout the children's story telling the experimenter attempted to neutralize any verbal feedback given. For example, if a child looked to the experimenter for recognition that he or she was telling the story correctly, the experimenter would respond by producing an agreement sound such as "mm-mh". If the child was unable to think of anything to say about a particular picture, either by looking blank at the picture or by asking the experimenter for guidance, the experimenter would respond by saying something like *O! Be' sy'n digwydd yn fama?* "O! What's happening here?" or *Pwy sgywnno ni'n fama?* "Who do we have here?" In each case, the experimenter avoided the use of any gender-marked contexts as much as possible (this was to reduce any cueing of gender-marked responses). Each story was recorded on a video camera and later transcribed by the experimenter.

Results

Scoring and Analyses

The data were scored as “correct” if the participants’ gender-marked responses corresponded to the expected norm. Feminine /p, t, k, b, d, g, m/-initial nouns that underwent SM after the definite article and feminine /ʃ/- and /r/-initial nouns and masculine nouns that did not undergo SM after the definite article were scored as being correct. Similarly, adjectives that underwent SM after feminine nouns and those that did not after masculine nouns were scored as being correct. If the adults failed to mark the nouns’ gender appropriately in these ways, their response was considered “incorrect”. (“Correct” and “incorrect” are used throughout the results sections for ease of clarification of scoring. In fact, no adult response is truly “incorrect” since the adult patterns are the “norm”.)

Two main analyses were conducted. The first analysed the productions of nouns modified by the definite article, and the second analysed the productions of adjectives modifying nouns. Initial analysis of the nouns was conducted on deliberately elicited items only; subsequent analysis combined these items with any other non-elicited items that were produced by the participants. Since the analysis of all noun productions (elicited and non-elicited) resulted in similar results to the analysis conducted on the elicited items, only the results for the elicited items will be discussed here. For the analysis of the adjectives that followed nouns, since these were not fully balanced, all examples of adjectives after nouns were analysed. I will first report on the results for the production of nouns with the definite article; this will be followed by a report of the results for the production of adjectives. In both reports, adult data will be discussed first, followed by the child data. Comparisons of the adults’ and the children’s data will then be made where possible. (Raw statistical data for this study are presented in Appendix 4.6.)

Nouns

Adults.

The adults' responses were analysed using a repeated measures ANOVA in which Animacy (animate and inanimate), Gender (masculine and feminine), and Age (16 to 30 years, 31 to 50 years, 51+ years) were treated as independent variables. Because of the nature of the data (the proportion of "correct" mutations out of the number of times participants produced the determiner + noun construct), arcsin transformations were applied to the data. Each story was transcribed by the experimenter. Ten percent of the materials (three fully transcribed stories) were later transcribed by an independent Welsh speaker. This produced an inter-rater reliability agreement of 97.83%.

The analysis showed that the only significant main effect was of Gender ($F(1,27) = 29.28, p < .001$); there were no interaction effects. Figure 4.1 charts these data.

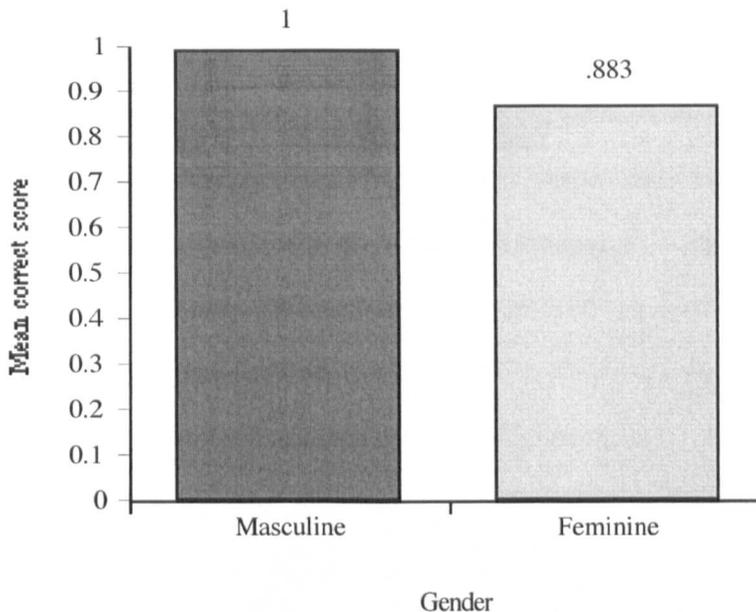


Figure 4.1: Adults' Mean Proportions by Gender.

The mean correct proportions for masculine and feminine nouns were 1.00 and .883 respectively ($SD = .204$). All participants from all adult age groups performed at 100% level on masculine nouns; that is, masculine nouns were never mutated after the definite article.

The adults did not differ significantly in their responses across age groups ($F(2,27) = .932, p > .05$). However, examination of the data suggested a trend for the middle age group to perform more poorly on feminine nouns. Table 4.2 presents adults' success rate in providing the "correct" mutation of the noun in the determiner + noun context. Visual inspection of the data revealed that in Group 2 there was one extreme respondent (henceforth referred to as *Participant A*) whose productions for feminine nouns almost always failed to undergo SM. For feminine animate nouns, this participant's level of mutation was 70.59% (12/17 nouns underwent SM after the definite article). For feminine inanimate nouns, on the other hand, Participant A mutated the nouns after the article only 5.56% of the time (2/36 times). For both animate and inanimate nouns, these figures produced much lower levels than for any of the other respondents in that group. When the percent correct responses for feminine nouns were re-calculated to exclude Participant A's data, the resulting percentages for Group 2 adults increased to levels comparable to those of the other adult age groups (see Table 4.2b).

Table 4.2: Percent Correct Gender Marking on Elicited Nouns by Adults (Raw Figures in Parentheses).

(a) All Subjects	Animate		Inanimate	
	Feminine	Masculine	Feminine	Masculine
Group 1: 16 – 30 years	94.21% (114/121)	100% (47/47)	90.63% (87/96)	100% (74/74)
Group 2: 31 – 50 years	89.3% (118/132)	100% (64/64)	76.47% (156/204)	100% (122/122)
Group 3: 51+ years	95.98% (191/199)	100% (78/78)	95.22% (239/251)	100% (227/227)
Total	93.58% (423/452)	100% (189/189)	87.48% (482/551)	100% (423/423)
(b)	Animate		Inanimate	
	Feminine	Masculine	Feminine	Masculine
Group 2 (Excluding Participant A)	92.17% (106/115)	100% (64/64)	91.67% (154/168)	100% (122/122)
New Total	94.48% (411/435)		93.2% (480/515)	

Finally, the adults did not respond differently according to the animacy of the nouns ($F(1,27) = .391, p > .05$). This is consistent with findings for grammatical gender in other languages.

It is worth comparing nouns for humans with nouns for animals. The majority of the animate responses were nouns for animals; only a very small proportion of the responses contained nouns for humans, because I did not consciously balance for the two types of animate beings¹⁰. However, qualitative analysis suggests little difference between the two groups of animate nouns (see Table 4.3).

¹⁰ To statistically re-analyse the data to distinguish between performance for both animacy types would be difficult since some of the adults did not produce nouns for male humans, some did not produce nouns for female humans, and others did not produce a noun for either. Statistical analysis of these scores would mean that for many of the participants there would be no data.

Table 4.3: Percent Correct Marking for Animate Nouns: Humans vs. Non-Humans (raw figures in parentheses).

	Human Animates Feminine	Non-Human Animates Feminine	Human Animates Masculine	Non- Human Animates Masculine
Group 1: 16 – 30 years	90.48% (19/21)	95% (95/100)	100% (9/9)	100% (38/38)
Group 2: 31 – 50 years	100% (7/7)	88.8% (111/125)	100% (13/13)	100% (51/51)
Group 3: 51+ years	94.44% (17/18)	96.13% (174/181)	100% (25/25)	100% (53/53)
Total	93.48% (43/46)	93.6% (380/406)	100% (47/47)	100% (142/142)

From Table 4.3 we can see that Groups 1 and 3 performed with at least 90% correct mutation for all feminine nouns. All groups performed with 100% accuracy on both human and non-human masculine nouns. However, the percent correct score for Group 2 feminine human nouns was below 90%. The data for Group 2 feminine humans consisted of data from only five of the participants, and errors occurred in the speech of only one of these participants. (This participant was not the same respondent as Participant A, mentioned above.)

It seems, from the above analysis, that the gender system is well established in adult speech. The marking of the elicited masculine nouns in the determiner + noun context was errorless, and the marking of the elicited feminine nouns in the same context was largely at least 90% correct.

In the data presented above, a collective analysis of all elicited nouns was conducted, regardless of their initial sounds. Recall, however, that the sounds /ʃ/ and /ʒ/ do not mutate after the article, even in the feminine nouns. It is possible that performance on such nouns may have artificially inflated the figures for feminine nouns (all /ʃ/- and /ʒ/-initial nouns -- except for *rhaw* “shovel” -- were “correctly” produced in their basic form after the definite article). However, the incidence of /ʃ/- and /ʒ/-initial nouns in the corpus of nouns produced by the adults

was relatively small¹¹. In fact, when scores for /ʃ/- and /ʒ/-initial feminine nouns were taken out of the adults' percent scores reported in Table 4.2a, there was little difference in the scores (less than .06% difference in all cases).

It should also be noted that in a few cases some of the participants had the “traditional” SM form as the basic form and “double mutated” the noun after the definite article. Two of the participants produced *y ddylluan* “the owl”, indicating the use of *dylluan* (and not the traditional *tylluan*) as the basic form. (One of them also used the noun in the phrase *a dylluan yn isda yn edrach arni* “and (an) owl sitting, looking at her”, where one would expect *a thylluan*, given that *a* “and” triggers AM.) Another participant produced *yr wningen* “the rabbit” on two separate occasions during her story; this indicated the use of *gwningen* (and not the traditional form *cwningen*) as the basic form. (This participant produced the same type of “double mutation” in a different mutating context: she said *wedi cael hyd i wningen* “has found (a) rabbit”, suggesting that the basic form for this participant is *gwningen* rather than *cwningen*.)

Summary: adult data.

The adults produced more basic forms of masculine nouns after the definite article than they did of SM form of feminine nouns after the article. There was no effect of animacy on their performance, not even when the animate data were divided to look at human vs. non-humans. The inclusion of /ʃ/- and /ʒ/-initial nouns in the analysis (given that /ʃ/- and /ʒ/-initial feminine nouns do not undergo SM after the article in the northern dialect) did not skew the data. Finally, three of the adults produced the interesting phenomenon of “double mutation”. Two lexical items -- *cwningen* “rabbit” and *tylluan* “owl” -- seemed to have the forms

¹¹ Overall there were 11 productions of *llif* (feminine) “saw” (Group 3 was given a score of 7/7 for *llif*, Group 2 had a score of 3/3); there were 9 productions of *llwybr* (masculine) “path” (Group 3 was given a score of 3/3 for *llwybr*, Group 2 had a score of 5/5, and Group 1 had a score of 1/1); there were 6 productions of *rhaw* (feminine) “shovel” (Group 3 was given a score of 3/4 for *rhaw*, Group 2 had a score of 2/2); there were 15 productions of *llygoden* (feminine) “mouse” (each age group was given a score of 5/5); and there were 15 productions of *llwynog* (masculine) “fox” (Group 1 was given a score of 8/8, Group 2 had a score of 2/2, and Group 3 had a score of 5/5).

gwningen and *dylluan* as their basic forms; these were subsequently mutated to *wningen* and *ddylluan* after the article.

Children.

The children's data were scored in the same way as the adults' data. After the stories were transcribed, a random sample of 10% of the materials (5 of the stories, 2 of one age group and one each of the other three age groups) was transcribed by an independent rater. Inter-rater reliability produced 93.4% agreement.

The children's responses were analysed using a repeated measures ANOVA in which Animacy (animate and inanimate), Gender (masculine and feminine), Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, and 9-year-olds), and Order were treated as independent variables. (Order indicated the position of this study relative to the other studies -- that is, whether children were given the semi-naturalistic task of Study 1 before the more experimentally controlled tests of Studies 2 to 4, or vice versa.) Arcsin transformations were applied since the data consisted of proportional values.

The analysis revealed two significant main effects, of Gender ($F(1,24) = 51.815, p < .001$) and of Order ($F(1,24) = 5.793, p < .05$). Figures 4.2 and 4.3 chart these data.

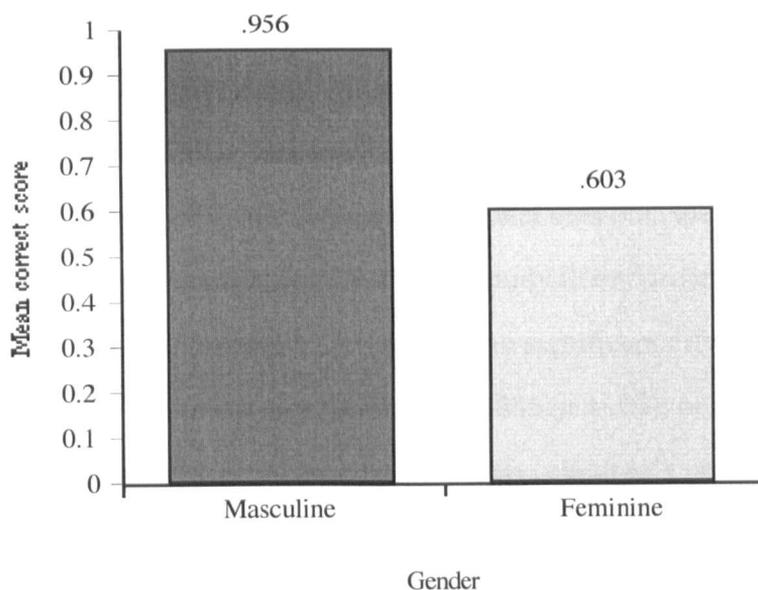


Figure 4.2: Children's Mean Proportions by Gender.

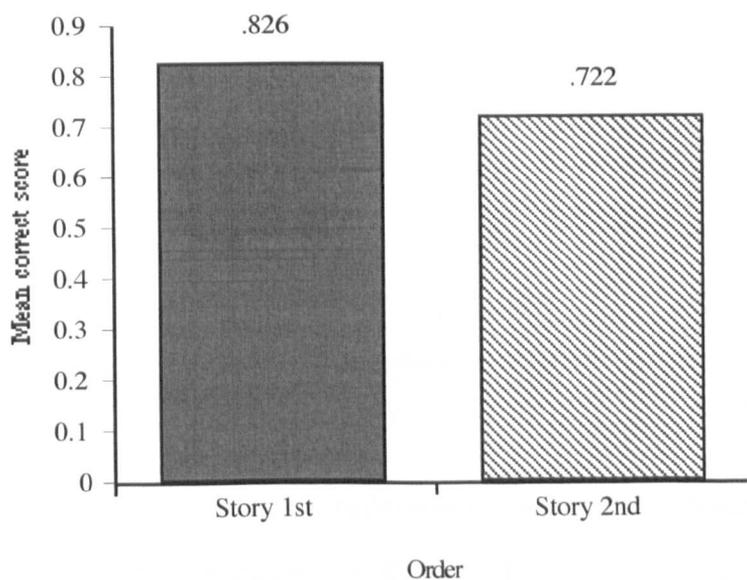


Figure 4.3: Children's Mean Proportions by Order.

The analysis revealed that children performed better on masculine nouns ($M = .956$, $SD = .154$) than on feminine nouns ($M = .603$, $SD = .327$). In addition, children who were administered the story first, before all the other tests of the

other studies, performed better ($M = .826$, $SD = .279$) than the children who produced the story after all the tests for the other studies were administered ($M = .722$, $SD = .339$). This result might be explained by the fact that children may have tired by the end of the experimental sessions; the results of those children who were given the story as the last study item during their last session could have been a reflection of this. There was no significant effect of Animacy ($F(1,24) = .792$, $p > .05$) or of Age ($F(3, 24) = .885$, $p > .05$), or any significant interactions.

To explore the data qualitatively, children's performance by Age, Animacy, and Gender (shown in Table 4.4) was examined.

Table 4.4: Children's Percent Correct Gender Marking on Elicited Nouns (Raw Figures in Parentheses).

	Animate		Inanimate		Total	Total
	Feminine	Masculine	Feminine	Masculine	Feminine	Masculine
4 1/2-year-olds	61.9% (13/21)	100% (17/17)	55.56% (10/18)	100% (10/10)	58.97% (23/39)	100% (27/27)
6-year-olds	49.23% (32/65)	100% (37/37)	61.36% (27/44)	100% (18/18)	54.13% (59/109)	100% (55/55)
7 1/2-year-olds	71.1% (91/128)	90% (45/50)	53.75% (43/80)	100% (57/57)	64.42% (134/208)	95.33% (102/107)
9-year-olds	57.75% (41/71)	97.37% (37/38)	68.12% (47/69)	89.29% (25/28)	62.86% (88/140)	93.93% (62/66)
Total	62.11% (177/285)	95.77% (136/142)	60.19% (127/211)	97.35% (110/113)		

While children's performance on masculine nouns was always near or above 90% correct, their production of SM on feminine nouns ranged from 49% to 71%. No general trends across age groups appeared discernible.

As was the case with the adult data, the statistical analysis reported above included the children's performance on /t/- and /r/-initial nouns. To investigate any effects the inclusion of nouns with these word-initial sounds might have had on the results, the overall percentage scores were re-calculated for the elicited nouns, excluding these scores. The new scores were not very different, with no

score changing more than 2.8%. (Appendix 4.7 shows figures after /ʃ/- and /ʒ/- initial nouns were taken out.)

Finally, none of the children seemed to show the double-mutation phenomenon that some of the adults showed.

Summary: child data.

Like the adults, the children produced more basic forms of masculine nouns after the definite article than they did of SM forms of feminine nouns after the article. There was no effect of animacy on their performance. The children were also better when they were given the picture-story first (before any of the other items from the other studies) than when they were given the story after the items for the other studies. This was probably due to the children who were given the picture-story last having tired by the end. The inclusion of /ʃ/- and /ʒ/-initial nouns in the analysis (given that /ʃ/- and /ʒ/-initial feminine nouns do not undergo SM after the article in the northern dialect) did not skew the data. There were also no clear trends in the data when they were analysed by Animacy, Gender, and Age. Finally, the children did not show the “double mutation” phenomenon evident in the adult data.

Adults vs. children.

The above analysis for the determiner + noun context indicate that the mutation rule that is associated with this context is more or less stable in the adult language. The children, on the other hand, although performing with at least 50% accuracy, have yet to master responses as consistently and as error free as the adults.

To investigate any difference between the adults' and the children's responses in this task, a repeated measures ANOVA compared the two sets of data.

The results showed significant effects of Gender ($F(1,54) = 86.222, p < .001$), of Age ($F(4, 54) = 8.232, p < .001$), and of Age x Gender ($F(4,54) = 4.041, p < .01$). There was no significant effect of Animacy ($F(1,54) = .409, p > .05$).

As with the previous analyses, the significant effect of gender was due to better performance on masculine ($M = .98, SD = .110$) than on feminine ($M = .75, SD = .305$) nouns. Figure 4.4 charts the data for the main effect of Age.

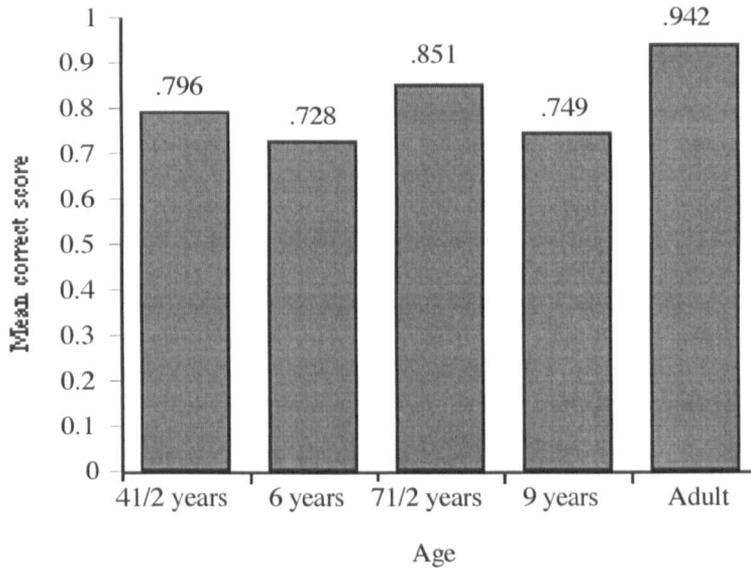


Figure 4.4: Adults' and Children's Mean Proportions by Age.

The effect of age was explored through pairwise mean comparisons. These revealed that the adults ($M = .942, SD = .155$) performed significantly better than the 6-year-olds ($M = .728, SD = .369$) ($F(1, 54) = 15.978, p < .001$) and the 9-year-olds ($M = .749, SD = .309$) ($F(1, 54) = 22.489, p < .001$).

The interaction of Age x Gender was due to the fact that there was no difference across ages in performance on masculine nouns, but there was on feminine nouns. Figure 4.5 charts these data.

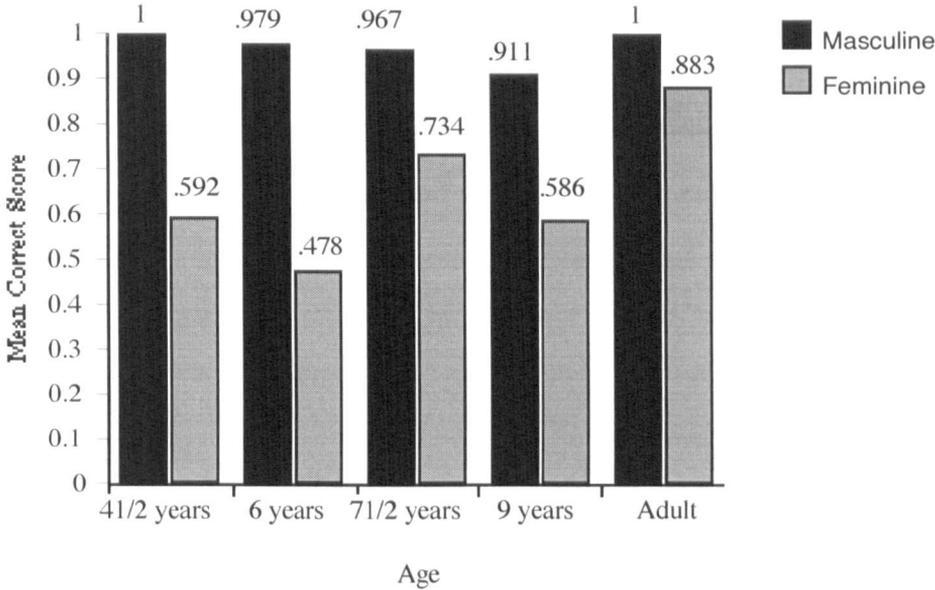


Figure 4.5: Adults’ and Children’s Mean Proportions per Age x Gender.

In particular, post hoc analysis revealed that there were significant differences in performance on the feminine nouns between the adults’ responses and the 6-year-olds’, the 7 1/2-year-olds’, and the 9-year-olds’ (Student Newman Keuls, $p < .05$). There was no significant difference between the adults’ and the 4 1/2-year-olds’ performance on feminine nouns. However, this was possibly due to the fact that the 4 1/2-year-olds produced few examples that could be analysed.

Summary: Adults vs. children.

As expected, this analysis revealed a significant effect of Gender, and also significant effects of Age, and Age x Gender. Overall, the adults performed better than did the 6-year-olds and the 9-year-olds. When performance across Gender and Age was investigated, the adults were better at producing the SM form of feminine nouns after the article than the 6-, the 7 1/2-, and the 9-year-olds. The adults did not differ significantly in their performance from the 4 1/2-year-olds. However, more detailed inspection of the data revealed that there were fewer data from the younger children (4 1/2-year-olds) compared to the older children.

Adjectives

Overall the participants did not produce as many of the noun + adjective construct as they did of the determiner + noun construct. Because of this, adjective analyses were conducted on all of the participants' responses; that is, the forms of any adjectives that had mutable onsets and that occurred after either elicited or non-elicited nouns were analysed.

Adults.

The adults' responses were analysed using a repeated measures ANOVA in which Animacy (animate and inanimate noun), Gender (masculine and feminine), and Age (16 to 30 years, 31 to 50 years, 51+ years) were treated as independent variables. Because the data were again proportional figures, arcsin transformations were applied to the data.

The analysis showed a main effect of Gender only ($F(1, 1) = 180.024, p < .05$). Figure 4.6 illustrates the adults' data by Gender.

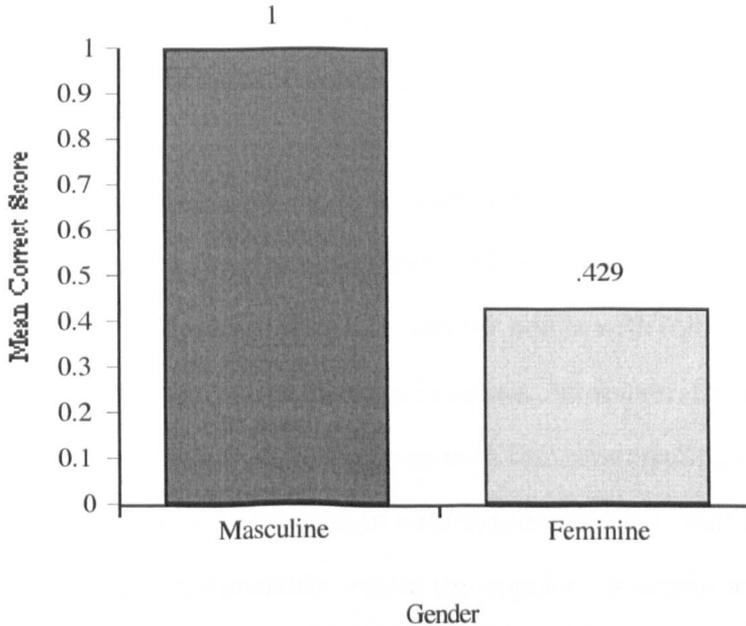


Figure 4.6: Adults' Mean Proportions by Gender.

All participants performed with 100% accuracy on the marking of adjectives after masculine nouns ($M = 1$): adjectives were never mutated after masculine nouns. However, the adults were less accurate on the marking of adjectives after feminine nouns ($M = .429$, $SD = .431$).

Qualitative inspection of the data suggests that the success rate of mutation of adjectives with feminine nouns was dependent on whether the noun began with a mutable onset. Table 4.5 presents adults' success rate, by animacy, on feminine forms when the noun began with mutable onsets vs. when it did not.

Table 4.5: Percent Correct Form for Adjectives After Nouns With and Without Mutable Onsets (Raw Figures in Parentheses).

	Mutable Onset Nouns		Non-Mutable Onset Nouns	
	Feminine		Feminine	
	Animate	Inanimate	Animate	Inanimate
16 – 30 years	50% (11/22)	76.32% (29/38)	0% (0/18)	92.31% (36/39)
31 – 50 years	32.14% (9/28)	71.79% (28/39)	0% (0/23)	65.22% (15/23)
51+ years	60% (57/95)	82.95% (73/88)	7.5% (6/80)	91.55% (65/71)
Total	53.1% (77/145)	78.78% (130/165)	4.96% (6/121)	87.22% (116/133)

Inspection of Table 4.5 indicates that with the feminine nouns, the adults mutated the adjective more often with inanimate nouns than they did when it was with animate nouns; this was both for nouns with initial mutable sounds and those with non-mutable initial sounds. Moreover, the adults also seemed to be better able at marking adjectives with feminine inanimate nouns with non-mutable initial sounds than with inanimate nouns that have initial mutable sounds, but performance was in the opposite direction with animates.

Further inspection of these data revealed that a single lexical item seemed to consistently resist mutation after feminine nouns; this item was *bach* “small”, used frequently with animate nouns. Table 4.6 shows that, when *bach* was

excluded from the analysis, there was minimal difference in the adults' responses on adjectives that co-occurred with inanimate nouns across onset types, and an increase in performance with animate nouns (see Table 4.6). (All non-mutable feminine animate nouns were used in conjunction with *bach* "small"; there were no examples of these nouns with any other adjective form.)

Table 4.6: Adult Performance on the Noun + Adjective Construction Excluding the Use of *Bach* "Little".

	Mutable Onset		Non-Mutable Onset	
	Feminine	Inanimate	Feminine	Inanimate
	Animate		Animate	
16 – 30 years	100% (3/3)	78.38% (29/37)	-	92.3% (36/39)
31 – 50 years	50% (3/6)	73.68% (28/38)	-	71.43% (15/21)
51+ years	94.49% (35/37)	90.12% (73/81)	-	94.2% (65/69)
Total	89.13% (41/46)	83.33% (130/156)	-	89.92% (116/129)

The data from Table 4.6 were re-analysed using a repeated measures ANOVA in which Animacy (animate and inanimate), Gender (masculine and feminine), and Age (16 to 30 years, 31 to 50 years, 51+ years) were treated as independent variables. Because the data were again proportional figures, arcsin transformations were applied to the data.

Results still yielded a significant main effect of Gender ($F(1, 5) = 91.477$, $p < .001$), but performance on feminine adjectives was considerably higher than when *bach* was included (see Figure 4.7).

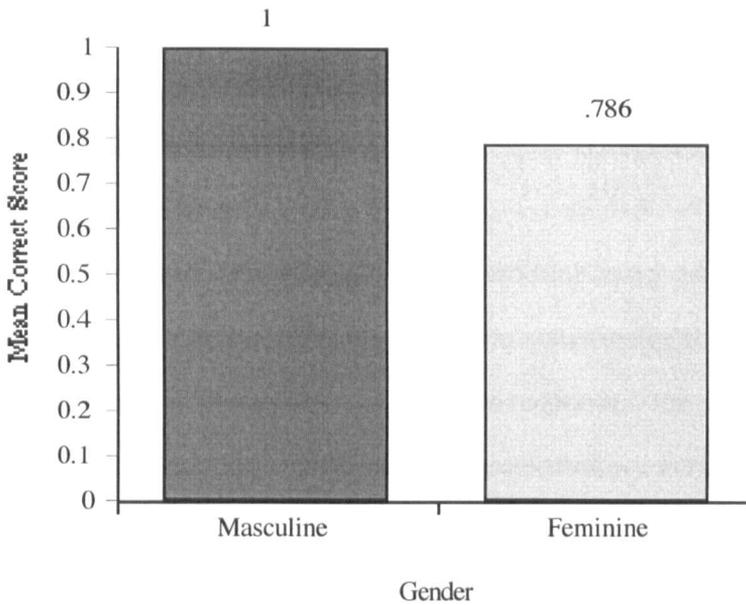


Figure 4.7: Adults' Mean Proportions by Gender, Excluding *Bach*.

The analysis also revealed a main effect of Age ($F(1, 5) = 48.152, p < .01$) and an interaction of Gender x Age ($F(1, 5) = 48.152, p < .01$). (Because of the paucity of the adjective data produced by the younger adults -- the 16- to 30-year-olds -- their data could not be compared with those of the other two groups. Thus the Age analysis compared only the 31- to 50-year-old and the 51+ year-old groups. The main effect of age was due to the 51+ year-olds' better performance ($M = .958, SD = .111$) than that of the 31- to 50-year-olds ($M = .5, SD = .577$). The interaction of Age x Gender indicated that the difference between the two groups lay in their performance on feminine nouns (Student Newman Keuls, $p < .05$.)

Summary: adult data.

Adults were better at producing the basic form of adjectives after masculine nouns than the SM form of adjectives after feminine nouns. More interestingly, visual inspection of the data revealed that one lexical item -- *bach* "small" -- almost always resisted mutation after feminine nouns. With *bach*

excluded from analysis, performance on adjectives with feminine nouns increased from having a mean score of .429 to having a mean score of .786.

Children.

Overall, the children did not produce many adjective forms after the nouns. This limited the variables that could be statistically compared. Because of the irregularity of the children's adjective responses, the children's data were collapsed to allow for an analysis of performance across gender only. The independent variables were therefore Gender (masculine, feminine) and Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, and 9-year-olds). This revealed a significant main effect of Gender ($F(1, 17) = 10.573, p < .01$). Figure 4.8 illustrates these data.

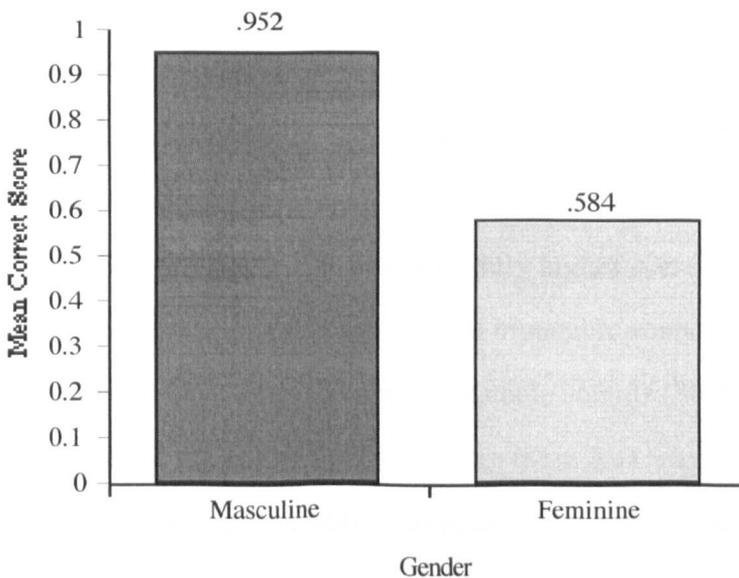


Figure 4.8: Children's Mean Proportions by Gender.

Again, the children were better at producing the appropriate form of adjectives after masculine nouns than they were at producing the appropriate form of adjectives after feminine nouns. Because of the lack of mutation with *bach* "little" in the adults' data, qualitative analysis was conducted to examine the same effect

by children. Table 4.7 presents percent scores for children's production of the SM form of all adjectives after feminine nouns.

Table 4.7: Children's Percent Scores on the Noun + Adjective Construction.

	Mutable Onset		Non-Mutable Onset	
	Feminine Animate	Inanimate	Feminine Animate	Inanimate
4 1/2-year-olds	0% (0/3)	25% (1/4)	25%(3/12)	50% (1/2)
6-year-olds	87.5% (7/8)	-	88.24% (15/17)	100% (1/1)
7 1/2-year-olds	70.59% (12/17)	77.78% (7/9)	16.67% (1/6)	59.26% (16/27)
9-year-olds	37.5% (3/8)	0% (0/3)	60% (12/20)	32.1% (3/13)
Total	61.11% (22/36)	50% (8/16)	56.36% (31/55)	47.62% (20/42)

The percent scores suggest that children might perform better on adjectives occurring with feminine animate nouns (61.11% and 56.36%) than with feminine inanimate nouns (50% and 47.62%), for nouns with initial mutable sounds and those without. There was also a slightly higher correct response rate for adjectives with feminine nouns that have initial mutable sounds (61.11% and 50%) than for those with nouns without initial mutable sounds (56.36% and 47.62%). The incidence of the use of *bach* "little" in these data was very high. Because of this, it was not possible to conduct comparable analysis to that conducted on the adult data looking at responses excluding *bach* "little". (There were no errors with the use of *bach* with masculine nouns.) With feminine nouns, inspection of Table 4.8 reveals that the children mutated *bach* "little" more often than the adults did: *bach* was mutated between 0% and 84.62% of the time; the adults, on the other hand, mutated *bach* between 0% and 42.1% of the time.

Table 4.8: Children's Use of *Bach* "little" After Masculine and Feminine Nouns.

	Mutable Onset		Non-Mutable Onset	
	Feminine		Feminine	
	Animate	Inanimate	Animate	Inanimate
4 1/2-year-olds	0% (0/2)	0% (0/2)	27.27% (3/11)	0% (0/1)
6-year-olds	80% (4/5)	-	84.62% (11/13)	-
7 1/2-year-olds	80% (4/5)	-	16.67% (1/6)	-
9-year-olds	40% (2/5)	0% (0/3)	60% (12/20)	-
Total	58.82% (10/17)	0% (0/5)	80% (40/50)	0% (0/1)

Summary: child data.

Children were better at producing the basic form of adjectives after masculine nouns than the SM form of adjectives after feminine nouns. Visual inspection of the data suggested that the children were able to mutate *bach* "small" more than the adults in this context.

Adults vs. children.

Since it was only possible to conduct a repeated measures ANOVA on the children's data when it was collapsed to allow for comparisons of Gender only, both adults and children's data were compared in this way, with Gender (masculine, feminine) and Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, 9-year-olds, and adults) as independent variables. As expected, the analysis revealed a significant effect of Gender ($F(1, 40) = 25.276, p < .001$). Since this effect has already been discussed in the individual analysis of the adults' and the children's data, it will not be discussed further here. The analysis also revealed a significant effect of Age ($F(4, 40) = 3.518, p < .05$). Figure 4.9 illustrates these data.

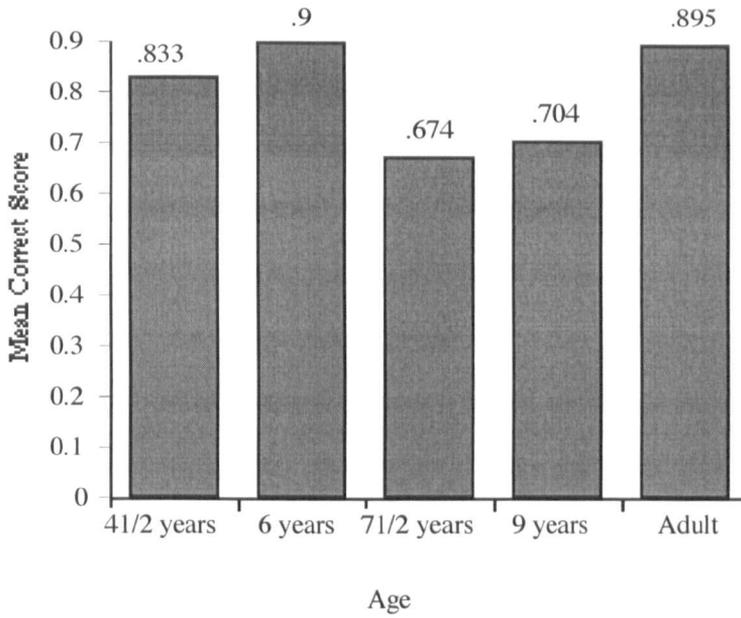


Figure 4.9: Adults' and Children's Mean Proportions by Age.

Mean comparisons revealed that the adults were significantly better overall than the 9-year-olds ($F(1,40) = 4.657, p < .05$) and the 7 1/2-year-olds ($F(1,40) = 8.615, p < .01$). The 6-year-olds were also significantly better than the 9-year-olds ($F(1,40) = 5.154, p < .05$) and the 7 1/2-year olds ($F(1,40) = 8.011, p < .01$).

Summary: adults vs. children.

The adults' and the children's data were analysed together to look for the effects of gender. As with the separate analysis of the adults' and the children's data, the combined analysis revealed a significant effect of Gender. The analysis also revealed a significant effect of Age, where both adults and 6-year-olds performed better than the 9-year-olds and the 7 1/2-year-olds.

Discussion

Data from a semi-naturalistic study revealed that both adult and child participants performed significantly better on the marking of masculine nouns than on the marking of feminine nouns. This was the case for two types of gender-

marked contexts: the noun when occurring with the definite article and the adjective following a noun. Children and adults were better at producing the basic form of masculine nouns and their modifiers than they were at producing the SM form of feminine nouns and their modifiers. This result is not surprising considering that, to be marked for their gender, feminine forms must undergo a complex linguistic process, whereas masculine forms surface in their basic form. Whenever participants did not use feminine nouns in their SM form they used the basic form -- the form used to mark the masculine. One might suggest that participants are therefore not distinguishing feminine gender from masculine gender. However, this is clearly not the case because children and adults rarely mark masculine forms with mutations relevant to feminine forms. If speakers were assigning gender by chance, there would be some SM forms on masculine forms and adjectives as often as observed with feminine forms. In the adult data, there were no forms other than the basic form of masculine nouns after the article, and only a few SM forms of adjectives after masculine nouns. Therefore the adult language that the children are exposed to consistently uses the basic forms when masculine forms are used. Feminine forms, on the other hand, are marked more variably in the adult language with SM. Children are hearing variable use of marking on feminine forms and this appears to cause children's acquisition to be a protracted process.

There was no effect of animacy (animate nouns vs. inanimate nouns) in the marking of gender on the noun. This indicates, as is observed in other grammatical gender languages, that the potential semantic cue to gender status (i.e., the biological sex of the referent) does not aid children's understanding of the gender of a noun more than any information pertaining to inanimate referents. However, with regard to the mutation of adjectives following feminine nouns, qualitative analysis of the children's responses suggests that performance might be better on animate nouns than on inanimate nouns; this suggests that in order to correctly mark nouns for their genders in this context, children might initially rely

on some semantic properties of animate nouns. However, none of these trends were significant.

Performance on the nouns after the article vs. on the adjectives modifying the noun suggested no clear advantage of one over the other. With masculine forms, performance on both was near ceiling. With feminine forms, children seemed to perform better on the definite article + noun construction (62.11%) than on the noun + adjective construction (53.1%) when the noun was animate, but better on the noun + adjective construction (78.78%) than on the definite article + noun construction (60.19%) when nouns were inanimate.

The adults produced SM of adjectives after feminine nouns between 83.33% and 89.92% of the time, and the SM of feminine nouns after the article between 93.2% and 94.48% of the time. Therefore children are hearing fairly consistent gender marking in the language of the adult members of their linguistic community. These analyses show that children are able to mark gender only not as consistently, or to the same extent as adults. The children's scores were still well below the adult norm on this task even at 9 years of age. The children produced the SM of adjectives after feminine nouns between 60.19% and 62.11% of the time, and the SM of feminine nouns after the article between 47.62% and 61.11% of the time. Children were producing significantly fewer SM on feminine nouns after the article than the adults. The only exception here was that the adults did not differ significantly from the 4 1/2-year-olds; however, this was possibly due to the overall paucity of data obtained from the 4 1/2-year-olds. However, since the adjective data was less consistent and copious than the noun data, it was not possible to statistically compare performance across these two gender-marked contexts.

On the production of the SM form of adjectives after feminine nouns, the adults were significantly better than the 7 1/2-year-olds and the 9-year-olds. Excluding the 4 1/2-year-olds' data (they did not differ significantly from the adults and produced the least amount of data) indicates that the children's ability

to mark adjectives after feminine nouns seems good initially, only to decrease in performance before slowly increasing by the age of 9 years (a U-shaped fashion). Together, these results indicate that some sort of learning process is occurring whereby the children are gradually improving in their understanding of the system.

Finally, the analysis identified one lexical item that resisted mutation after feminine nouns in the adult language -- *bach* "little". The peculiar nature of this item has been documented elsewhere (e.g., Thorne, 1993; Thomas, 1996; Griffiths & Jones, 1995; and see Chapter 2). The reason as to why this particular item behaves in this way can only be explained by looking at the specific properties that this item has in comparison with other adjectives. *Bach* seems to be functioning as a diminutive, in which case the mutation or no mutation rule appears to be becoming less relevant. However, the children were able to mutate *bach* after feminine nouns more than the adults. One explanation for children's apparent superiority on the marking of *bach* is that children initially use *bach* as an adjective. Only later will they start to use *bach* as a diminutive, in which case, the non-mutated form seems to be the most frequent form.

In conclusion, the data from these two main analyses of the two gender-marked contexts make it clear that, even at 9 years of age, children's gender-marking remains immature, indicating that they are yet to fully develop the adult system.

Additional Issues

The above analyses of the data have treated all nouns in the same way. All feminine nouns with initial mutable sounds must undergo a process of mutation after the definite article. However, recall from Chapter 2 that some nouns are produced in their SM form even in contexts that require the basic form. Thomas (1996) provided a list of such nouns, which includes two of the nouns elicited in the story. These were *tylluan* "owl" and *cwningen* "rabbit". According to

Thomas (1996), these nouns often have *dylluan* and *gwningen* as their basic forms (as was the case with two of the adult subjects here). If such nouns have a SM form as their basic form, then it is not possible to say whether the children who said *y gwningen* deliberately mutated the noun after the definite article or produced *gwningen* as the basic form of the noun. More information was needed to explore this issue.

One problem with the picture-story task was that it did not intentionally elicit nouns in their basic forms. Throughout the texts, children (and adults) produced more mutating contexts in which these nouns occurred than non-mutating contexts. It was, therefore, very difficult to look at children's possible productions of the basic forms of these nouns, as they would appear in non-mutating contexts, from the story. For this reason, a follow-up study was devised to look specifically at children's representations of the basic forms of nouns; this study is described in the next section.

Follow-up Study

Although there were no examples of the "double mutation" phenomenon in the children's data, it was important to know whether the children's productions represented the forms expected. Initially, the concern was that children's representations of the basic forms of /g/-, /m/-, and /ɾ/-initial nouns might have the traditional SM form (where the /g/ is deleted and /m/-initial nouns are produced with a /v/-initial sound) as their basic form, and that some /ɾ/-initial nouns are often left devoiced (see Chapter 5). In order to explore children's knowledge of the basic form of these and other feminine nouns, a follow-up test was conducted to elicit the basic form of the nouns used in the story.

Method

Participants

A subset of the children who participated in the picture-story was used in the follow-up test: Group 1 consisted of 7 of the 4 1/2-year-olds (age range = 4;0 to 5;3 years, mean age = 4;8 years); Group 2 consisted of 10 of the 6-year-olds (age range = 5;7 to 6;7 years, mean age = 6;1 years), Group 3 consisted of 11 of the 7 1/2-year-olds (age range = 6;9 to 7;9 years, mean age = 7;3 years), and Group 4 consisted of 9 of the 9-year-olds (age range = 8;3 to 9;7 years, mean age = 8;10 years).

Linguistic Stimuli

The test took the form of a poster that contained pictures of the referents of nouns from the story. The pictures depicted were the referents of all of the nouns from the story that took word-initial mutable sounds. This consisted of 52 nouns (see Table 4.1).

Non-Linguistic Stimuli

A large piece of white card (approx. A2 in dimension) contained the coloured pictures of all the characters and objects taken directly from the pictures in the story (see Appendix 4.8).

Procedure

The aim of the study was to ask the children to individually name each item depicted in the poster (i.e., independent of any linguistic context) with a view to discovering what basic forms the nouns took. The procedure was the same for all children. For the older children, the experimenter introduced the poster as follows:

Be' sydd genym ni yn fama ydi poster o'r holl bethau a'r holl gymeriadau welon ni yn y story. Y cwbl 'dw i eisiau i ti ei wneud ydi dweud be' oedd enwau'r pethau welon ni yn y stori.

“What we have here is a poster of all the things and all the characters we saw in the story. All I want you to do is to say what the names of the things we saw in the story were.”

The experimenter then elicited the children's names for the objects by pointing to the first picture on the poster and saying:

Felly, be' sydd genym ni yn famma?

“So, what do we have here?”

If the child did not produce a name for an item when the experimenter pointed to a picture, he or she was asked *be' ydi'r peth yma?* “what's this thing?” for inanimate objects, and *pwy sy'n fama?* “Who's here?” for animate beings. Once the session was over, the child was thanked for his or her participation, and presented with stickers.

For the younger children, the instructions differed in that they involved the use of a teddy. The child was told that a teddy wanted to know what the child had seen in the story. The child was therefore encouraged to name all the items seen in the story for the teddy. These instructions were as follows:

Mae gen i boster yn fama sydd yn dangos yr holl bethau welon ni yn y stori. Wyt ti am ddweud wrth tedi be welon ni yn y stori? Mae tedi eisiau gwybod be welon ni yn y stori.

“I have a poster here that shows all the things we saw in the story. Are you going to tell teddy what we saw in the story? Teddy wants to know what we saw in the story.”

Results

On 42 of the 52 nouns (24 masculine, 17¹² feminine) 100% of the children gave 100% base-form responses. These nouns will not be discussed further. However, for the remaining 10 nouns, some children produced something other than the “traditional” citation form. These nouns, and performance on them, are presented in Table 4.9. All errors involved the substitution of the traditional SM form of the nouns where the basic form was required. Moreover, all errors occurred with feminine nouns.

Table 4.9: 10 Nouns for Which Children Gave Non-Basic Responses (Numbers Show Proportions and Percent Correct Use of Basic Form).

Initial Sound	Noun	4 1/2-year-olds	6-year-olds	7 1/2-year-olds	9-year-olds	Total
/p/	<i>pabell</i> “tent”	1/1	3/5	5/5	3/3	85.71% (12/14)
/t/	<i>trol</i> “cart”	-	0/1	-	5/5	83.3% (5/6)
/k/	<i>coets</i> “pram”	0/2	1/1	1/3	-	33.3% (2/6)
	<i>cwningen</i> “rabbit”	4/5	6/6	7/8	7/7	92.3% (24/26)
/b/	<i>basged</i> “basket”	3/3	4/5	8/8	7/8	91.67% (22/24)
	<i>buwch</i> “cow”	4/4	8/9	7/7	8/8	96.42% (27/28)
/g/	<i>gardd</i> “garden”	5/6	1/5	1/4	3/5	50% (10/20)
	<i>gwiwer</i> “squirrel”	0/4	0/6	1/5	1/6	9.52% (2/21)
/m/	<i>melin</i> “mill”	1/2	3/6	1/7	1/6	28.57% (6/21)
	<i>mainc</i> “bench”	0/1	0/2	0/1	0/3	0% (0/7)
Total		64.29% (18/28)	56.52% (26/46)	64.58% (31/48)	68.63% (35/51)	

For some of the nouns the (incorrect) SM form was preferred only by one or two of the children (i.e., the /p/-, /t/-, /k/-, and /b/-initial nouns *pabell*, *trol*, *cwningen*, and *basged*), and by children in only one or two of the age groups. However, the majority of the errors occurred on one /k/-initial noun (*coets*) and the /g/- and /m/-initial nouns; this was across all age groups.

In order to see whether these nouns could have skewed the results for the story-telling task, the data were re-analysed to exclude the nouns in Table 4.9. Under this additional analysis, results were comparable to those found previously when all elicited nouns were analysed. The analysis showed a main effect of Gender ($F(1, 21) = 41.46, p < .001$) where the children's performance was still better on masculine nouns ($M = .970$) than on feminine nouns ($M = .571$). When the children's data on feminine nouns (both animate and inanimate) in the first analysis and in this subsequent analysis were compared, there was no significant difference.

Discussion

The data from this follow-up task suggest that, for some children, there are what Thomas (1984) termed "untriggered mutated initials" for some nouns. The most notable nouns affected (from the nouns used here in the story) are *coets* "pram", and the /g/- and /m/-initial nouns *gardd* "garden", *gwiwer* "squirrel", *melin* "mill" and *mainc* "bench". This suggests the following:

First, children might not hear the basic form of these particular nouns much in the language input they receive. For this to be the case the adult system that the children are exposed to will contain the same basic form errors, or will involve more uses of these nouns with the definite article than without.

Second, since only a small number of nouns are affected in this way, these are possible exceptions to the "norm". There might be something peculiar to these nouns themselves that cause the change from the traditional basic form to the SM

¹² Since none of the children produced *gwennol* "swallow", it was not included here.

form as the surface form. Perhaps, for example, words beginning with velars and /m/ are more susceptible to re-analysis than those beginning with other sounds.

Third, since there are inconsistencies in the application of this shift from the traditional basic form to the SM form (i.e., not all /k/-initial nouns were affected in this way) the case for the peculiarity of particular nouns is made stronger.

Fourth, since feminine nouns undergo SM more often than masculine nouns (due to the article) it might be that children associate feminine nouns with SM thus allowing for the overextension of the SM form of feminine nouns to other contexts. I will return to discuss this notion in Chapter 8.

Fifth, ultimately what this means is that some nouns are developing a new basic form. And with the prevalence of SM in the language, it is not surprising that the new form that these nouns are developing is the SM form.

* * * * *

Study 1 presented data on children's and adults' production of gender-marked constructs in a semi-naturalistic task. As noted, one problem with such tasks is that one cannot always depend on this methodology to elicit the desired data, and one must be careful in making any inferences from the data. For this reason, more experimentally controlled methods can provide a more detailed investigation of children's linguistic competence (Demuth, 1996). Therefore Study 2 was designed to look at children's ability to mark gender in a more experimentally controlled situation. This study (Study 2) would allow for the manipulation of certain cues to gender status. Study 2 was designed to look at children's (and adults') ability to attend to certain cues to determine the gender of a noun and will form a complement to the more "naturalistic" data of Study 1.

CHAPTER 5

Exploratory Test

Introduction

Since relatively little is known about the acquisition and use of Welsh, there is a lack of available information regarding Welsh-speaking children's language in general, and no readily available databases for child language. Welsh exists as a minority language that is in constant contact with English. Although the structure of both languages is very different, the influence of English on the Welsh language is vast. Ultimately, this results in lexical borrowings and code switching: items from the stronger language are slotted into the Welsh grammar system. Although it is widely known that this phenomenon occurs, the extent of such substitutions from English is not clearly documented. The result of this is that we do not know the extent to which some children are more familiar with borrowed vocabulary than with some "native" vocabulary.

In addition to the influences of foreign vocabulary, much of the Welsh language is in a state of flux. This is particularly true of the mutation system (see Chapter 2). For both borrowed and "native"¹ vocabulary, the extent to which children begin with the basic form, and from that form the mutated variant, is unclear (but see Chapter 3). This means that, for some nouns, the basic form might be supplanted by a mutated form for some children. Moreover, since there is variation in adults' adherence to mutations, the nature of the input to the child is variable.

Because of the number of nouns required for the study and the selection problems outlined below, it was possible, given the present state of the language, that the frequency of some of the nouns, both in productive and receptive speech,

¹ Due to the difficulty in distinguishing between which nouns are native and which nouns are English borrowings, in this chapter I will use the following labels: first, "native" will be used to refer to nouns that are accepted as Welsh nouns; second, "borrowed" will be used to refer to nouns that are either recent borrowings or early borrowings that have been incorporated into the language.

would be lower than for others. This would mean that children's knowledge of some of the nouns, especially their possible forms and so on, would be better than for others. Thus, an exploratory test was initially conducted to gain knowledge about children's familiarity with the real inanimate nouns that were selected for use in Study 2.

Preliminary Issues

The process of selecting appropriate real nouns for Study 2 presented difficulties. This was for various reasons. Some problems arose from the varying natures of the mutation and grammatical gender systems in Welsh. Others were due to a general lack of information as regards children's (and adults') productive use of nouns; this left the experimenter with nothing from which to work other than her intuition and a few notes on potential variation of usage for some entries in prescriptive grammars -- there is no standardized descriptive grammar. Thus the following problems arose:

1. *Nouns of common gender*. The aim was to search for masculine and feminine nouns suitable for the ages of the children involved in the study. However, there is a relatively large number of common nouns that are, according to both *Y Geiriadur Mawr* and *Geiriadur yr Academi*, of common, or variable gender -- that is, nouns that vacillate between masculine and feminine class according to dialect, individual preference, uncertainty about the gender of recent borrowings, and so on (see Chapter 2). Although some such nouns appear to have been very common in children's speech (e.g., *afal* "apple", *oren* "orange", *coes* "leg", *nyth* "nest", *troed* "foot") they had to be excluded from the study and replaced with other, often less frequently used, nouns.

2. *Object familiarity*. All nouns had to be names of concrete objects, and further, of objects that would be familiar to children; this was in order to avoid the possibility that child participants would treat the words as novel nouns. In this respect, many abstract nouns that are said to show some formal gender-marking

properties in the nouns' endings (see e.g., Surridge, 1989) could not be used in this study. However, because of a lack of nouns with particular initial sounds that were required for the study, other less familiar object nouns had to be used to balance the number of nouns across sounds.

3. *Ambiguity of form.* Some common feminine nouns tend to be pronounced in their mutated form (SM) even when the linguistic context in which they appear requires the basic form (i.e., non-mutated), and when the noun is used in isolation (see e.g., Ball & Müller, 1992, and Zwicky, 1984, for a discussion on the lenited form as the default). For example, *pont* /pɔ̃nt/ is the prescriptive basic form for "bridge", but the form that is often used when the basic form should occur is *bont* /bɔ̃nt/ (i.e., the SM form for *pont*). Nouns used in such a way had to be eliminated from the corpus of nouns for the study wherever possible, for to have had them here would have complicated the criteria by which the mutation or non-mutation of a noun after the definite article could be analysed. To have included such nouns in the study would have rendered it impossible to ascertain whether a child produced a mutated form for *pont* after the article as a consequence of some underlying knowledge that the noun was feminine, or as a consequence of the fact that he or she always used the mutated form as the basic form.

While some such words are considered by *Y Geiriadur Mawr* and *Geiriadur yr Academi* to have a single basic form (e.g., *pont* is considered as the basic form of "bridge"), other words are described as having two basic forms (e.g., "bowl" is entered under two forms -- *powlen* and *bowlen* -- both of which are feminine, and one of which can be considered to be the SM form of the other, /p/ → /b/). In some cases, some nouns are assigned two different genders (e.g., the noun for "pencil" is given as *pensil* (masculine) and *pensel* (feminine) according to *Y Geiriadur Mawr*). Due to their variable usage, and to avoid any problems in classifying their actual form, such nouns had to be excluded from the study.

4. *Native vs. borrowed nouns.* The ideal corpus of nouns would be native Welsh words that are marked for their genders consistently in the adult language. As already mentioned, there is no information on adult usage available that can be of help here. For this reason, whatever information there was (e.g., prescriptive grammars) had to be studied to obtain some information about the forms of nouns. Due to the lack of a sufficient number of "native" Welsh nouns, some common English borrowings (see footnote 1) had to be included in the corpus of words, and a balance sought between the "native" Welsh words and the English borrowings. All /g/-initial borrowings had to be excluded from the study since such nouns usually resist mutation in most environments for SM (see Chapter 2).

5. *Obtaining the required number of nouns.* Finding the required number of words to be used was problematic. This was due not only to the aforementioned difficulties, but also to the restrictions laid out for the nouns that could be used. Moreover, a balance had to be sought between and within the word-initial consonants used; this was in order to allow quantitative analysis of the results. However, some of these word-initial classes had numerous examples that I could draw from (e.g., there were ample possibilities for /k/-initial nouns) while others were limited (e.g., there was a very limited class of /r/-initial nouns from which I could extract possible nouns).

Because of these problems, an exploratory test was conducted to examine children's familiarity with the nouns that were possible to select and that were appropriate for use in the main study.

Exploratory Test Phase 1: Noun Familiarity Test

Aim

The design of this test was more stringent than the tests in Study 2 (see Chapter 6). In Study 2, the experimenter provided the children with the nouns. By contrast, in this exploratory test, it was the child's task to provide the name of

an object. The purpose of this test was to simply gauge whether Welsh-speaking 3-to 4-year-olds were familiar with the words to be used in the study.

Participants

Ten children took part in the exploratory test. All parents received a letter outlining the details of the test, and a signed consent form was received from all prior to the administration of the test. All parents also completed a "language background" questionnaire; this asked about the parents' language background as well as that of their child (see Appendix 4.2). All the children were either from Anglesey or just outside the island in the Ogwen area. For seven of the children, both parents were L1 Welsh. For a further two of the children, the fathers were L1 Welsh and the mothers had learned Welsh before having children. The remaining child had an L1 Welsh mother and a father who had learned Welsh before having children. All parents addressed their child in Welsh only. The children were between 2;9 and 4;3 years of age ($M = 3;7$ years). (The children who participated in the main study were between the ages of 4 1/2 and 9 years. The assumption was that 4-year-old (and older) children's understanding and recognition of nouns would be equal, or even better, than that of the children who took part in the exploratory test.)

Linguistic Materials and Design

Target nouns.

Generally, in this exploratory test, children were shown a picture and were asked to name what they saw. Target nouns were chosen to represent masculine and feminine nouns that began with consonants that were, or were not, susceptible to SM. (At the time of administering the exploratory test, the inclusion of vowel-initial nouns in Study 2 was not envisaged.) Therefore 132 nouns were initially considered; these consisted of 6 masculine and 6 feminine real words for each of the following word-initial sounds: /p, t, k, b, d, g, ʃ, r, m, n, f/. The list of 132

words is shown under (a) in Table 5.1. A number of standardised Welsh dictionaries (e.g., *Y Geiriadur Mawr*; *Geiriadur yr Academi*) and a number of Welsh dictionaries for children (e.g., *Geiriadur Cymraeg Cyntaf*; *Y Geiriadur Lliwgar*), and books specifically designed to assist children's vocabulary learning in Welsh (e.g., *Y Ditectif Geiriau*) were consulted for the nouns. Also, data from a Schools Council Project, designed to investigate the teaching of reading in Welsh, were consulted (Ogwen & Jenkins, 1978; see Chapter 3).

The first participant to take part in the test was administered the 132 nouns shown under (a) in Table 5.1. Three additional words, thus 135 words (shown under (b) in Table 5.1), were used with the second child, and one more additional word, thus 136 words (shown under (c) in Table 5.1), were used with the remaining children. The additional nouns were used for the following purposes:

Two of the /r̥/-initial words initially selected for the study were the masculine English borrowings *rhuban* "ribbon" and *rhwbwr* "eraser" (from "rubber"). However, it is possible that in some dialects the initial /r̥/ in such borrowings are unvoiced, whereas in other dialects they are voiced (see e.g., Watkins, 1993; Ball, 1993). Since there is, compared to other mutable sounds, a relatively limited number of /r̥/-initial nouns in Welsh, *rhuban* and *rhwbwr* were selected for the study because they were included in many children's dictionaries and books. Due to the potential problem of voicing with these nouns, all but the first child to take part in this test were also given *rhiniog* "threshold", *rhidyll* "sieve", and *rhwd* "rust" in addition to *rhuban* and *rhwbwr*. These were the only available object nouns that were anticipated to be voiced with /r̥/ in this dialect area. If the children could show recognition of these alternative words, they would be considered as replacement nouns for *rhuban* and *rhwbwr* in the study.

After administering the test to the first participant, a problem was also anticipated regarding *gardd* "garden".

Table 5.1: Nouns Tested in the Exploratory Test.

(a)	Native Masculine	Non-Native Masculine	Native Feminine	Non-Native Feminine
/p/	<i>pastwn</i> "truncheon" <i>popty</i> "oven" <i>penelin</i> "elbow" <i>pen-glin</i> "knee"	<i>papur</i> "paper" <i>plât</i> "plate"	<i>pais</i> "petticoat" <i>pabell</i> "tent" <i>pedol</i> "horseshoe" <i>pêl</i> "ball"	<i>poced</i> "pocket" <i>planed</i> "planet"
/t/	<i>tŷ</i> "house" <i>tân</i> "fire" <i>tecell</i> "kettle" <i>tegan</i> "toy" <i>to</i> "roof"	<i>tap</i> "tap"	<i>telyn</i> "harp" <i>ton</i> "wave" <i>torth</i> "loaf" <i>trol</i> "cart" <i>teisen</i> "cake"	<i>taten</i> "potato"
/k/	<i>clo</i> "lock" <i>cwch</i> "boat" <i>cety'n</i> "pipe" <i>cleddyf</i> "sword" <i>caws</i> "cheese" <i>crys</i> "shirt"		<i>cylllell</i> "knife" <i>calon</i> "heart" <i>cloch</i> "bell" <i>coeden</i> "tree" <i>cadwyn</i> "necklace" <i>cadair</i> "chair"	
/b/	<i>blodyn</i> "flower" <i>barcut</i> "kite" <i>bwrdd</i> "table"	<i>bath</i> "bath" <i>brws</i> "brush" <i>bocs</i> "box"	<i>bwyell</i> "axe" <i>brechdan</i> "sandwich"	<i>breichled</i> "bracelet" <i>bricsen</i> "brick" <i>basged</i> "basket" <i>blows</i> "blouse"
/d/	<i>drych</i> "mirror" <i>drws</i> "door" <i>dant</i> "tooth"	<i>drôr</i> "drawer" <i>dis</i> "die" <i>drwm</i> "drum"	<i>daear</i> "earth" <i>deilen</i> "leaf" <i>diod</i> "drink"	<i>dysgl</i> "dish" <i>dol</i> "doll" <i>desg</i> "desk"
/g/	<i>goleudy</i> "lighthouse" <i>glaw</i> "rain" <i>goriad</i> "key" <i>gwely</i> "bed"	<i>gwn</i> "gun" <i>gliw</i> "glue"	<i>gwisg</i> "dress" <i>gwialen</i> "rod" <i>gwobr</i> "prize" <i>gwe</i> "web"	<i>gardd</i> "garden" <i>gwasgod</i> "waistcoat"
/l/	<i>llwyn</i> "bush" <i>llia'n</i> "cloth" <i>llefrith</i> "milk" <i>llyfr</i> "book" <i>llun</i> "picture" <i>llythyr</i> "letter"		<i>llong</i> "ship" <i>llif</i> "saw" <i>llawes</i> "sleeve" <i>llaw</i> "hand" <i>llwy</i> "spoon" <i>lleuad</i> "moon"	
/r/	<i>rhew</i> "ice" <i>rhosyn</i> "rose" <i>rhif</i> "number"	<i>rhwbwr</i> "eraser" <i>rhuban</i> "ribbon" <i>rheiddiadur</i> "radiator"	<i>rhaff</i> "rope" <i>rhwyd</i> "net" <i>rhaw</i> "shovel" <i>rhwyf</i> "oar" <i>rhestr</i> "list"	<i>rhewgell</i> "freezer"
/m/	<i>madarch</i> "mushrooms" <i>mêl</i> "honey" <i>morthwyl</i> "hammer" <i>menyn</i> "butter"	<i>map</i> "map" <i>medal</i> "medal"	<i>maneg</i> "glove" <i>modrwy</i> "ring" <i>melin</i> "mill" <i>mellten</i> "bolt of lightning" <i>moronen</i> "carrot"	<i>matsien</i> "match"
/n/	<i>nos</i> "night" <i>Nadolig</i> "Christmas" <i>nenfwd</i> "ceiling"	<i>noinyn</i> "onion" <i>nodyn</i> "musical note" <i>napcyn</i> "napkin"	<i>nant</i> "brook" <i>neges</i> "shopping" <i>nodwydd</i> "needle" <i>neuadd</i> "hall"	<i>nofel</i> "novel" <i>nyten</i> "nut (& bolt)"
/f/	No Examples	<i>ffolder</i> "folder" <i>fflat</i> "flat" <i>ffrwyth</i> "fruit" <i>ffotograff</i> "photograph" <i>ffôn</i> "phone" <i>ffrilen</i> "frill"	<i>fffenest</i> "window"	<i>ffidil</i> "fiddle" <i>fflag</i> "flag" <i>ffliwt</i> "flute" <i>fforc</i> "fork" <i>ffrog</i> "dress, frock"
(B)	<i>rhiniog</i> "threshold" <i>rhidyll</i> "sieve" <i>rhwd</i> "rust"			
(C)			<i>gwlad</i> "country"	

This noun is often pronounced with a deleted /g/, that is, in SM form, where the linguistic aspects of the environment in which it occurs requires its basic form (i.e., with a voiced initial /g/). Therefore, for the remaining participants, an additional /g/-initial noun was introduced as an alternative to *gardd*². If the children were able to recognise this alternative noun, it would be considered as a replacement for *gardd*. This alternative /g/-initial noun was *gwlad* "country".

Table 5.1 shows that in the original corpus of nouns there were 41 real native masculine nouns and 25 real masculine borrowings. The sample of masculine borrowings included mainly /m/-, /n/-, /f/-, and /r/-initial nouns. There were 45 real native feminine nouns and 21 real feminine borrowings. The sample of feminine borrowings were mainly /b/- and /f/-initial nouns (most /f/-initial nouns are in fact English borrowings). Most (or even all) of these borrowings are, according to contemporary dictionaries (and by the author's judgement), more commonly used than their "native" Welsh variants (where these Welsh variants are available -- e.g., *papur* is the only available word for "paper"; however *tent* "tent" is used more often than *pabell* "tent"). However, there are no guidelines available about the extent to which children, adults, or both may use an English form over a Welsh form for particular words. Moreover, the feminine borrowings used in this study were nouns that had been incorporated into the gender system as standard (see e.g., Jones, 1993, for discussion on usage of borrowings in the language).

Distracter nouns.

A further set of 264 words was selected for this exploratory test. These were to be used in conjunction with the target words (i.e., the words in Table 5.1) when administering the test. There were three types of errors that the children could make when asked to name what they saw in a picture: (a) he or she might not produce a name for the object in the picture; (b) he or she might produce a related name to that elicited (e.g., *bara* "bread" for *torth* "loaf"); or (c) he or she

² In fact, I also anticipated the same problem with the /m/-initial noun *melin* "mill". However, there were no other /m/-initial nouns that could be tested as possible replacement nouns.

might produce a different name for the object, a name that would be associated with a similarly shaped object, but would be semantically and lexically different to the target noun (e.g., if the child said "policeman's hat" when shown a picture of a bell). If any of these error types arose the experimenter would give the child a choice of three names for the object: the target name and two additional, distracter names. These two additional words, used in conjunction with the target word, were chosen to be of a similar level of lexical difficulty. These additional words were also chosen so as not to be overtly linked semantically to the target noun; for example, *cwch* "boat" and *bâd* "barge" would not be used as choices if the target noun was *llog* "ship". The distracter nouns are shown with the target nouns in Table 5.2.

Table 5.2: The Target Nouns and Their Accompanying Distracter Nouns.

Target Noun	Distracter 1	Distracter 2
<i>pastwn</i> "truncheon"	<i>cylchgrawn</i> "magazine"	<i>cannwyll</i> "candle"
<i>popty</i> "oven"	<i>siswrn</i> "scissors"	<i>tebot</i> "teapot"
<i>pais</i> "petticoat"	<i>gwair</i> "grass"	<i>wal</i> "wall"
<i>pabell</i> "tent"	<i>llygad</i> "eye"	<i>bwcwl</i> "buckle"
<i>pedol</i> "horseshoe"	<i>cynffon</i> "tail"	<i>potel</i> "bottle"
<i>poced</i> "pocket"	<i>seren</i> "star"	<i>ffôn</i> "phone"
<i>planed</i> "planet"	<i>cotwm</i> "cotton"	<i>pren</i> "wood"
<i>papur</i> "paper"	<i>siwmpwr</i> "jumper"	<i>cwlwm</i> "knot"
<i>plât</i> "plate"	<i>ceg</i> "mouth"	<i>beic</i> "bike"
<i>penelin</i> "elbow"	<i>siop</i> "shop"	<i>wy</i> "egg"
<i>pen-glin</i> "knee"	<i>siglen</i> "swing"	<i>trwyn</i> "nose"
<i>pêl</i> "ball"	<i>bol</i> "tummy"	<i>coes</i> "leg"
<i>tŷ</i> "house"	<i>het</i> "hat"	<i>côt</i> "coat"
<i>tân</i> "fire"	<i>cae</i> "field"	<i>môr</i> "sea"
<i>tap</i> "tap"	<i>lamp</i> "lamp"	<i>switsh</i> "switch"
<i>tecell</i> "kettle"	<i>mwclis</i> "necklace"	<i>botwm</i> "button"
<i>taten</i> "potato"	<i>cwpan</i> "cup"	<i>hosan</i> "sock"
<i>telyn</i> "harp"	<i>cyrten</i> "curtain"	<i>palmant</i> "pavement"
<i>ton</i> "wave"	<i>glo</i> "coal"	<i>gris</i> "stair"
<i>torth</i> "loaf"	<i>trên</i> "train"	<i>pwll</i> "pool"
<i>trol</i> "cart"	<i>ffedog</i> "apron"	<i>grât</i> "grate"
<i>tegan</i> "toy"	<i>sebon</i> "soap"	<i>soser</i> "saucer"
<i>to</i> "roof"	<i>pensel</i> "pencil"	<i>pot</i> "pot"
<i>teisen</i> "cake"	<i>olwyn</i> "wheel"	<i>awyren</i> "aeroplane"
<i>clo</i> "lock"	<i>pei</i> "pie"	<i>cot</i> "crib"
<i>cwch</i> "boat"	<i>tractor</i> "tractor"	<i>pig</i> "beak"
<i>cyllell</i> "knife"	<i>esgid</i> "shoe"	<i>lemon</i> "lemon"
<i>calon</i> "heart"	<i>oren</i> "orange"	<i>powlen</i> "bowl"
<i>cloch</i> "bell"	<i>bag</i> "bag"	<i>giât</i> "gate"
<i>cetyn</i> "pipe"	<i>piano</i> "piano"	<i>sbectol</i> "glasses"
<i>coeden</i> "tree"	<i>banana</i> "banana"	<i>bwced</i> "bucket"
<i>cleddyf</i> "sword"	<i>palmant</i> "pavement"	<i>oriawr</i> "watch"
<i>caws</i> "cheese"	<i>clust</i> "ear"	<i>jwg</i> "jug"
<i>cadwyn</i> "necklace"	<i>sialc</i> "chalk"	<i>traeth</i> "beach"
<i>crys</i> "shirt"	<i>cwpan</i> "cup"	<i>crib</i> "comb"
<i>cadair</i> "chair"	<i>pen</i> "head"	<i>trên</i> "train"
<i>bocs</i> "box"	<i>afal</i> "apple"	<i>trowsus</i> "trousers"
<i>basged</i> "basket"	<i>creision</i> "crisps"	<i>awyren</i> "aeroplane"
<i>blows</i> "blouse"	<i>troed</i> "foot"	<i>oren</i> "orange"
<i>bwyell</i> "axe"	<i>berfa</i> "wheelbarrow"	<i>chwiban</i> "whistle"
<i>breichled</i> "bracelet"	<i>gobennydd</i> "pillow"	<i>trwmped</i> "trumpet"
<i>blodyn</i> "flower"	<i>cerdyn</i> "card"	<i>sosban</i> "saucepan"
<i>bath</i> "bath"	<i>tŵr</i> "tower"	<i>powlen</i> "bowl"
<i>brwsh</i> "brush"	<i>blanced</i> "blanket"	<i>pont</i> "bridge"
<i>barcut</i> "kite"	<i>olwyn</i> "wheel"	<i>parsel</i> "parcel"
<i>bricsen</i> "brick"	<i>moddion</i> "medicine"	<i>pafin</i> "pavement"
<i>brechdan</i> "sandwich"	<i>hosan</i> "sock"	<i>robot</i> "robot"
<i>bwrdd</i> "table"	<i>beic</i> "bike"	<i>cap</i> "cap"
<i>dis</i> "die"	<i>pin</i> "pin"	<i>te</i> "tea"
<i>drwm</i> "drum"	<i>castell</i> "castle"	<i>carped</i> "carpet"
<i>drych</i> "mirror"	<i>powdwr</i> "powder"	<i>mynydd</i> "mountain"
<i>drws</i> "door"	<i>balŵn</i> "balloon"	<i>pont</i> "bridge"
<i>dant</i> "tooth"	<i>coron</i> "crown"	<i>garej</i> "garage"
<i>drôr</i> "drawer"	<i>gwlan</i> "wool"	<i>hances</i> "handkerchief"
<i>dysgl</i> "dish"	<i>halen</i> "salt"	<i>golau</i> "light"
<i>dol</i> "doll"	<i>ceg</i> "mouth"	<i>car</i> "car"
<i>desg</i> "desk"	<i>buarth</i> "playground"	<i>awyr</i> "sky"
<i>daear</i> "earth"	<i>cribin</i> "rake"	<i>cerflun</i> "statue"
<i>deilen</i> "leaf"	<i>angel</i> "angel"	<i>enfys</i> "rainbow"

<i>diod</i> "drink"	<i>grisiau</i> "stairs"	<i>golau</i> "light"
<i>gliw</i> "glue"	<i>dŵr</i> "water"	<i>pres</i> "money"
<i>goleudy</i> "lighthouse"	<i>camera</i> "camera"	<i>rheilffordd</i> "railway"
<i>gwn</i> "gun"	<i>cloc</i> "clock"	<i>pwr</i> "purse"
<i>gwialen</i> "rod"	<i>sbwriel</i> "rubbish"	<i>bathodyn</i> "badge"
<i>gwobr</i> "prize"	<i>gwregys</i> "belt"	<i>llen</i> "curtain"
<i>gardd</i> "garden"	<i>nyth</i> "nest"	<i>tywod</i> "sand"
<i>gwasgod</i> "waistcoat"	<i>botwm</i> "button"	<i>mwclis</i> "necklace"
<i>glaw</i> "rain"	<i>pwll</i> "pool"	<i>gwair</i> "grass"
<i>gwisg</i> "dress"	<i>simdde</i> "chimney"	<i>ysgwydd</i> "shoulder"
<i>goriad</i> "key"	<i>hoelen</i> "nail"	<i>berfa</i> "wheelbarrow"
<i>gwely</i> "bed"	<i>sgert</i> "skirt"	<i>sinc</i> "sink"
<i>gwe</i> "web"	<i>clwt</i> "nappy"	<i>cig</i> "meat"
<i>llwyn</i> "bush"	<i>postyn</i> "post"	<i>coler</i> "collar"
<i>lliain</i> "cloth"	<i>arian</i> "money"	<i>potel</i> "bottle"
<i>llong</i> "ship"	<i>lori</i> "lorry"	<i>teledu</i> "television"
<i>llif</i> "saw"	<i>boch</i> "cheek"	<i>bawd</i> "thumb"
<i>llawes</i> "sleeve"	<i>syracas</i> "circus"	<i>soser</i> "saucer"
<i>llaw</i> "hand"	<i>mop</i> "mop"	<i>pin</i> "pin"
<i>llwy</i> "spoon"	<i>carreg</i> "stone"	<i>cneuen</i> "nut"
<i>llefrith</i> "milk"	<i>lolf</i> "lounge"	<i>eirin</i> "plums"
<i>lleuad</i> "moon"	<i>ynys</i> "island"	<i>gwliith</i> "dew"
<i>llyfr</i> "book"	<i>dosbarth</i> "classroom"	<i>radio</i> "radio"
<i>llun</i> "picture"	<i>cist</i> "treasure chest"	<i>blanced</i> "blanket"
<i>llythyr</i> "letter"	<i>chwilen</i> "beetle"	<i>olew</i> "oil"
<i>rhew</i> "ice"	<i>gwlan cotwm</i> "cotton wool"	<i>pren</i> "wood"
<i>rhosyn</i> "rose"	<i>twannel</i> "tunnel"	<i>mefusen</i> "strawberry"
<i>rheiddiadur</i> "radiator"	<i>ysbyty</i> "hospital"	<i>dyffryn</i> "valley"
<i>rhif</i> "number"	<i>ras</i> "race"	<i>nyrs</i> "nurse"
<i>rhaff</i> "rope"	<i>cwyr</i> "wax"	<i>hedyn</i> "seed"
<i>rhwyd</i> "net"	<i>clwt</i> "nappy"	<i>spwnj</i> "sponge"
<i>rhaw</i> "shovel"	<i>cwyr</i> "wax"	<i>simdde</i> "chimney"
<i>rhewgell</i> "freezer"	<i>llusern</i> "lantern"	<i>gwerysll</i> "camp"
<i>rhwyf</i> "oar"	<i>sinc</i> "sink"	<i>potel</i> "bottle"
<i>rhwbwr</i> "eraser"	<i>ystlum</i> "bat"	<i>ambarél</i> "umbrella"
<i>rhuban</i> "ribbon"	<i>simdde</i> "chimney"	<i>planhigyn</i> "plant"
<i>rhestr</i> "list"	<i>piben</i> "pipe"	<i>perth</i> "bush"
<i>madarch</i> "mushrooms"	<i>peiriant</i> "machine"	<i>hofrennydd</i> "helicopter"
<i>map</i> "map"	<i>haul</i> "sun"	<i>sied</i> "shed"
<i>medal</i> "medal"	<i>tocyn</i> "ticket"	<i>pupur</i> "pepper"
<i>maneg</i> "glove"	<i>sebon</i> "soap"	<i>llwybr</i> "path"
<i>modrwy</i> "ring"	<i>siocled</i> "chocolate"	<i>mefus</i> "strawberries"
<i>matsien</i> "match"	<i>grawnwin</i> "grapes"	<i>clorian</i> "scales"
<i>melin</i> "mill"	<i>twannel</i> "tunnel"	<i>camlas</i> "canal"
<i>mellten</i> "bolt of lightning"	<i>traeth</i> "beach"	<i>beudy</i> "cowshed"
<i>moronen</i> "carrot"	<i>coedwig</i> "forest"	<i>selsig</i> "sausages"
<i>mêl</i> "honey"	<i>teiar</i> "tyre"	<i>cig</i> "meat"
<i>morthwyl</i> "hammer"	<i>llinell</i> "line"	<i>trolï</i> "trolley"
<i>menyn</i> "butter"	<i>casgen</i> "barrel"	<i>dawns</i> "dance"
<i>nodyn</i> "musical note"	<i>gwliith</i> "dew"	<i>natur</i> "nature"
<i>nos</i> "night"	<i>niwl</i> "fog"	<i>lloeren</i> "satellite"
<i>nionyn</i> "onion"	<i>nefoedd</i> "heaven"	<i>noson</i> "evening"
<i>Nadolig</i> "Christmas"	<i>ffynnon</i> "well"	<i>gwydryn</i> "tumbler"
<i>napcyn</i> "napkin"	<i>gwefus</i> "lip"	<i>lludw</i> "ash"
<i>nenfwd</i> "ceiling"	<i>dyffryn</i> "valley"	<i>hambwrdd</i> "harbour"
<i>nant</i> "brook"	<i>ffair</i> "fair"	<i>cadach</i> "cloth"
<i>neges</i> "shopping"	<i>porth</i> "port"	<i>dinas</i> "city"
<i>nodwydd</i> "needle"	<i>moddion</i> "medicine"	<i>draen</i> "drain"
<i>nofel</i> "novel"	<i>llafn</i> "blade"	<i>porfa</i> "pasture"
<i>neuadd</i> "hall"	<i>fflachlamp</i> "torch"	<i>byddin</i> "army"
<i>nyten</i> "nut (& bolt)"	<i>cwlwm</i> "knot"	<i>pyped</i> "puppet"
<i>ffolder</i> "folder"	<i>siwmpwr</i> "jumper"	<i>corcyn</i> "cork"

<i>fflat</i> "flat"	<i>polyn</i> "pole"	<i>llithren</i> "slide"
<i>ffrwyth</i> "fruit"	<i>clustog</i> "cushion"	<i>carreg</i> "stone"
<i>ffotograff</i> "photograph"	<i>defnydd</i> "material"	<i>cardbord</i> "cardboard"
<i>ffôn</i> "phone"	<i>cwprdd</i> "cupboard"	<i>soffa</i> "sofa"
<i>ffrilen</i> "frill"	<i>cwyr</i> "wax"	<i>mantell</i> "cloak"
<i>ffenest</i> "window"	<i>carped</i> "carpet"	<i>sliper</i> "slipper"
<i>ffidil</i> "fiddle"	<i>parc</i> "park"	<i>coets</i> "coach"
<i>fflag</i> "flag"	<i>siop</i> "shop"	<i>parsel</i> "parcel"
<i>ffliwt</i> "flute"	<i>pwmp</i> "pump"	<i>halen</i> "salt"
<i>fforc</i> "fork"	<i>mat</i> "mat"	<i>llygad</i> "eye"
<i>ffrog</i> "dress, frock"	<i>gwallt</i> "hair"	<i>pluen</i> "feather"

Non-linguistic Materials

For each target noun, a picture was drawn on a card (6" x 4" approx.) to represent the referent of the noun. In all, 136 picture cards were drawn up. Individual pictures were drawn in black and white; most were 2D representations, although 3D representations were employed only when absolutely necessary³.

Procedure

Each child was asked to come and play a naming game. The child was shown a picture and asked what was in the picture:

Be' sydd yn y llun yma?

"What's in this picture?"

The child's response was noted on a marking sheet. If the child produced the target name for the object in the picture, the experimenter went on to the next picture. If the child did not provide the target name for the object, or did not produce a name for the object, the experimenter provided the child with a choice of three answers. These three choices were presented to the child orally. The experimenter then asked the child which one of these three choices he or she thought was the name for the object in the picture:

³On a few occasions, a real example of the object depicted in the picture was introduced; for example, one parent produced real cheese from the kitchen to show to her child when her child failed to produce *caws* "cheese" when given its picture-referent.

Be' ti'n meddwl ydi o? Tŷ, het, 'ta côf?

"What do you think it is? (a) house, (a) hat, or (a) coat?"

The child's response was noted. When the child had to be provided with a choice of three nouns for an object, his or her first response was considered. If the child repeated all three items after the experimenter produced them, this response would be considered as a "no response".

The pictures were randomly administered to the children in such a way that no two children were given the same nouns in the same order. When the children were presented with three choices, the position of the target noun was randomised in such a way that the target noun could be the first, second, or third noun they heard in the list of three choices.

Results

The following method was used for scoring the data:

If a child produced the target noun on seeing the object in the picture, or if the child correctly chose the target noun from the three choices, this response was given a score of 1. If a child could not produce a name for the object on seeing the picture, and could not correctly choose the appropriate target noun from the three choices, this response was given a score of 0.

Table 5.3 shows the words for which 80% or more of the children responded correctly; Table 5.4 shows those words for which fewer than 80% of the children responded correctly.

A total of 65.15% (43/66) of the feminine nouns was recognised by at least 80% of the children. However, 34.84% (23/66) of the feminine nouns were recognised by 70% or less of the children; only 9% (6/66) of the feminine nouns were recognised by less than half of the children. The children's performance on masculine nouns was slightly better than it was on feminine nouns in this test. A

total of 75.75% (50/66) of the masculine nouns was recognised by at least 80% of the children, and 24.24% (16/66) of the masculine nouns were recognised by 70% or less of the children. Only 6% (4/66) of the masculine nouns were recognised by less than half of the children. Overall, most of the children recognised most of the nouns with initials /p/-, /t/-, /k/-, /b/-, /d/-, /ʃ/-, and /m/-. At least five of them recognised all these nouns, both masculine and feminine. (For the masculine nouns, all the children showed recognition for all of the masculine nouns that had /p/-, /b/-, and /m/- initial sounds.)

Table 5.3: The Nouns Recognised by at Least 80% of the Children.

Initial Phoneme	Feminine		Masculine	
/p/	<i>pêl</i> "ball" <i>pais</i> "petticoat" <i>pedol</i> "horseshoe"	<i>poced</i> "pocket"	<i>papur</i> "paper" <i>pastwn</i> "truncheon" <i>pen-glin</i> "knee"	<i>plât</i> "plate" <i>popty</i> "oven" <i>penelin</i> "elbow"
/t/	<i>taten</i> "potato" <i>teisen</i> "cake" <i>telyn</i> "harp"	<i>ton</i> "wave"	<i>ty'</i> "house" <i>tân</i> "fire" <i>tap</i> "tap"	<i>to</i> "roof" <i>tecell</i> "kettle"
/k/	<i>cadair</i> "chair" <i>cylllell</i> "knife" <i>calon</i> "heart"	<i>coeden</i> "tree" <i>cloch</i> "bell"	<i>caws</i> "cheese" <i>clo</i> "lock" <i>crys</i> "shirt"	<i>cwch</i> "boat"
/b/	<i>basged</i> "basket" <i>blows</i> "blouse" <i>breichled</i> "bracelet"	<i>bricsen</i> "brick" <i>brechdan</i> "sandwich"	<i>bath</i> "bath" <i>blodyn</i> "flower" <i>bocs</i> "table"	<i>brwsh</i> "brush" <i>bwrdd</i> "table" <i>barcut</i> "kite"
/d/	<i>diod</i> "drink" <i>deilen</i> "leaf" <i>dysgl</i> "dish"	<i>dol</i> "doll" <i>desg</i> "desk"	<i>drws</i> "door" <i>dant</i> "tooth" <i>drôr</i> "drawer"	<i>drwm</i> "drum"
/g/	<i>gardd</i> "garden" <i>gwe</i> "web"		<i>glaw</i> "rain" <i>gwely</i> "bed" <i>goleudy</i> "lighthouse"	<i>gwn</i> "gun" <i>goriad</i> "key"
/ʃ/	<i>llaw</i> "hand" <i>lleuad</i> "moon" <i>llong</i> "ship"	<i>llwy</i> "spoon" <i>llif</i> "saw"	<i>llefrith</i> "milk" <i>llyfr</i> "book" <i>llun</i> "picture"	<i>lliain</i> "cloth" <i>llythyr</i> "letter"
/r/	<i>rhaff</i> "rope" <i>rhaw</i> "spade" <i>rhwyd</i> "net"		<i>rhew</i> "ice" <i>rhosyn</i> "rose" <i>rhif</i> "number"	<i>rhwbwr</i> "eraser"
/m/	<i>maneg</i> "glove" <i>modrwy</i> "ring" <i>matsien</i> "match"	<i>melin</i> "mill"	<i>Madarch</i> "mushrooms" <i>map</i> "map" <i>medal</i> "medal"	<i>morthwyl</i> "hammer" <i>menyn</i> "butter" <i>mêl</i> "honey"
/n/	<i>nodwydd</i> "needle"	<i>nos</i> "night" <i>nionyn</i> "onion" <i>Nadolig</i> "Christmas"		
/f/	<i>fffenest</i> "window" <i>fflag</i> "flag" <i>ffliwt</i> "flute"	<i>fforc</i> "fork" <i>ffrog</i> "dress"	<i>ffrwyth</i> "fruit" <i>ffôn</i> "phone"	

Table 5.4 : The Nouns Recognised by Less Than 80 % of the Children.

Initial Phoneme	Feminine Noun	Percentage Recognition	Masculine Noun	Percentage Recognition
/p/	<i>pabell</i> "tent"	60%	<i>planed</i> "planet"	50%
/t/	<i>trol</i> "cart"	70%	<i>tegan</i> "toy"	70%
	<i>torth</i> "loaf"	60%		
/k/	<i>cadwyn</i> "necklace"	50%	<i>cetyn</i> "pipe"	60%
			<i>cleddyf</i> "sword"	50%
/b/	<i>bwyell</i> "axe"	77.78%		
/d/	<i>daear</i> "earth"	30%	<i>dis</i> "die"	77.78%
			<i>drych</i> "mirror"	70%
/g/	<i>gwialen</i> "rod"	70%	<i>gliw</i> "glue"	70%
	<i>gwobr</i> "prize"	70%		
	<i>gwasgod</i> "waistcoat"	60%		
	<i>gwisg</i> "dress"	50%		
/h/			<i>llwyn</i> "bush"	20%
/r/	<i>rhewgell</i> "freezer"	70%	<i>rhuban</i> "ribbon"	70%
	<i>rhwyf</i> "oar"	60%		
	<i>rhestr</i> "list"	40%		
/m/	<i>moronen</i> "carrot"	70%		
	<i>mellten</i> "bolt of lightning"	60%		
/n/	<i>nant</i> "brook"	50%	<i>nodyn</i> "musical note"	50%
	<i>neges</i> "shopping"	30%	<i>napcyn</i> "napkin"	40%
	<i>nofel</i> "novel"	10%	<i>nenfwd</i> "ceiling"	0%
	<i>neuadd</i> "hall"	40%		
	<i>nyten</i> "nut (& bolt)"	20%		
/f/	<i>ffidil</i> "fiddle"	70%	<i>ffolder</i> "folder"	50%
			<i>fflat</i> "flat"	50%
			<i>ffotograff</i> "photograph"	60%
			<i>ffril</i> "frill"	70%

All the nouns in Tables 5.3 and 5.4 were used in Study 2 with the following exceptions:

1. The additional /r/- and /g/- initial nouns used in the exploratory test as possible replacements of *rhuban* "ribbon", *rhwiwr* "eraser/rubber", and *gardd* "garden" (see above) were not well recognised by the children, and less well recognised than *rhuban*, *rhwiwr*, and *gardd*. Therefore *rhuban*, *rhwiwr*, and *gardd* remained as examples of /r/- and /g/-initial nouns in Study 2.

2. After the administration of the exploratory test, it was determined that a number of the nouns used in the exploratory test were unsuitable for inclusion in the study. First, some of these nouns were discovered to be common gender nouns; these were replaced as follows:

Blows (masculine/feminine, but used as feminine in the exploratory test) "blouse" was replaced by *blanced* (feminine) "blanket"; *penelin* (masculine/feminine, but used as masculine in the test) "elbow" was replaced by *pwrs* (masculine) "purse"; *drôr* (masculine/feminine, but used as masculine in the test) "drawer" was replaced by *deimwnt* (masculine) "diamond"; *ffolder* (masculine/feminine, but used as masculine in the test) "folder" was replaced by *ffisig* "medicine"; and *nos* (used as masculine in the test, but feminine according to some standard grammars) "night" was replaced by *niwl* (masculine) "fog".

Second, some nouns were changed because their forms either signified the plural or because they signified the wrong gender. Thus *madarch* "mushrooms" (plural) was changed to *masiarw̄m* "mushroom" because the singular form of *madarch* would have been the feminine *madarchen*. Due to the limitation of /m/-initial nouns, the English borrowing *masiarw̄m* had to be used since it is masculine. Moreover, *ffrilen* "frill" (feminine) had to be changed into *ffril* "frill" (masculine).

Third, others were eliminated because they were nouns that denote substances. Therefore, to ensure that all nouns were of the same type, such nouns were replaced as follows: *llefrith* (masculine) "milk" was replaced by *llyn* (masculine singular) "lake"; *menyn* (masculine) "butter" was replaced by *mynydd* (masculine singular) "mountain"; and *mêl* (masculine) "honey" was replaced by *melon* (masculine singular) "melon".

Finally, additional vowel-initial nouns were added to the final list of nouns; this was to provide information about children's recognition of vowel-initial nouns as basic form or as the SM form of /g/-initial nouns, and how this effected their gender marking.

The differential performance on nouns will be addressed in Study 2 by carrying out sub-tests on the data; these will separate the words for which the children performed at 80-100% accuracy in the exploratory test from those that were at 70% or less accuracy.

Exploratory Test Phase 2: Colour Adjective Familiarity Test

Rationale

This part of the test was carried out in order to establish which colour terms 3- to 4-year-old children were most familiar with. This information would allow the selection of the most appropriate colour terms to be used in Study 2.

Participants

The same participants who took part in the noun recognition phase received this phase of the test.

Linguistic Stimuli

The following set of colour adjectives was elicited: *piws* "purple", *pinc* "pink", *coch* "red", *brown* "brown", *du* "black", *glas* "blue", *gwyrdd* "green", *llwyd* "grey", *melyn* "yellow", and *gwyn* "white".

Non Linguistic Stimuli

A set of 10 felt-tip pens was used as colour stimuli, one for each of the colour terms used.

Procedure

After the completion of the noun familiarity test, the children were randomly shown the felt tip pens, one at a time, and the experimenter asked:

Pa liw ydi hwn?

"What colour is this?"

After the children produced a colour term for each of the pens, the children were thanked for their participation and presented with stickers.

Results

Of the 10 children who participated, 8 had no difficulty in providing the correct colour term for each of the pens. Of the remaining two children, one had difficulty in producing *llwyd* "grey", and produced the English term "peach" instead. The youngest child to participate, aged 2;9, did not respond to the colour pens (although he nevertheless correctly produced *piws* "purple" and *melyn* "yellow" whilst playing with a coloured truck; however, these responses were not scored and therefore this participant's data for this phase were excluded from analysis).

Since all nine of the other children responded correctly to all the colour terms with the one exception of *llwyd* "grey", any of the colour terms tested could be used for the study. For the study, the following colour terms were selected: *pinc* "pink", *coch* "red", *brown* "brown", *du* "black", *glas* "blue", and *melyn* "yellow" (see Chapter 6).

Summary

Initial exploratory tests were used to aid in the choice of nouns and adjectives to be used in Study 2. The adjectives to be used were all produced correctly by the 3-year-olds tested. The majority of the nouns were correctly produced or recognised by 80% or more of the children. To deal with the fact that some nouns were less familiar, some of the analyses of Study 2 will separate the familiar (80% or more correct) nouns from the less familiar ones (70% or less correct).

CHAPTER 6**Study 2: Gender Elicitation Tests****Introduction**

In Chapter 6, I present data from an experimental study that was designed to investigate the acquisition of the gender system in Welsh. The study aimed to investigate the extent to which children and adults rely on a variety of cues for gender categorisation in the language. A series of test items that looked at children's and adults' productive command of gender in Welsh is presented. Six individual tests were used. The tests took the form of elicitation-style tests (Berko, 1958); these were designed to evoke particular sentence structures (Thornton, 1996). For each test, each participant heard masculine and feminine forms, both for real words and nonsense forms, presented in particular linguistic contexts; some of these contexts provided cues to gender status, some did not. The tests were designed to test knowledge of gender marking on the noun itself or on its modifier (i.e., "local" gender constructs). Each participant was asked to use both real and nonsense nouns in a variety of contexts; some of these contexts required gender marking, others required the production of the basic form of the nouns.

The data from this study provide some initial answers to the following general questions:

- To what extent, and at what phase in development, do Welsh-speaking children rely on specific cues for gender categorisation available in the input?
- Is one type of contextual information more useful as a cue than another? That is, would the mutation of nouns modified by the definite article be more useful as a cue than the mutation of adjectives modifying nouns, or vice versa?

- To what extent is children's knowledge of gender productive? Children's ability to extend gender mutation to nonsense nouns may help provide answers to this last question.

Rationale for the Study

As noted in Chapter 2, there is little about the forms of Welsh nouns themselves that can indicate their gender status. The primary cue to a noun's gender is in the mutation or non-mutation of nouns modified by the definite article and of adjectives modifying feminine nouns (Jones, 1993). Therefore this study focused on children's ability to attend to specific cues to gender status: the mutation or non-mutation of nouns and adjectives. In this sense, this study follows the methodology used by other researchers of grammatical gender (e.g., Karmiloff-Smith 1978, 1979; MacWhinney, 1987; and Levy & Tolchinsky, 1999) in that the parts of the sentence that provide cues to gender are manipulated in the phrase given to the participant (here the mutation or non-mutation of real and nonsense nouns and modifiers; in previous studies, the salience of particular noun endings and agreement within the noun phrase).

Method

Participants

Both children and adults were tested. The adult data were collected to determine the baseline which children are aiming to master.

Adults.

Fifteen of the 30 adult participants who took part in Study 1 took part in Study 2. Five adults were selected randomly from each of three age groups. These were Group 1, which included 16- to 30-year-olds ($N = 5$, mean age 20 years); Group 2, which included 31- to 50-year-olds ($N = 5$, mean age 38 years); and Group 3, which included over 51-year-olds ($N = 5$, mean age 53 years). Most of the

participants had spent the majority of their lives on *Ynys Môn* (Anglesey). All the adult participants judged that they had at least 80% or more of their linguistic input at home in Welsh whilst growing up.

Children.

Forty-eight children took part in Study 2. They all attended primary schools situated in or around Anglesey or in the Bangor area.

The children were divided into four age groups: Group 1, which consisted of 4 1/2-year-olds ($N = 12$, mean age = 4;9 years, age range = 4;0 to 5;5 years); Group 2, which consisted of 6-year-olds ($N = 12$, mean age = 6;2 years, age range = 5;7 to 6;7 years); Group 3, which consisted of 7 1/2-year-olds ($N = 12$, mean age = 7;2 years, age range = 6;9 to 7;9 years); and Group 4, which consisted of 9-year-olds ($N = 12$, mean age = 8;9 years, age range = 8;3 to 9;7 years). All the children's parents judged that their children received at least 80% or more of their linguistic input at home in Welsh. (In fact, only two of the children were judged as having only at least 80% Welsh input from their parents; all other children had at least 90% Welsh input.)

Linguistic Stimuli

Nouns.

The six tests created for this study were designed to test knowledge of marking in the NP itself for gender (i.e., on "local" cues) either in the SM on the noun or on its modifier. Six real masculine nouns and six real feminine nouns for each of the following word-initial phonemes were used: /p, t, k, b, d, g, t̪, r, m, n, f/. (/n/ and /f/ were used as controls.) A further set of six real masculine and six real feminine vowel-initial nouns was also used. These were included in the study in order to explore the extent to which children might reverse the direction of SM for the alternation between a deleted /g/ and vowels. That is, it is possible that children

would sometimes add /g/ to vowel-initial nouns. This gave a total of 72 masculine and 72 feminine real nouns, 144 real nouns in all.

In addition to the real nouns, a set of nonsense nouns was created. As with the real nouns, 144 nonsense nouns were used. Of these, 72 were arbitrarily assigned as "feminine" and the other 72 were arbitrarily assigned as "masculine". A set of six "masculine" nonsense nouns and six "feminine" nonsense nouns for each of the following word-initial phonemes were used: /p, t, k, b, d, g, ʔ, r, m, n, f/. A further set of vowel-initial nouns (6 feminine and 6 masculine) was also used. All nouns used in the study were in singular form. The nouns used are shown in Table 6.1. (Note that the spelling of the nouns is irrelevant: the nouns were presented to the children aurally. See Appendix 6.1 for phonetic transcriptions of the nouns.) In addition to these test nouns, 4 "warm-up" nouns were chosen for use in the tests. The real items for the warm-ups -- *lamp* /lamp/ "lamp", *siswrn* /sɪsɨrn/ "scissors", and *haul* /hɑil/ "sun" -- and the nonsense item -- *siwnydd* /ʃɨnɨð/ -- had initial consonants that were not part of the group of sounds that undergo SM in Welsh. Each of the warm-up nouns was chosen to avoid any cueing prior to the experimental session. Moreover, the test items for Tests 2, 3, 4, and 6 included coloured referents. Therefore the children were presented with warm-up items that would replicate the test items in that they elicited some adjective forms, but adjective forms that could not undergo SM.

Balancing.

Six individual tests were prepared for this study. Each of these individual tests had 48 nouns: one masculine, one feminine, one nonsense "masculine", and one nonsense "feminine" noun for each of the initial sounds investigated (i.e., one feminine /p/-initial noun, one masculine /p/-initial noun, one nonsense "feminine" /p/-initial noun, and one nonsense "masculine" /p/-initial noun in each test; one feminine /t/-initial noun, one masculine /t/-initial noun, one nonsense "feminine" /t/-initial noun, and one nonsense "masculine" /t/-initial noun in each test, and so forth).

The 288 nouns in Table 6.1 were tested in each of the 6 tests; however, a given child was given only 48 of these per test. For each test there was six sets of stimuli. A given child was given one of these sets. Each set was designed to have one noun of each gender type beginning with each phoneme. Thus, for example, Set 1 stimuli for Test 1 had the /p/-initial words *pastwn* (masculine) "truncheon", *pêl* (feminine) "ball", *pibot* (used as nonsense masculine), and *pefryn* (used as nonsense feminine); Set 2 stimuli had the /p/-initial words *papur* (masculine) "paper", *pabell* (feminine) "tent", *palan*, and *pair*; and so forth. Similarly, Set 1 for Test 1 had the /t/-initial words *tÿ* (masculine) "house", *ton* (feminine) "wave", *tesol*, and *tolfa*; Set 2 had *tegan* (masculine) "toy", *teisen* (feminine) "cake", *tarin*, and *torn* and so forth.

Each age group had 12 participants; two children in each age group were assigned a given set of stimuli for each test. That is, two children in a given age group were given Set 1 stimuli for Tests 1 to 6, two children were given Set 2, two children were given Set 3, and so forth.

Furthermore, across the six tests of Study 2, a given child was assigned 6 distinct sets. Thus a child was assigned Set 1 of the /p/-words in Test 1, Set 2 of the /p/-words in Test 2, Set 3 of the /p/-words in Test 3, and so forth.

The order of presentation of the items within each test was randomised. In addition, the order of presentation of the 6 tests was randomised. Since the items in this study were administered concurrently with the test items for subsequent studies (an overall 9 tests), the tests were randomly divided into three sessions. Each child was administered a random selection of three of the tests in a given session. (However, if a particular child could not do three different tasks in a particular sitting, then he or she was encouraged to take part in two or even in one of the tests. Subsequent sessions would then either consist of more than three tests, or the child would take part in one or two tests, and be seen in more than three sessions.)

Table 6.1 : The Nouns (Real and Nonsense) Used in Study 2.

Word- Initial Phoneme	Real Masculine	Real Feminine	Nonsense Masculine	Nonsense Feminine
/p/	<i>pastwn</i> "truncheon" <i>papur</i> "paper" <i>plât</i> "plate" <i>popty</i> "oven" <i>pen- glin</i> "knee" <i>pwrs</i> "purse"	<i>pêl</i> "ball" <i>pabell</i> "tent" <i>pedol</i> "horseshoe" <i>pais</i> "petticoat" <i>planed</i> "planet" <i>poced</i> "pocket"	<i>pibot</i> <i>palan</i> <i>peglan</i> <i>polet</i> <i>pwfr</i> <i>pesel</i>	<i>pefryn</i> <i>pair</i> <i>piban</i> <i>pigell</i> <i>pogair</i> <i>pall</i>
/t/	<i>tŷ</i> "house" <i>tegan</i> "toy" <i>to</i> "roof" <i>tecell</i> "kettle" <i>tap</i> "tap" <i>tân</i> "fire"	<i>ton</i> "wave" <i>teisen</i> "cake" <i>taten</i> "potato" <i>telyn</i> "harp" <i>trol</i> "cart" <i>torth</i> "loaf"	<i>tesol</i> <i>tarin</i> <i>torel</i> <i>taber</i> <i>twnsydd</i> <i>twrin</i>	<i>tolfa</i> <i>torn</i> <i>twnin</i> <i>twrdd</i> <i>tigail</i> <i>tabar</i>
/k/	<i>clo</i> "lock" <i>cleddyf</i> "sword" <i>cetyn</i> "pipe" <i>crys</i> "shirt" <i>cwch</i> "boat" <i>caws</i> "cheese"	<i>coeden</i> "tree" <i>cadair</i> "chair" <i>cyllell</i> "knife" <i>calon</i> "heart" <i>cadwyn</i> "necklace" <i>cloch</i> "bell"	<i>cwgel</i> <i>celeg</i> <i>calur</i> <i>cellig</i> <i>cabir</i> <i>cadan</i>	<i>cerin</i> <i>coglan</i> <i>caig</i> <i>cwrlith</i> <i>canad</i> <i>cinw</i>
/b/	<i>blodyn</i> "flower" <i>bocs</i> "box" <i>brwsh</i> "brush" <i>barcut</i> "kite" <i>bwrdd</i> "table" <i>bath</i> "bath"	<i>bricsen</i> "brick" <i>bwyell</i> "axe" <i>basged</i> "basket" <i>blanced</i> "blanket" <i>brechdan</i> "sandwich" <i>breichled</i> "bracelet"	<i>batail</i> <i>bâl</i> <i>banw</i> <i>baran</i> <i>belon</i> <i>barth</i>	<i>boled</i> <i>bilwr</i> <i>bligior</i> <i>belem</i> <i>bwll</i> <i>baniar</i>
/d/	<i>dis</i> "die" <i>drwm</i> "drum" <i>dant</i> "tooth" <i>drych</i> "mirror" <i>deimwnt</i> "diamond" <i>drws</i> "door"	<i>daear</i> "earth" <i>diod</i> "drink" <i>dysgl</i> "dish" <i>dol</i> "doll" <i>deilen</i> "leaf" <i>desg</i> "desk"	<i>delan</i> <i>dimyn</i> <i>digw</i> <i>donyn</i> <i>daig</i> <i>dwlydd</i>	<i>darrig</i> <i>digan</i> <i>dogan</i> <i>dabir</i> <i>didan</i> <i>daer</i>
/g/	<i>gwely</i> "bed" <i>gwn</i> "gun" <i>goriad</i> "key" <i>goleudy</i> "lighthouse" <i>gliw</i> "glue" <i>glaw</i> "rain"	<i>gwasgod</i> "waistcoat" <i>gwe</i> "web" <i>gwialen</i> "rod" <i>gwobr</i> "prize" <i>gwisg</i> "outfit" <i>gardd</i> "garden"	<i>gefalch</i> <i>gollt</i> <i>gelor</i> <i>gisarn</i> <i>gele</i> <i>garan</i>	<i>graidd</i> <i>galas</i> <i>gared</i> <i>gwibell</i> <i>gelan</i> <i>gabil</i>
/l/	<i>llwyn</i> "bush" <i>llun</i> "picture" <i>llythyr</i> "letter" <i>lliain</i> "cloth" <i>llyfr</i> "book" <i>llyn</i> "lake"	<i>llong</i> "ship" <i>llwy</i> "spoon" <i>lleuad</i> "moon" <i>llaw</i> "hand" <i>llif</i> "saw" <i>llawes</i> "sleeve"	<i>llesarn</i> <i>llaer</i> <i>lleban</i> <i>llaib</i> <i>llabi</i> <i>llerin</i>	<i>lliber</i> <i>llwr</i> <i>llesem</i> <i>llaber</i> <i>llîn</i> <i>llain</i>
/r/	<i>rheiddiadur</i> "radiator" <i>rhwiwr</i> "eraser" <i>rhif</i> "number" <i>rhosyn</i> "rose" <i>rhuban</i> "ribbon" <i>rheu</i> "ice"	<i>rhaw</i> "spade" <i>rhaff</i> "rope" <i>rhestr</i> "list" <i>rhwyf</i> "oar" <i>rhwyd</i> "net" <i>rhwgell</i> "freezer"	<i>rheng</i> <i>rhivin</i> <i>rhawd</i> <i>rhaidd</i> <i>rhath</i> <i>rheinws</i>	<i>rhîb</i> <i>rhwgnel</i> <i>rhodl</i> <i>rhaig</i> <i>rhigan</i> <i>rhaith</i>

/m/	<i>mynydd</i> "mountain" <i>mat</i> "mat" <i>map</i> "map" <i>melon</i> "melon" <i>morthwyl</i> "hammer" <i>masiarŵm</i> "mushroom"	<i>matsien</i> "match" <i>maneg</i> "glove" <i>moronen</i> "carrot" <i>mellten</i> "bolt of lightning" <i>modrwy</i> "ring" <i>melin</i> "mill"	<i>melan</i> <i>merin</i> <i>mafur</i> <i>mursan</i> <i>magl</i> <i>mant</i>	<i>medan</i> <i>meigwn</i> <i>maben</i> <i>mallt</i> <i>meran</i> <i>meigel</i>
/n/	<i>nionyn</i> "onion" <i>nenfwd</i> "ceiling" <i>nodyn</i> "musical note" <i>Nadolig</i> "Christmas" <i>napcyn</i> "napkin" <i>niwl</i> "fog"	<i>neges</i> "shopping" <i>nant</i> "brook" <i>neuadd</i> "hall" <i>nyten</i> "nut (to go with bolt)" <i>nofel</i> "novel" <i>nodwydd</i> "needle"	<i>nwl</i> <i>nalwr</i> <i>nochel</i> <i>nigol</i> <i>nilan</i> <i>nelfa</i>	<i>noler</i> <i>nibot</i> <i>neddin</i> <i>nipyn</i> <i>nagur</i> <i>naer</i>
/f/	<i>ffrwyth</i> "fruit" <i>ffril</i> "frill" <i>ffôn</i> "phone" <i>fflat</i> "flat" <i>ffotograff</i> "photograph" <i>ffisig</i> "medicine"	<i>ffidil</i> "fiddle" <i>ffliwt</i> "flute" <i>ffrog</i> "frock" <i>fffenest</i> "window" <i>fflag</i> "flag" <i>fforc</i> "fork"	<i>ffagol</i> <i>ffwlgan</i> <i>ffenydd</i> <i>ffalor</i> <i>ffola</i> <i>ffâl</i>	<i>ffagor</i> <i>ffolyn</i> <i>ffaer</i> <i>ffolydd</i> <i>ffrithin</i> <i>ffïell</i>
vowel- initial	<i>enw</i> "name" <i>ysbyty</i> "hospital" <i>asgwrn</i> "bone" <i>adeilad</i> "building" <i>ŵy</i> "egg" <i>inc</i> "ink"	<i>olwyn</i> "wheel" <i>ysgol</i> "ladder" <i>awyren</i> "aeroplane" <i>esgid</i> "shoe" <i>weiren</i> "wire" <i>wats</i> "watch"	<i>ysgwn</i> <i>walar</i> <i>afan</i> <i>ianti</i> <i>oblwr</i> <i>erwy</i>	<i>olydd</i> <i>adair</i> <i>erydd</i> <i>waner</i> <i>ysgell</i> <i>ilwr</i>

Adjectives.

A set of colour adjectives was used with four of the tests. Six colours were chosen to aid the balancing both within and across tasks. Each colour term had a different word-initial sound that was part of the class of sounds that undergo SM: *pinc* /pink/ "pink"; *coch* /kɔːx/ "red"; *brown* /brɔːn/ "brown"; *du* /diː/ "black"; *glas*¹ /glaːs/ "blue"; *melyn* /mɛlɪn/ "yellow". In addition to these test adjectives, three warm-up adjectives were chosen. These were *oren* /ɔːrɛn/ "orange", *streipiog* /strɛɪpɪɔːg/ "striped", and *sbotiog* /sbɔːtɪɔːg/ "spotted". These were all chosen on

¹ Although there are three frequently used colour terms with an initial /g/- in the language, it was decided to include *glas* "blue" in this study as it lacked a marked feminine counterpart. The other /g/- initial colour adjectives exhibit a feminine form; that is, *gwyn* "white" has the marked feminine form *gwen*, and *gwyrdd* "green" has the marked feminine form *gwerdd*. It was decided to avoid the use of such adjectives if possible so as not to complicate the methodology. Although *melyn* "yellow" does have a marked feminine form *melen*, it was decided to include *melyn* in the study so that the tests had as wide a range as possible of colour adjectives with different word-initial sounds that can undergo SM. No /t/-initial colour terms exist in Welsh, apart from borrowings such as *tyrcwais* "turquoise", *tartan* "tartan" and so forth. There are no /r/-initial nouns accessible to children (*rhudd* "red" is only use in the literary standard). Although *llwyd* "grey" does exist as a possible example of a /t/-initial colour adjective, it was decided to use the other six colour terms because they always undergo mutation after feminine nouns (whereas /t/-initial adjectives can resist mutation in some dialects, although this is not the norm in the North).

the basis that their initial sounds were not sounds that could undergo SM in Welsh, and that they would reflect the procedure to be used with the test items (i.e., colour adjective forms).

Balancing.

These colour adjectives were distributed across the six tests so that a particular noun would be associated with a particular colour term only once. The tests that required the colour adjectives were Tests 2, 3, 4, and 6. Recall that every test involved four nouns for each word-initial sound, one real feminine, one real masculine, one nonsense “feminine”, and one nonsense “masculine”. For a given child, all four nouns with the same word-initial sound were given the same adjective in the same test. For example, for Set 1 stimuli, *pinc* “pink” was used with all the stimuli beginning with /p/. For Set 2 stimuli, *coch* “red” was used with all the stimuli beginning with /p/. For Set 3 stimuli, *brown* “brown” was used with all the stimuli beginning with /p/, and so forth. For each child, the colour adjectives were distributed across the initial sounds. So, for example in Set 1 of Test 2, the /p/-initial nouns had the adjective *pinc* “pink”, the /t/-initial nouns had the adjective *coch*, the /k/-initial nouns had the adjective *brown* “brown”, the /b/-initial nouns had the adjective *du* “black”, the /d/-initial nouns had the adjective *glas* “blue”, the /g/-initial nouns had the adjective *melyn* “yellow”, the /ʃ/-initial nouns had the adjective *pinc* “pink”, the /f/-initial nouns had the adjective *coch* “red”, the /m/-initial nouns had the adjective *brown* “brown”, the /n/-initial nouns had the adjective *du* “black”, the /l/-initial nouns had the adjective *glas* “blue”, and the vowel-initial nouns had the adjective *melyn* “yellow”. In addition, for each child, nouns with the same word-initial sound were given different adjectives across the tests.

Linguistic Cues

In each of the six tests, the participants were given one form of a noun in one linguistic context (e.g., *y gadair* “the chair”), and asked to provide another form of that same noun in a different context (e.g., *cadair goch* “red chair”).

These six tests were designed to investigate (a) what children know about real-word forms and (b) when, and the extent to which, children attend to the cues that are available in the input to determine the gender of a noun, and the extent to which this knowledge is productive and extendable to new nouns.

The design of each test was as follows:

Test 1: N → y + N²

Test 1 elicited the production of a noun after a definite article (e.g., *y daten* or *y *taten* “the potato”), given the noun in its basic form (*taten* “potato”).

Test 2: N → N+ Adj

Test 2 elicited the production of a colour adjective after a noun (e.g., *taten goch* or *taten *coch* “red potato”), given the noun in its basic form (*taten* “potato”).

The information from these first two tests would reflect children's stored knowledge of the gender of real nouns, and would provide a base for their ability to generate gender marking for novel nouns (in this case where no gender cue was present in the stimulus).

Test 3: y + N → N + Adj

Test 3 elicited the production of a noun followed by a colour adjective (e.g., *taten goch* or *taten *coch* “red potato”), given a definite article with the noun (e.g., *y daten* “the potato”). Thus the experimenter provided a cue to the gender of the noun

²These titles for the individual tests will be used where necessary in the remainder of this chapter when referring to the tests.

(in the form of mutation or non-mutation of the initial sound of the noun) that the child might be able to draw on to determine the appropriate form of the adjective for gender.

Test 4: N + Adj → y + N+ Adj

Test 4 provided the child with a noun followed by a colour adjective (e.g., *taten goch* "red potato"). The production of an article with the same noun followed by a different colour adjective was then elicited (e.g., *y daten* or *y *taten*, followed by *las* or **glas* "the blue potato").

Tests 3 and 4 would indicate the extent to which children make use of the cues provided in their language to determine the gender of nouns. A comparison of the children's performance on the two tests would indicate the extent to which one type of contextual information (mutation of the noun after *y* vs. mutation of the adjective after the noun) is a more reliable cue to the gender status of a particular noun for the child. (However, see discussion under "Ambiguity of Surface Forms of Nouns", below, about the possible ambiguity of some forms as cues in these contexts.)

Test 5: y + N → N

Test 5 elicited the production of a noun in its basic form given the noun in a gender marked context. The noun was provided with a definite article (e.g., *y daten* "the potato") and the production of the noun in its basic form was elicited (*taten* or **daten* "potato").

Test 6: y + N + Adj → N

Test 6 provided a noun with a definite article and a colour adjective (e.g., *y daten goch* "the red potato") and elicited the production of the noun in its basic form (*taten* or **daten* "potato").

Tests 5 and 6 were designed to investigate the extent to which children and adults know the basic form of nouns, or can determine the basic form of a noun from the gender-marked contexts provided. (Again, see the discussion under “Ambiguity of Surface Forms of Nouns”, below, regarding the potential ambiguity of some forms as cues in these contexts.)

Ambiguity of Surface Forms of Nouns

In the gender-marked contexts presented to the participants, some surface sounds could correspond to more than one basic form, and others were unambiguous with regard to gender (see also Ball & Müller, 1992, and Ball, 1990, for other discussions of the ambiguity of mutated forms). In particular, the surface word-initial sounds can be divided as follows:

Unambiguous forms.

In the context of a definite article followed by a noun, the following initial sounds are unambiguous with reference to gender status and basic forms:

1. y + /p/-initial noun.
2. y + /t/-initial noun.
3. y + /k/-initial noun.
4. y + /m/-initial noun.

The occurrence of /p/-, /t/-, /k/-, and /m/-initial nouns after the definite article indicates that the noun is in its basic form; this is because no sounds mutate into /p/, /t/, /k/, or /m/. Also, the noun must be masculine. So, for /p/-, /t/-, /k/-, and /m/-initial nouns after the definite article, the gender status and the basic form of the noun are unambiguous.

5. *y*+ /ð/-initial noun.

/ð/ only exists as a SM form of /d/; there are virtually no /ð/-initial words in Welsh³. Therefore, whenever a /ð/-initial noun appears after the definite article, this signifies that the form is the SM form of an underlying⁴ /d/-initial noun. The noun heard in this context must therefore be a feminine noun.

Ambiguous forms.

In the context of a definite article followed by a noun, the following sounds are ambiguous with reference to gender status and/or basic form:

6. *y* + /v/-initial noun: feminine with underlying /b/ or /m/.

7. *y* + /b/-initial noun: masculine with underlying /b/, or feminine with underlying /p/.

8. *y* + /d/-initial noun: masculine with underlying /d/, or feminine with underlying /t/.

9. *y* + /g/-initial noun: masculine with underlying /g/, or feminine with underlying /k/.

With regard to Example 6, a /v/-initial noun after *y* may correspond to a word with an underlying /v/, /b/, or /m/. However, /v/-initial nouns are rare, and are mostly restricted to English borrowings, for example *ficer* "vicar", *finegr* "vinegar", *fiolin* "violin"⁵. Therefore a /v/-initial form after *y* is more likely to be a mutated variant of either a /b/- or a /m/-initial noun, but it is impossible to tell on the surface which.

³ However, there is *ddoe* "yesterday" < *doe* that is used as a noun and as an adverb (Evans & Thomas, 1987).

⁴ Note that the use of "underlying" is not a conscious attempt to follow any theoretical viewpoint; it is merely used to clarify a point where the use of "basic form", as has been adopted throughout this thesis, is not appropriate.

⁵ There are also some fossilised /v/-initial forms in Welsh, for example, *fyny* "up" (from *i fyny*), *fe* "him", (from *efe*), *felly* "so, therefore" (Ball & Müller, 1992).

Therefore a /v/-initial noun after the definite article is very likely to be feminine, a mutated variant of a form beginning with either /b/ or /m/.

In Examples 7 to 9, /b/-, /d/-, and /g/-initial nouns after *y* are ambiguous with regard to basic form. The forms with /b/-, /d/-, and /g/- could be the basic forms of nouns, in which case the noun is masculine. They could alternatively be the SM forms for /p/-, /t/-, and /k/-initial nouns, in which case the noun is feminine. However, it is impossible to know which of these is most likely to be the case on the surface level.

10. *y* + /ʃ/-initial noun: masculine or feminine

(given that /ʃ/ often resists mutation after *y*).

11. *y* + /ʀ/-initial noun: masculine or feminine

(given that /ʀ/ often resists mutation after *y*).

Examples 10 and 11 present different problems. Although feminine /ʃ/- and /ʀ/-initial nouns can undergo mutation after *y*, they more often than not resist mutation in northern dialects. Therefore when one hears /ʃ/-initial and /ʀ/-initial forms after *y* the gender of the noun is ambiguous. In Study 2, each /ʃ/- and /ʀ/-initial noun was presented in its basic form after the definite article in conformity with the northern dialects, regardless of gender.

12. /n/- and /f/-initial nouns: no mutation; masculine or feminine.

Both /n/- and /f/-initial nouns after the definite article are ambiguous with regards to gender; neither sound undergoes SM. Therefore both feminine and masculine nouns appear in the same form in this context.

13. *y* + vowel-initial noun: masculine or feminine.

Vowel-initial nouns after *y* are three-ways ambiguous. This form can be an example of (a) a vowel-initial sound of a masculine noun presented in its basic form after *y*, (b) a vowel-initial feminine noun presented in its basic form after *y* (because vowels do not undergo mutation), or (c) a vowel-initial form of a feminine /g/-initial noun that has undergone SM.

Adjective Mutation or Non-Mutation as Cue⁶

As is the case with the surface forms of nouns after *y*, the surface forms of adjectives after nouns present varying levels of information regarding a noun's gender status. Any noun followed by a non-mutated adjective (see Example 14) is unambiguously masculine.

Unambiguous.

Example 14.

/p/-initial noun	}	+ non-mutated adjective: masculine.
/t/-initial noun		
/k/-initial noun		
/b/-initial noun		
/d/-initial noun		
/g/-initial noun		
/ʒ/-initial noun		
/ʁ/-initial noun		
/m/-initial noun		
/n/-initial noun		
/f/-initial noun		

⁶ Note that the same analysis of the ambiguity of surface forms of nouns is applicable to adjectives. Moreover, it was assumed that children would know the basic form of the colour terms used. However, my main concern was with the noun forms. Not all the real nouns given were familiar to the children, and half of the nouns were nonsense forms.

Similarly, any noun followed by a mutated adjective (see Example 15) is unambiguously feminine.

Example 15.

/p/-initial noun	}	+ mutated adjective: feminine.
/t/-initial noun		
/k/-initial noun		
/b/-initial noun		
/d/-initial noun		
/g/-initial noun		
/ʒ/-initial noun		
/ʔ/-initial noun		
/m/-initial noun		
/n/-initial noun		
/f/-initial noun		

The mutation or non-mutation of the adjective is, therefore, a clear cue to gender status.

When both adjectives and the definite article are used (as in Test 6), most forms that are ambiguous with only the definite article become unambiguously masculine or feminine. The different examples under Example 16 illustrate this:

Example 16a.

y + /g/-initial noun: ambiguous (masculine /g/-initial word; feminine /k/-initial word).

y + /g/-initial noun + non-mutated adjective: masculine.

y + /g/-initial noun + mutated adjective: feminine.

Example 16b.

y + /b/-initial noun: ambiguous (masculine /b/-initial word; feminine /p/-initial word).

y + /b/-initial noun + non-mutated adjective: masculine.

y + /b/-initial noun + mutated adjective: feminine.

Example 16c.

y + /ʃ/-initial noun: ambiguous (masculine /ʃ/-initial word; feminine /ʃ/-initial word).

y + /ʃ/-initial noun + non-mutated adjective: masculine.

y + /ʃ/-initial noun + mutated adjective: feminine.

Adjectives do not resolve the ambiguity in cases in which the ambiguity has to do with the nature of the basic form -- namely, in cases in which y occurs with /v/-initial nouns or vowel-initial nouns. With /v/-initial nouns we have seen that the noun is unambiguously feminine, but the basic form might be either /m/-initial or /b/-initial. The addition of a mutated adjective, as in Example 17, does not resolve this.

17. y + /v/-initial noun + mutated adjective: feminine with underlying /b/ or /m/.

The case of vowel-initial nouns is somewhat different. We saw that y + /v/-initial nouns can be either masculine or feminine. The addition of a mutated or non-mutated form of an adjective classifies the gender status of the noun, as in Example

18. However, if a mutated adjective is added, it is still not transparent whether the basic form of the feminine noun is vowel-initial or /g/-initial.

Example 18.

y + vowel-initial noun + non-mutated adjective: masculine (vowel-initial noun).

y + vowel-initial noun + mutated adjective: feminine (vowel-initial noun or /g/-initial noun).

Possible Predictions:

Children's Ability to Use the Cues

From the above discussion, it is possible to make the following predictions concerning the usefulness of the specific gender-marked contexts as cues to gender status and to the basic form of the nouns in Study 2.

Tests 1 and 2

These tests are irrelevant here since they provided no cues to gender status.

Tests 3 and 5: y + noun

Strong cues

The only strong cues to gender status and underlying form for both Test 3 and 5 were sentences that contained the following:

1. Nouns with initial /p, t, k, m/ after the definite article (these can only be masculine).

2. Nouns with initial /ð/ after the definite article (these can only be feminine).

Fairly strong cue

A weaker cue was associated with nouns with initial /v/ after the definite article. This was because nouns with initial /v/ are very likely to be the SM form of /b/- and /m/-initial nouns. Thus, when the participants heard a /v/-initial noun after the definite article, this should have been a fairly strong cue that it is a feminine noun. However, the basic form of the noun (/b/- or /m/-initial) can not be extracted from the derived form.

Weak cues

The only weak cues to gender and basic form were sentences that contained nouns with initial /b, d, g, t, r/ and vowels after the article. The sounds /b, d, g/ could correspond either to underlying /b, d, g/ of masculine nouns, or underlying /p, t, k/ of feminine nouns. /t/ and /r/- initial feminine nouns, on the other hand, resist SM after the article in this context. Therefore their gender is ambiguous in this context. Vowel-initial nouns can appear as the SM form of feminine /g/-initial nouns and as initial sounds of either masculine or feminine vowel-initial nouns. The occurrence of a vowel-initial noun after the definite article is therefore ambiguous with regards to both gender and basic form.

No cue: Controls

/n/- and /f/-initial nouns do not undergo mutation after the definite article, even if they are feminine nouns. Therefore their genders cannot be extracted from the context *y* + noun alone.

Tests 4 and 6: N + Adj, y + N + Adj*Strong cue*

In Tests 4 and 6, the mutation or lack of mutation of the adjective after all word-initial sounds served as a strong cue to gender status. However, the mutation of an adjective after /v/-initial nouns in the context *y + noun + adjective* is ambiguous with regard to the form of the (feminine) noun (i.e., /m/- vs. /b/- initial basic form). Similarly, the SM of the adjective after (feminine) vowel-initial nouns is ambiguous with regard to the basic form of the noun (i.e., vowel-initial or /g/-initial noun).

Non-Linguistic Stimuli

For each test, pictures (or pairs of pictures) were drawn, one for each noun to be tested. Each child saw 48 of these pictures, those corresponding to the words in the set of nouns assigned to that child described under "Linguistic Stimuli" above. That is, for each test, 6 distinct sets of stimuli were drawn up, each corresponding to one of the 6 sets of nouns. The general design of these stimuli was either a story-like test or a picture-card test. The particular set of pictures for each test was as follows:

Test 1 ($N \rightarrow y + N$). For this test, the participants were presented with a set of stimuli contained in a folder to create the appearance of a book. All the pictures were presented in black and white. Forty-eight pairs of pictures were presented. For each pair, the first picture depicted a girl who had lost a particular object. The second picture depicted the same girl having found the object she had lost. With the first picture, the child was told the girl had lost an "X," and with the second, the child was prompted to say that she had found "the X." (See Appendix 6.2 for examples of the pictures presented to the children for Test 1.)

Test 2 ($N \rightarrow N + Adj$). The stimuli for this test were similar to those used in Test 1. The participants were presented with a set of stimuli in a folder. The pictures depicted a little girl who had received colourful, new objects. Each stimuli set involved 48 different objects, 48 pictures in all. The child was told that the girl

had "(an) X," and the child was prompted to say that the girl had "(a) blue/red/pink/brown/black/yellow X." (See Appendix 6.3 for examples of the pictures presented to the children for Test 2.)

Test 3 ($y + N \rightarrow N + \text{Adj}$). For this test, the participants were presented with 48 pairs of picture cards on which objects were drawn. In each pair, the first card showed a black line drawing of an object on a white background. The second card showed a coloured drawing of the same object. With the first card, the experimenter told the child that he or she could see "the X;" with the second, the child was prompted to produce "(a) blue (etc.) X." (See Appendix 6.4 for examples of the pictures presented to the children for Test 3.)

Test 4 ($N + \text{Adj} \rightarrow y + N$). The stimuli for this test were similar to those used in Tests 1 and 2. The participants were presented with 48 paired stimuli in a folder. For each pair, the first picture depicted a girl who had lost a coloured object. The second picture depicted the same little girl having found a similar, but different coloured object on her bed. With the first picture, the experimenter told the child that the girl had lost "(a) blue (etc.) X." With the second picture, the child was prompted to say the girl had found "the pink (etc.) X." (See Appendix 6.5 for examples of the pictures presented to the children for Test 4.)

Test 5 ($y + N \rightarrow N$). For this test, the participants were presented with a set of 48 picture cards. Each card exhibited a black line drawing of the object on a white background. The experimenter told the child that he or she would see "the X;" the child was prompted to say that he or she could see "(an) X." (See Appendix 6.6 for examples of the pictures presented to the children for Test 5.)

Test 6 ($y + N + \text{Adj} \rightarrow N$). The stimuli for this test were similar to those in Test 5. The participants were presented with a set of picture cards. Each card exhibited a coloured drawing of a particular object. The experimenter told the child that he or she would see "the red (etc.) X;" the child was prompted to say that he or

she could see "(an) X." (See Appendix 6.7 for examples of the pictures presented to the children for Test 6.)

In addition to these test pictures, four warm-up pictures were designed. These consisted of a drawing of one nonsense object, and drawings of the *lamp* "lamp", *siswrn* "scissors", and *haul* "sun". For Tests 2, 3, 4, and 6, these items were used in conjunction with the non-mutable adjectives *oren* "orange", *streipio* "striped", and *sbotiog* "spotted".

Procedure

The experimenter asked the child if he or she would like to take part in some games and stories with her. If the child was willing to take part, the experimenter proceeded to present the child with four warm-up items that were similar to the items that were to be used in the tests. Warm-up items were administered before the experimental trials in each test to ensure that the participants had understood the instructions. The warm-up and experimental sessions were recorded using a video camera. All children were seen individually. The procedure used for each test was as follows (similar procedures were used with the adult participants):

Test 1: $N \rightarrow y + N$

The experimenter asked the child if he or she would like to take part in a story-game with her. Once the child was willing, the experimenter told the child that the story was about a little girl called Mair. The child was then told that Mair had lost a lot of different things, but that she found them all eventually. The child was then asked if he or she would like to help the experimenter to tell Mair's story. Once the child agreed, he or she was told that the experimenter would say what Mair had lost, and that the child was to say that Mair had found what she lost. The child was then told to listen to the way the experimenter said the story so that they could tell it together. The experimenter showed the child the first warm-up item on the first page of a book. This page had a picture of a girl with a thinking bubble, in which was a picture of a lamp. The experimenter said: *Roedd Mair wedi colli lamp* "Mair

had lost (a) lamp." The experimenter then turned the page to a picture of Mair with her hand out showing the item. The experimenter said: *Ond nath Mair weld y lamp* "But Mair saw the lamp." The child was asked if he or she would like to have a go at telling the story. The experimenter showed the first trial picture again and uttered the accompanying phrase, and when she turned the page, she asked the child to say what Mair had found in the same way as the experimenter had done. If the child's attempt was the same as the experimenter had produced, the experimenter proceeded to the next warm-up item. If the child's response was not the same as the one the experimenter had produced, the child was corrected and asked if he or she would like to go over it again. Once the child produced the elicited phrase with all four warm-up items, the experimenter went on to introduce the test items in the book.

Test 2: N → Noun + Adj

The experimenter asked the child if he or she would like to take part in a story game. The experimenter told the child that this was a story about Mair and that Mair had received a lot of new things of all different colours. The child was then told that the experimenter would say what Mair had received, and that the child's task was to say what colour it was. The child was told to listen carefully to the way the experimenter told the story for the first item so that he or she could join in later. The experimenter showed the child the first page and initially said: *Roedd Mair wedi cael lamp (newydd)* "Mair had a (new) lamp." The experimenter then told the child that she wanted him or her to say *Roedd Mair efo lamp oren rwan* "Mair had an orange lamp now." Once the child repeated the phrase successfully, the experimenter went on to the next picture. Once the child could provide the appropriate phrases for all four warm-up items, the experimenter went on to the test pictures in the book⁷.

⁷ Some of the first children to participate in this task found it difficult to produce the elicited phrase without producing *newydd* "new"; that is, they would produce *Roedd Mair efo lamp newydd oren rwan* "Mair had a new orange lamp now" by virtue of its inclusion in the initial sentence that the experimenter gave the child (i.e., *Roedd Mair wedi cael lamp newydd*). Although *newydd* "new"

Test 3: y + N → N + Adj

The child was asked if he or she would like to take part in a game where they would see a lot of pictures. Once the child was willing to participate, he or she was told that they were going to see two pictures of each item, one just an outline of the item depicted, the other coloured. The child was then told that the experimenter would say something about the first picture (the outline) and that their task was to say something about the colour of the item in the second picture. The experimenter then showed the child the first warm-up picture and said: *Ar y cerdyn yma fedri di weld y lamp* "On this card you can see the lamp." The child was then shown the second picture card and the experimenter said *Ac ar y cerdyn yma fedri di weld lamp oren* "And on this card you can see (an) orange lamp." The child was asked if he or she could say the same thing for the second picture. Once the child produced the desired phrase with the warm-up item, he or she was allowed to "post" the picture card through a slit in the lid of a box that was decorated with holographic paper. Once the child could say the desired phrase for the second picture, the experimenter went on to the next warm-up picture. Once the child could produce the desired phrase for all four warm-ups, the experimenter went on to the test items.

Test 4: N + Adj → y + N + Adj

The experimenter asked the child if he or she would be willing to take part in a story game. The experimenter then told the child that it was a story about Mair and that Mair had lost a lot of things. The child was then told that Mair found similar things in other colours but she could not find the right coloured one. The experimenter provided the participant with a picture of a girl with a thinking bubble

is an adjective, and adjectives that occur sequentially after a noun are all marked for gender, it was important that all colour adjectives elicited appeared immediately after the noun. This was to avoid any complications that might be the result of having any form intervening between the noun and the elicited adjective. Therefore whenever a child produced *newydd* in the trial items, it was taken out of the initial phrases produced by the experimenter for the test items, so the child would only hear sentences like *Roedd Mair wedi cael lamp* "Mair had got a lamp."

with an object drawn inside the bubble. The child was told that Mair had lost something: *Roedd Mair wedi colli lamp streipiog* "Mair had lost (a) striped lamp." The experimenter turned to the next picture where the girl was pointing to an item on her bed, and said: *Ond nath hi weld y lamp oren ar ei gwely* "But she saw the orange lamp on her bed." The child was asked if he or she would like to help tell the story in the same way. The experimenter introduced the first picture again. The experimenter introduced the second picture by repeating the whole of the elicited phrase, prompting the child to produce the desired construction. Once the child produced the desired linguistic constructions, the experimenter went on to the next warm-up item. Once the child had mastered the four warm-up items, the experimenter proceeded with the test items.

Test 5: y + N → N

The child was asked to participate in a picture game. The child was told that he or she would be given a picture, and that the experimenter would introduce the picture by using specific words, and that the child was to introduce the picture using a different set of words. The child was then shown a picture of a lamp. The experimenter said: *Yn y llun yma fedri di weld y lamp* "In this picture you can see the lamp." The child was then told that his or her task was to say: *Dyma lun lamp* "This is a picture of (a) lamp." Once the child produced this correctly, he or she was given the other warm-up items. Once the child produced the desired phrase with the warm-up item, he or she was allowed to "post" the picture card through a slit in a box, and proceeded onto the remaining trial items. Once the child produced the desired phrase with all four warm-up items, the experimenter introduced the test items.

Test 6: y + N + Adj → N

The child was asked to participate in a picture game. The child was told that he or she would be given a coloured picture, and that the experimenter would

introduce the picture using specific words. The child was told that his or her task was to introduce the picture using a set of different words. The experimenter provided the participant with a coloured picture and said: *Yn y llun yma fedri di weld y lamp oren* "In this picture you can see the orange lamp." The child was then told that his or her task was to say: *Dyma lun lamp* "This is a picture of (a) lamp." Once the child produced the desired phrase with the warm-up items, he or she was allowed to "post" the picture cards through a slit in a box. Once the child responded appropriately to the four warm-up items, the test items were introduced.

Predictions

Study 2 was designed to test children's ability to attend to different cues to the gender of nouns. Six tests were designed for this purpose. Both real and nonsense nouns were used. The first two tests provided the children with no cue to the gender of the nouns; the participants had to produce the noun given either after the definite article (Test 1) or to produce a colour adjective after the noun (Test 2). The remainder of the tests provided some cue to the gender of the nouns. The children's task in these tests was to produce the same noun as that provided, in a different gendered context to that given, or to produce the basic form of the noun.

This design allowed the following predictions about children's performance on these tasks:

- If children are using cues to gender status to inform themselves about the gender of a noun they should perform better on Tasks 3, 4, 5, and 6 than on Tasks 1 and 2.
- If children are using cues to gender status they should perform better on tasks with multiple cues than on tasks with only one cue; that is, they should perform better on Task 6 than on Task 5.
- If gender is a property of nouns children should perform better at an early age on tasks involving noun form than on tasks involving adjective

form; that is, they should perform better on Tasks 1, 4, 5, and 6 than on Tasks 2 and 3.

- Children should perform better on items involving real nouns than on those involving nonsense nouns.
- However, if children are gradually developing an abstract, rule-based system, their performance on nonsense nouns should improve as they get older.

In addition to the above predictions, the design allowed the following prediction about children's ability to attend to these cues:

If children are sensitive to these cues, they should make fewer errors with gender marking and with the production of the basic form when a strong cue is provided than when a weaker cue is provided. That is, they should be able to abstract gender-status information from Tests 4 and 6 (more transparent cues) more easily than from Tests 3 and 5 (more opaque cues).

Results

Scoring

Only attempts at the target forms were scored (i.e., no responses or responses with a distinct form were excluded from analysis). Thus individual scores represented the proportion of correct performances out of attempts at target forms. For the real nouns the appropriate marking of gender, according to the inherent gender of the nouns, was given a score of 1. Thus, in Tests 1 and 4, feminine nouns that were produced in their SM form after the article and masculine nouns (and feminine /ʒ/-, /r/-, /n/-, and /f/-initial nouns) that retained their basic forms were given a score of 1; any other forms were given a score of 0. In Tests 2 and 3, adjectives that underwent SM after feminine nouns, and adjectives that retained their basic forms after masculine nouns, were given a score of 1. In Tests 5 and 6, nouns that

were produced in their basic form were given a score of 1; any other forms were given a score of 0.

For the nonsense forms, two types of scoring methods were used. Recall that, for all forms, some cues are more useful than others in determining the gender and the basic form of the noun. Thus, for some of the nonsense forms and in some of the contexts, the gender of a noun would be apparent (e.g., for Tests 4 and 6, all nonsense nouns followed by a mutated adjective were feminine, all nonsense nouns followed by the basic form of an adjective were masculine). In some of the other contexts the gender of a noun would not be as apparent.

For the first set of analysis, all nonsense nouns were assigned a gender. In those cases in which the context unambiguously distinguished masculine and feminine forms, nonsense nouns followed their assigned gender patterns. In those cases in which gender class membership was not differentiated by the contexts, nonsense nouns were assigned gender *arbitrarily*⁸.

This method of scoring the data allowed for the comparison of participants' performance across real and nonsense nouns in general. (In cases in which nonsense nouns were assigned gender arbitrarily but the context gave no cue to gender status -- for example, Tests 1 and 2 -- performance on nonsense nouns could be expected to be much worse than on real nouns.)

A second set of analysis was conducted to deal with the ambiguity of some of the contexts provided as cues. In this second set of analysis, all nouns that were

⁸ That is, in Test 1, where the participants were given each noun without any cues to their gender, half of the nonsense nouns (i.e., 12 nouns, each with a different initial sound) were scored as being "feminine". This means that the nouns with mutable onsets in this group were given a score of 1 if they underwent SM after the definite article, and a score of 0 if they retained their basic form. The other half of the nouns were scored as if they were masculine nouns with a score of 1 if they retained their basic form after the article, and a score of 0 if they did not. In Test 2, where the participants were again given each noun without any cues to their gender, the nonsense nouns were again assigned a score as if the nouns had real, inherent gender. Therefore adjectives that underwent SM after the "feminine" nonsense nouns and those that did not after the "masculine" nonsense nouns were assigned a score of 1; those responses that were not marked in that way were assigned a score of 0. This method of scoring was also applied throughout the other tests such that even when a nonsense noun would not be clearly marked for its gender as in the case of *y baran* in Test 3 for example, it was arbitrarily assigned masculine gender, even if a respondent perceived it as being a feminine /p/-initial noun than had undergone SM after the definite article into a /b/-initial noun; it would only be assigned a score of 1 if it was marked appropriately for masculine gender.

ambiguous in particular contexts were taken out, and the nonsense and real nouns that were unambiguous with regards to gender were analysed.

The following sections first presents the results for the first analysis, and then for the second. Raw statistical data for this study are shown in Appendix 6.8.

Set 1 Analysis: All Real and Nonsense Nouns

Initial analysis compared performance on forms with sounds susceptible to mutation after the article (i.e., beginning with /p, t, k, b, d, g, m/) vs. those not susceptible to mutation (i.e., beginning with /t, r, n, f/ and vowel-initial). Figures 6.1 and 6.2 show children's performance on the two sets of word-initial sounds for tests that elicited the noun form and for tests that elicited the adjective form.

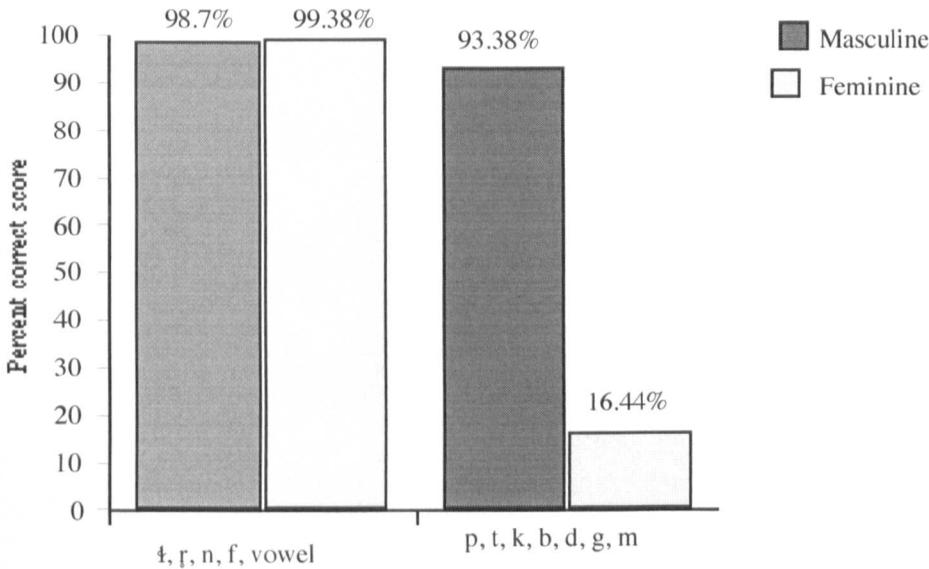


Figure 6.1: Children's Combined Scores for /t, r, n, f/- and Vowel-Initial Masculine and Feminine Nouns vs. /p, t, k, b, d, g, m/-Initial Masculine and Feminine Nouns in Tests 1, 4, 5, and 6.

Figure 6.1 shows that children's performance on /t, r, n, f/- and vowel-initial masculine and feminine nouns was near ceiling level. For this reason, performance

on /t, r, n, f/- and vowel-initial nouns in Tests 1, 4, 5, and 6 are excluded from the statistical analyses conducted below.

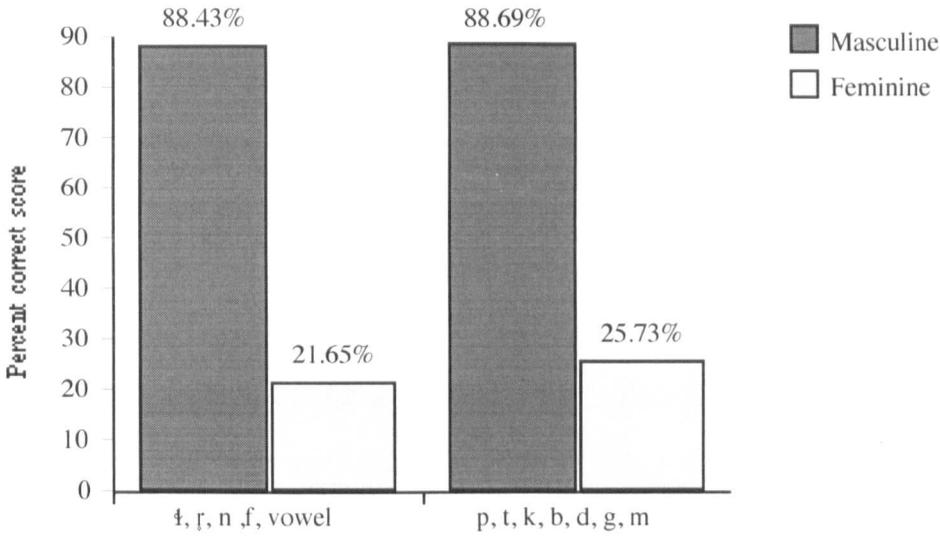


Figure 6.2: Children’s Combined Scores for Adjectives after /t, r, n, f/- and Vowel-Initial Masculine and Feminine Nouns vs. After /p, t, k, b, d, g, m/-Initial Masculine and Feminine Nouns in Tests 2 and 3.

Figure 6.2 shows children’s performance on adjectives in both Tests 2 and 3 for the two groups of nouns. A repeated measures ANOVA with Gender (masculine, feminine) and Initial Sound Type (mutable, non-mutable) treated as independent variables revealed no main effect of Initial Sound Type ($F(1, 430) = .091, p > .05$) or an interaction of Initial Sound Type x Gender ($F(1, 44) = 3.556, p > .05$). Performance was therefore similar for the two sets of nouns. Since performance on all six tests were to be analysed together, and since performance on /t, r, n, f/- and vowel-initial nouns would be excluded from the analyses for Tests 1, 4, 5, and 6, performance on adjectives after /t, r, n, f/- and vowel-initial nouns in Tests 2 and 3 were also excluded from the analyses conducted below. This ensured that the balancing of items and the number of initial sounds analysed was constant across tests.

Adults.

A repeated measures ANOVA was conducted in which Test (Tests 1, 2, 3, 4, 5, and 6), Gender (masculine, feminine), Noun Type (real, nonsense) and Age (16- to 30-year-olds, 31- to 50-year-olds, 51+ year-olds) were treated as independent variables. The dependent variable was the adults' ability to mark the nouns for their genders in each of the tests. Since the data were in proportions, arcsin transformations were applied. An inter-rater reliability score of 94.69% was obtained with the adult data.

The analysis produced significant main effects of Gender ($F(1, 11) = 161.996, p < .001$), Noun Type ($F(1, 11) = 48.703, p < .001$), and Test ($F(5, 55) = 4.643, p < .01$). There were also significant interactions of Test x Gender ($F(5, 55) = 15.705, p < .001$), Noun Type x Gender ($F(1, 11) = 11.062, p < .01$), and Test x Noun Type x Gender ($F(5, 55) = 6.822, p < .001$). Figure 6.3 shows performance by Gender.

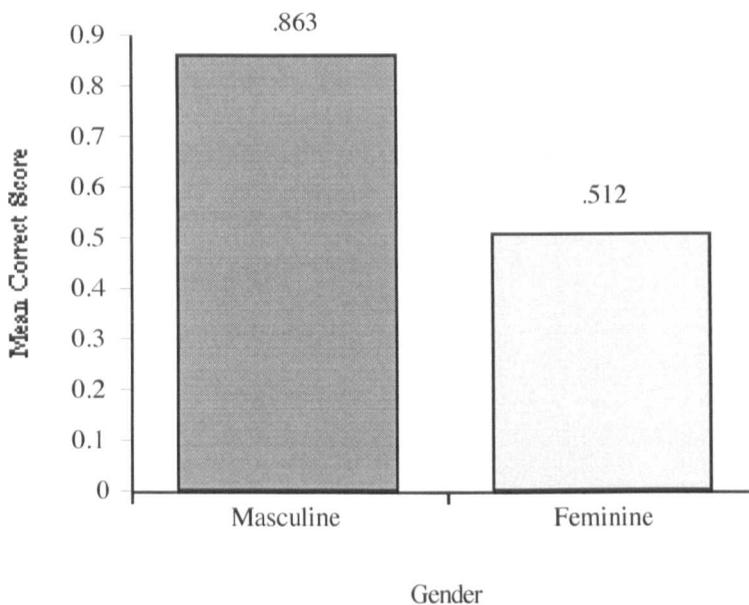


Figure 6.3: Adults' Mean Proportions by Gender.

This effect was due to the adults' overall better performance on the marking of masculine forms ($M = .863, SD = .225$) than on the marking of feminine forms ($M = .512, SD = .356$). Figure 6.4 shows performance by Noun Type.

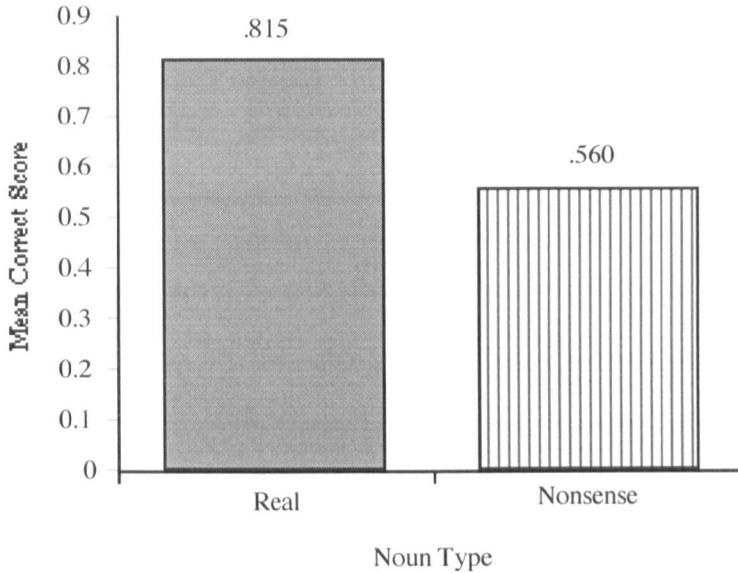


Figure 6.4: Adults' Mean Proportions by Noun Type.

This effect was due to the adults' better performance on real nouns ($M = .815, SD = .273$) than on nonsense nouns ($M = .560, SD = .364$). Performance by Test is shown in Figure 6.5.

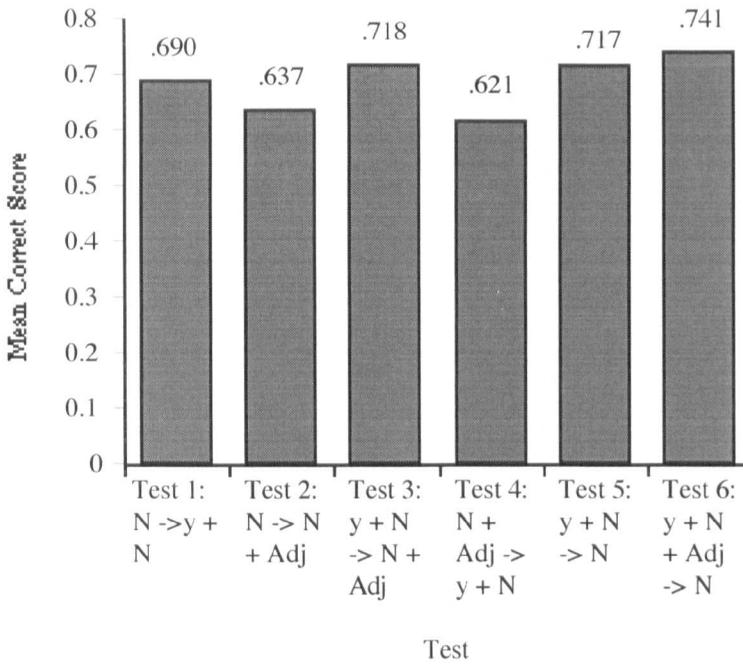


Figure 6.5: Adults' Mean Proportions by Test.

Planned mean comparisons revealed the following significant effects across Tests:

Test 6 vs. Test 1 ($F(1, 55) = 5.050, p < .05$), Test 6 vs. Test 3 ($F(1, 55) = 5.659, p < .05$), Test 6 vs. Test 2 ($F(1, 55) = 16.978, p < .001$), Test 5 vs. Test 2 ($F(1, 55) = 12.181, p < .01$), Test 6 vs. Test 4 ($F(1, 55) = 9.171, p < .01$), and Test 5 vs. Test 4 ($F(1, 55) = 5.751, p < .05$). These differences revealed that adults performed better at giving the basic form of nouns when given $y + \text{Noun} + \text{Adjective}$ (Test 6) than they were at producing the appropriate form of nouns after the definite article (without a cue) (Test 1). The adults were also better at giving the basic form when given gender-marked contexts (those given in Tests 5 and 6) than they were at producing the appropriate form of adjectives (Tests 3 and 2). Similarly, the adults were better at giving the basic form of nouns when given $y + \text{Noun} + \text{Adjective}$ (Test 6) and $y + \text{Noun}$ (Test 5) than they were at producing the appropriate form of nouns after the definite article (given a cue) in Test 4. Figure 6.6 shows performance by Test and by Gender.

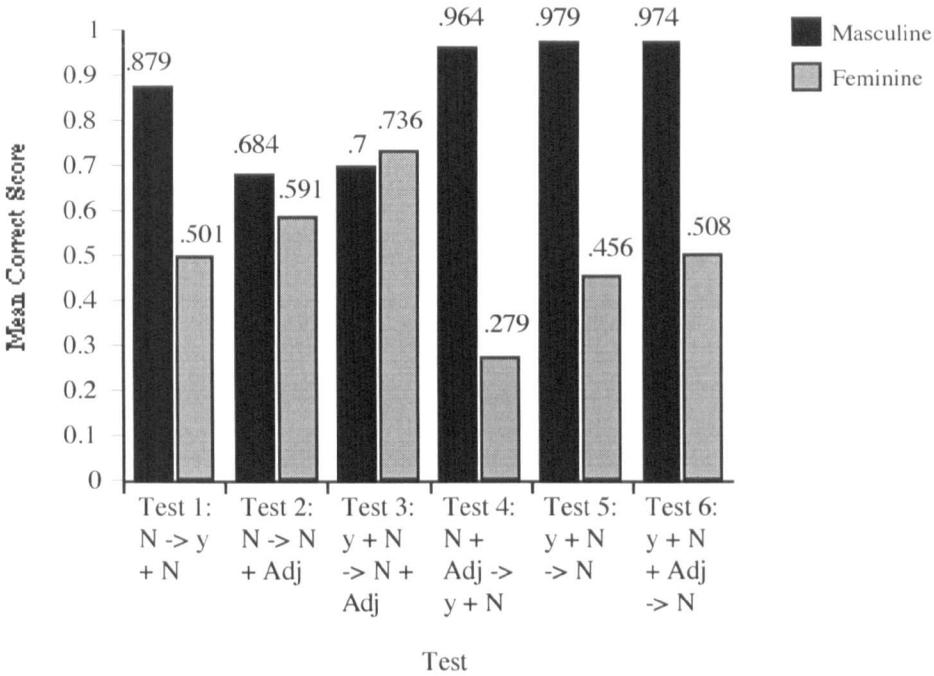


Figure 6.6: Adults' Mean Proportions per Test x Gender.

This interaction was due to the following significant effects across tests for masculine forms:

Test 1 vs. Test 2 ($F(1, 55) = 8.357, p < .01$), Test 1 vs. Test 3 ($F(1, 55) = 7.686, p < .01$), Test 4 vs. Test 2 ($F(1, 55) = 23.364, p < .001$), Test 4 vs. Test 3 ($F(1, 55) = 22.232, p < .001$), Test 5 vs. Test 1 ($F(1, 55) = 3.774, p < .05$), Test 6 vs. Test 1 ($F(1, 55) = 5.015, p < .05$), Test 5 vs. Test 2 ($F(1, 55) = 27.063, p < .001$), Test 5 vs. Test 3 ($F(1, 55) = 25.844, p < .001$), Test 6 vs. Test 2 ($F(1, 55) = 26.321, p < .001$), Test 6 vs. Test 3 ($F(1, 55) = 25.119, p < .001$). For masculine forms, the adults were better at giving the basic form of masculine real and nonsense nouns (Tests 5 and 6) than the basic form of adjectives after masculine nouns (Tests 2 and 3), and at producing the basic form of masculine nouns after the article (Test 1 -- given no cue, Test 4 -- given a cue) than the appropriate adjective form (Tests 2 and 3). The adults were also better at giving the basic form of masculine real and nonsense nouns when given gender-marked contexts (Tests 5 and 6) than they were at producing the SM form of the nouns (without a cue) after the definite article (Test 1). (The analysis also produced a near significant effect between Tests 1 and 4,

whereby the adults produced more basic forms of masculine real and nonsense nouns in Test 4 than in Test 1 ($p = .057$, $F = 3.774$.) This interaction was also due to the following significant effects across tests for feminine forms:

Test 3 vs. Test 1 ($F(1, 55) = 6.928$, $p < .05$), Test 2 vs. Test 4 ($F(1, 55) = 13.475$, $p < .001$), Test 3 vs. Test 4 ($F(1, 55) = 29.232$, $p < .001$), Test 5 vs. Test 4 ($F(1, 55) = 4.774$, $p < .05$), Test 6 vs. Test 4 ($F(1, 55) = 8.573$, $p < .01$), Test 3 vs. Test 5 ($F(1, 55) = 10.379$, $p < .01$), Test 3 vs. Test 6 ($F(1, 55) = 6.144$, $p < .05$), Test 1 vs. Test 4 ($F(1, 55) = 7.698$, $p < .01$). The adults were better at producing the SM form of adjectives after feminine nouns (Test 2 -- given no cue, and Test 3 -- given a cue) than they were at producing the SM form of feminine nouns after the article given a cue (Test 4). They were also better at producing the SM form of adjectives given a cue (Test 3) than they were at producing the SM form of feminine nouns after the article, given no cue (Test 1). The adults were also better at giving the basic form of feminine nouns when given in gender-marked contexts (Tests 5 and 6) than they were at producing the SM form of feminine real and nonsense nouns after the definite article given a cue (Test 3); they were also better on Tests 5 and 6 than on producing the SM form of feminine nouns after the article given a cue (Test 4). Finally, the adults were better at producing the SM form of feminine nouns after the article given no cue (Test 1) than when given a cue (Test 4). Figure 6.7 shows performance on Noun Type x Gender.

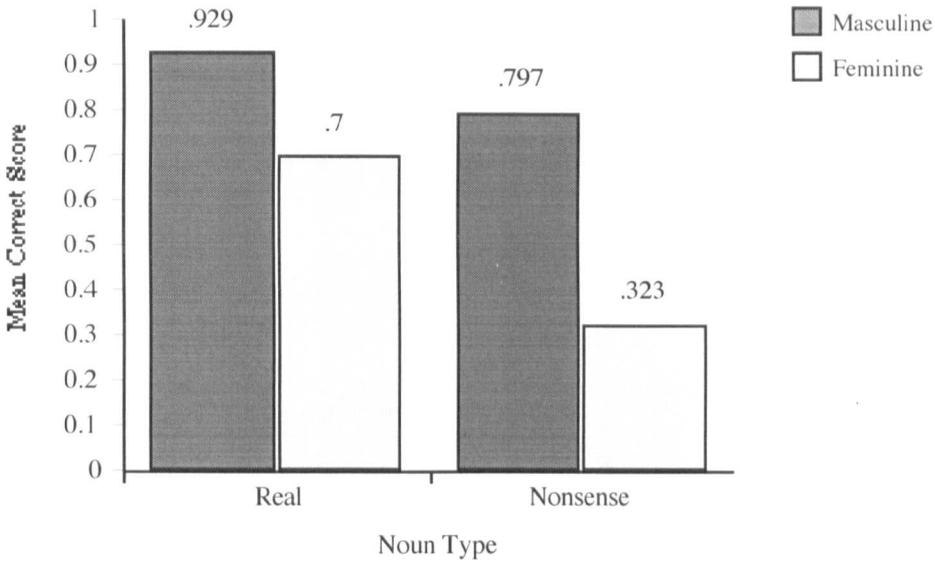


Figure 6.7: Adults' Mean Proportions per Noun Type x Gender.

Adults performed better on real masculine nouns than on real feminine nouns ($F(1, 11) = 39.128, p < .001$) and better on masculine nonsense nouns than on feminine nonsense nouns ($F(1, 11) = 120.097, p < .001$). Within genders, the adults were better on real masculine nouns than on nonsense masculine nouns ($F(1, 11) = 11.556, p < .01$) and on real feminine than on nonsense feminine ($F(1, 11) = 65.659, p < .001$). Figure 6.8 shows performance by Test, Noun Type, and Gender.

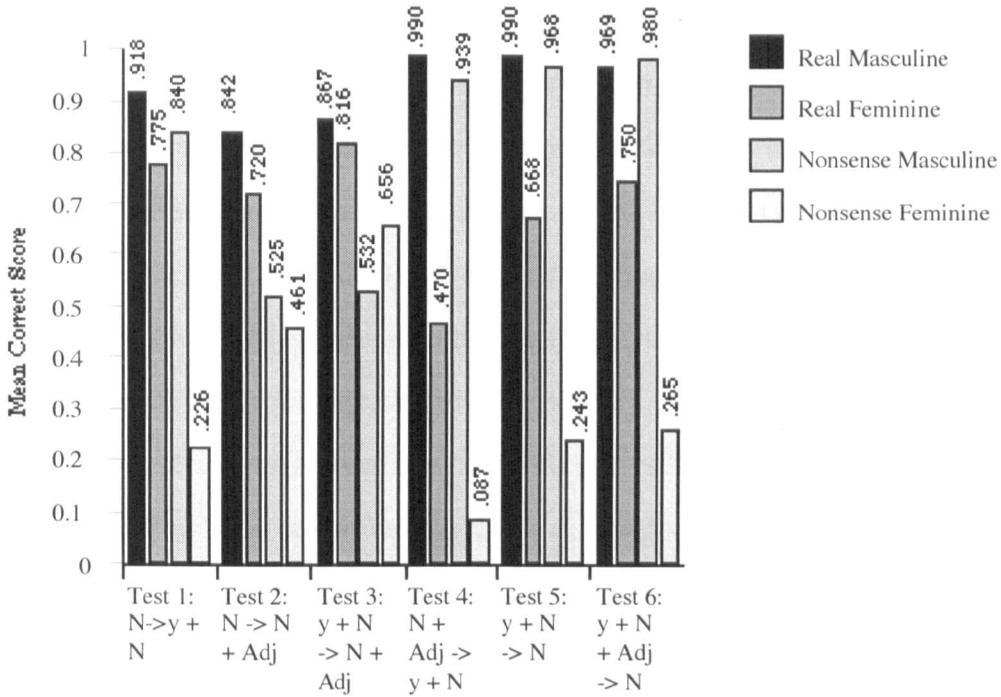


Figure 6.8: Adults’ Mean Proportions per Test x Noun Type x Gender.

Post hoc analysis revealed that this interaction was due to the following effects across tests for real masculine nouns:

Test 5 vs. Test 2, Test 6 vs. Test 2, Test 5 vs. Test 3, Test 6 vs. Test 3, Test 4 vs. Test 2, and Test 4 vs. Test 3 (Student Newman Keuls, $p < .05$). The adults were better at giving the basic form of real masculine nouns given in gender-marked contexts (Tests 5 and 6) than they were at producing the basic form of adjectives after real masculine nouns (Tests 2 and 3). The adults were also better at producing the basic form of real masculine nouns given a cue (Test 4) than they were at producing the basic form of adjectives (Tests 2 and 3). There was no significant difference between the adults’ performance on real feminine nouns across the tests. Post hoc analysis also revealed that this interaction was due to the following effects across tests for nonsense masculine nouns:

Test 4 vs. Test 2, Test 1 vs. Test 2, Test 5 vs. Test 2, Test 6 vs. Test 2, Test 4 vs. Test 3, Test 1 vs. Test 3, Test 5 vs. Test 3, Test 6 vs. Test 3 (Student Newman Keuls, $p < .05$). The adults were better at giving the basic form of nonsense

masculine nouns given in gender-marked contexts (Tests 5 and 6) than they were at producing the basic form of adjectives after nonsense masculine nouns (Tests 2 and 3). They were also better at producing the basic form of nonsense masculine nouns after the article when given (Test 4) and not given (Test 1) a cue than they were at producing the basic form of adjectives (Test 2 -- not given a cue, and Test 3 -- given a cue). Post hoc analysis revealed that this interaction was also due to the following effects across tests for nonsense feminine nouns:

Test 2 vs. Test 4, Test 3 vs. Test 4, Test 2 vs. Test 1, Test 3 vs. Test 1, Test 2 vs. Test 5, Test 3 vs. Test 5, Test 2 vs. Test 6, Test 3 vs. Test 6, and Test 3 vs. Test 2 (Student Newman Keuls, $p < .05$). The adults were better at producing the SM form of adjectives after nonsense feminine nouns (Test 2 -- given no cue, Test 3 -- given a cue) than they were at producing the SM form of nouns after the definite article (Test 4 -- given a cue and Test 1 -- not given a cue). They were also better at producing the SM form of adjectives after nonsense feminine nouns (Tests 2 and 3) than they were at giving the basic form of nonsense feminine nouns that were given in gender-marked contexts (Tests 5 and 6). Finally, the adults were better at producing the SM form of adjectives after nonsense feminine nouns when given a cue to gender status (Test 3) than when not given a cue (Test 2).

Summary: adults.

Overall, the adults performed better on masculine nouns than on feminine nouns. Within genders, they were better on real nouns than on nonsense nouns. Across tests, the adults' performance was better overall on Tests 5 and 6; that is, they were better at giving the basic forms of nouns when given gender-marked contexts than they were at producing the appropriate forms of nouns after the definite article and the appropriate forms of adjectives after nouns. When their performance on the tests was separated by gender, the adults' performance on masculine forms was worst overall on tests that required the appropriate form of adjectives after masculine nouns; that is, they produced more errors on the adjectives

than they did on the noun forms. Within tests that required the production of the noun, the adults were better on Tests 5 and 6 (giving the basic form) than on Test 1 (producing the noun after the article, given no cue). Their overall performance across tests with feminine nouns was the opposite of their performance with masculine nouns: the adults' performance was better on tests that required the appropriate form of the adjective after feminine nouns than on tests that required the production of the noun form. Moreover, within tests that required the production of the noun form, the adults were again better at giving the basic form of feminine nouns than on producing the appropriate form of the noun after the article (given a cue). They were also better on Test 1 (not given a cue) than on Test 4 (given a cue).

Set 1 Analysis: All Real and Nonsense Nouns

Children.

A repeated measures ANOVA was conducted in which Test (Tests 1, 2, 3, 4, 5, and 6), Gender (masculine, feminine), Noun Type (real, nonsense), and Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, and 9-year-olds) were treated as independent variables. The dependent variable was the children's ability to mark the nouns and adjectives appropriately in each of the tests. Since the data were in proportions, arcsin transformations were applied. An inter-rater reliability score of 95.4% was obtained for the children's data.

The analysis produced significant main effects of Gender ($F(1, 33) = 874.411, p < .001$), Noun Type ($F(1, 33) = 22.865, p < .001$), and Test ($F(5, 165) = 9.273, p < .001$). The analysis also revealed the significant interactions of Test x Gender ($F(5, 165) = 9.712, p < .001$), Noun Type x Gender ($F(1, 33) = 15.512, p < .001$), Test x Noun Type ($F(5, 165) = 2.504, p < .05$), Gender x Age ($F(3, 33) = 3.751, p < .05$), Test x Gender x Age ($F(15, 165) = 2.529, p < .01$), and Test x Noun Type x Gender ($F(5, 165) = 4.315, p < .01$). Figure 6.9 shows performance by Gender.

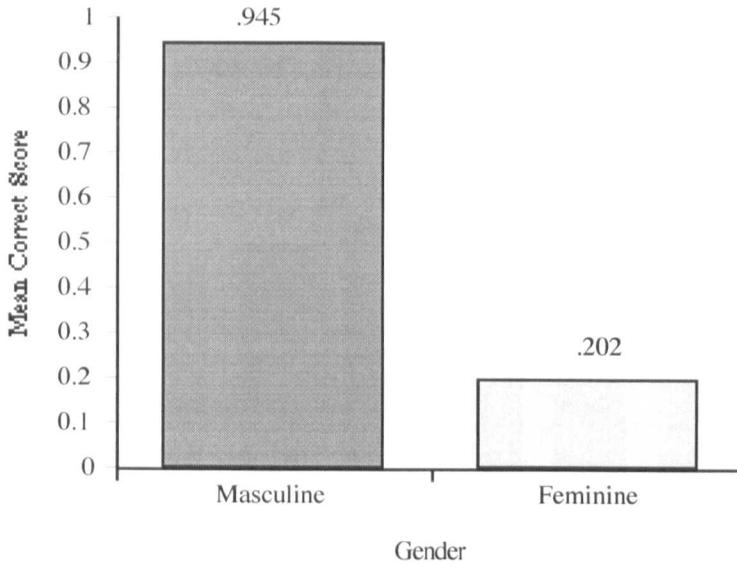


Figure 6.9: Children's Mean Proportions by Gender.

Children performed better overall on masculine forms ($M = .945$, $SD = .143$) than on feminine forms ($M = .202$, $SD = .262$). Figure 6.10 shows performance by Noun Type.

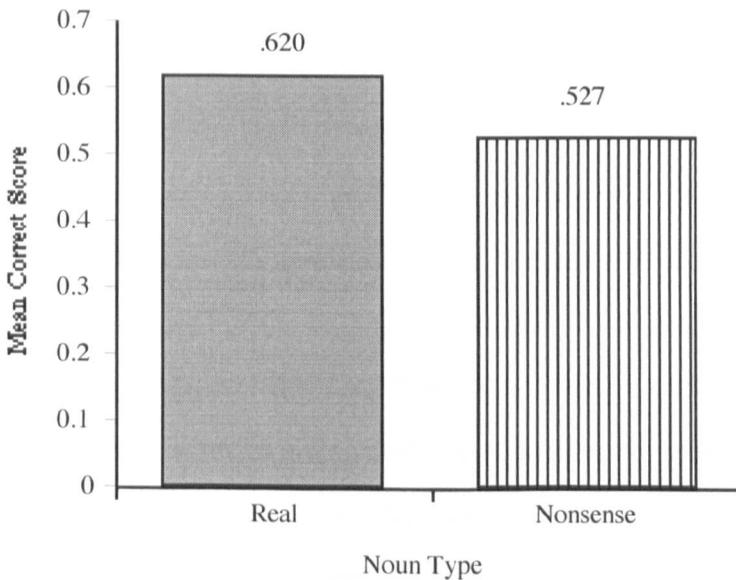


Figure 6.10: Children's Mean Proportions by Noun Type.

Children performed better overall on real nouns ($M = .620, SD = .402$) than on nonsense nouns ($M = .527, SD = .448$). Figure 6.11 shows performance by Test.

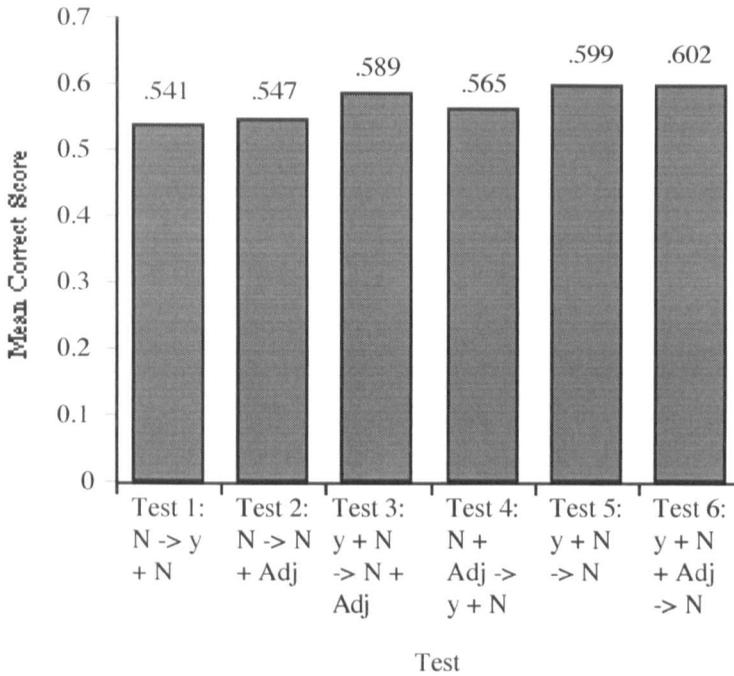


Figure 6.11: Children's Mean Score by Test.

Planned mean comparisons revealed the following significant effects across tests:

Test 5 vs. Test 1 ($F(1, 165) = 9.808, p < .01$), Test 6 vs. Test 1 ($F(1, 165) = 15.736, p < .001$), Test 5 vs. Test 2 ($F(1, 165) = 23.596, p < .001$), Test 5 vs. Test 3 ($F(1, 165) = 10.985, p < .001$), Test 6 vs. Test 2 ($F(1, 165) = 32.406, p < .001$), Test 6 vs. Test 3 ($F(1, 165) = 17.218, p < .001$), Test 4 vs. Test 2 ($F(1, 165) = 8.387, p < .01$), and Test 6 vs. Test 4 ($F(1, 165) = 7.821, p < .01$). The children were better overall at giving the basic form of nouns when given gender-marked contexts (Tests 5 and 6) than they were at producing the appropriate form of nouns after the definite article when not given a cue (Test 1). They were also better at giving the basic form of nouns given gender-marked contexts (Tests 5 and 6) than they were at producing the appropriate form of adjectives (Tests 2 and 3). The children were also better at producing the appropriate form of nouns after the

definite article in Test 4 than they were at producing the appropriate form of adjectives in Test 2. Finally, the children were also better at giving the basic form of nouns from gender-marked contexts (Test 6) than they were at producing the appropriate form of nouns after the definite article even when a cue was given (Test 4). Figure 6.12 shows performance by Test and by Gender.

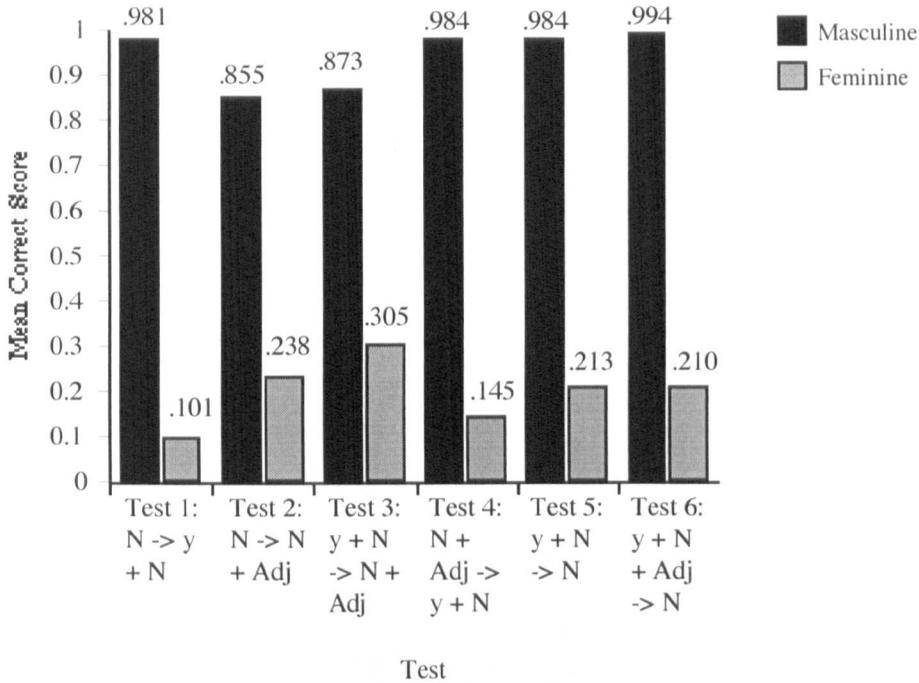


Figure 6.12: Children's Mean Proportions per Test x Gender.

This interaction was due to the following significant effects across tests for masculine forms:

Test 5 vs. Test 2 ($F(1, 165) = 16.163, p < .001$), Test 5 vs. Test 3 ($F(1, 165) = 17.095, p < .001$), Test 6 vs. Test 2 ($F(1, 165) = 9.405, p < .001$), Test 6 vs. Test 3 ($F(1, 165) = 20.426, p < .001$), Test 4 vs. Test 2 ($F(1, 165) = 15.165, p < .001$), and Test 4 vs. Test 3 ($F(1, 165) = 16.069, p < .001$). The children were better at giving the basic form of masculine real and nonsense nouns given in gender-marked contexts (Tests 5 and 6) than they were at producing the appropriate form of adjectives after masculine nouns (Tests 2 and 3). The children were also better at producing the basic form of masculine real and nonsense nouns after the definite

article, given a cue (Test 4), than they were at producing the basic form of adjectives after masculine nouns (Tests 2 and 3). This interaction was also due to the following significant effects across tests for feminine forms:

Test 2 vs. Test 1 ($F(1, 165) = 5.559, p < .05$), Test 3 vs. Test 1 ($F(1, 165) = 12.972, p < .001$), and Test 3 vs. Test 4 ($F(1, 165) = 9.111, p < .01$). The children were better at producing the SM form of adjectives after feminine real and nonsense nouns (Tests 2 and 3) than they were at producing the SM form of nouns after the definite article given no cue (Test 1). They were also better at producing the SM form of adjectives after feminine nouns given a cue (Test 3) than they were at producing the SM form of feminine nouns after the article also when given a cue (Test 4). Figure 6.13 shows performance by Test and by Noun Type.

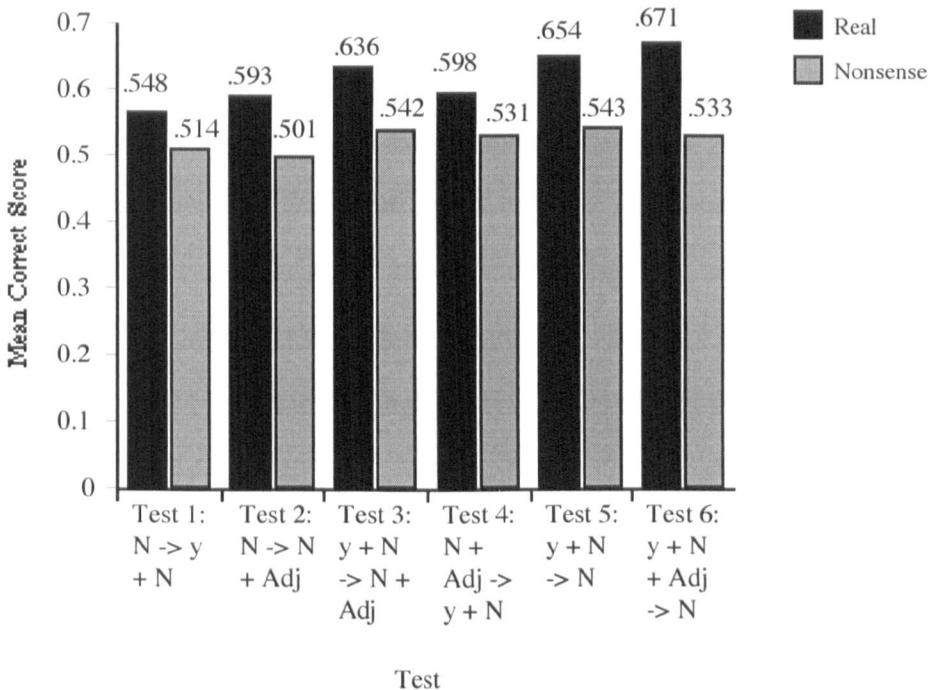


Figure 6.13: Children's Mean Proportions per Test x Noun Type.

This interaction was due to the following significant effects across the tests for real nouns:

Test 5 vs. Test 1 ($F(1, 165) = 12.828, p < .001$), Test 6 vs. Test 1 ($F(1, 165) = 23.839, p < .001$), Test 5 vs. Test 4 ($F(1, 165) = 6.671, p < .05$), Test 6 vs.

Test 4 ($F(1, 165) = 15.083, p < .001$), Test 5 vs. Test 2 ($F(1, 165) = 12.331, p < .001$), Test 6 vs. Test 2 ($F(1, 165) = 23.160, p < .001$), Test 5 vs. Test 3 ($F(1, 165) = 6.671, p < .05$), and Test 6 vs. Test 3 ($F(1, 165) = 11.857, p < .001$). The children performed the best on giving the basic form of nouns from gender-marked contexts. They were better on Tests 5 and 6 than they were at producing the appropriate form of nouns after the definite article (Tests 1 and 4), and better on Tests 5 and 6 than they were at producing the appropriate form of adjectives after feminine nouns (Tests 2 and 3). This interaction was also due to the following significant effects across the tests for nonsense nouns:

Test 5 vs. Test 2 ($F(1, 165) = 13.911, p < .001$), Test 6 vs. Test 2 ($F(1, 165) = 13.496, p < .001$), Test 3 vs. Test 4 ($F(1, 165) = 6.037, p < .05$), and Test 3 vs. Test 6 ($F(1, 165) = 7.520, p < .01$). The children were better at giving the basic form of nonsense nouns when given in gender-marked contexts (Tests 5 and 6) than they were at producing the appropriate form of adjectives, given no cue, after these nouns (Test 2). When the children produced adjectives, given a cue to gender (Test 3), their performance was better than when they produced the appropriate form of nouns after the definite article given a cue (Test 4), and better than when they were required to give the basic form of nonsense nouns when in gender-marked contexts (Test 6). Figure 6.14 shows performance by Noun Type and by Gender.

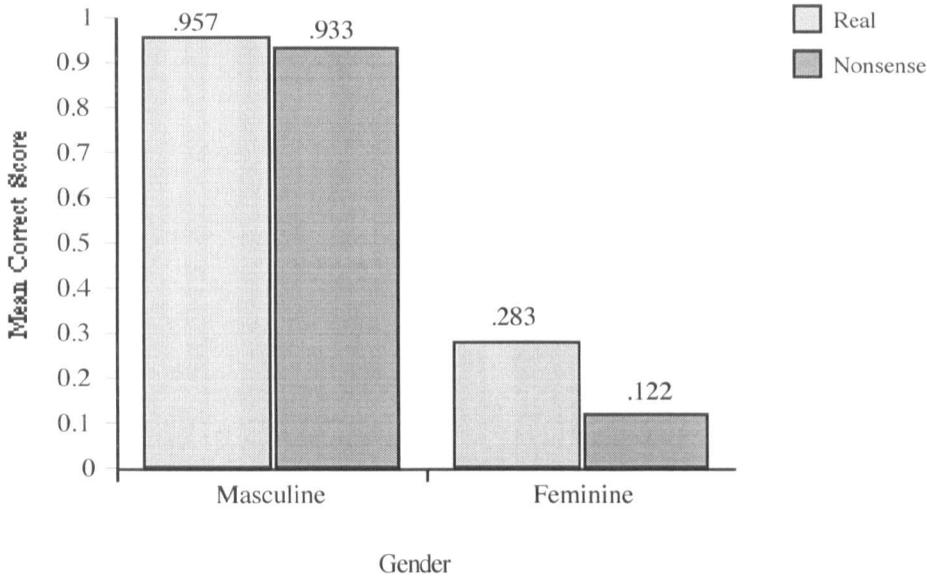


Figure 6.14: Children's Mean Proportions per Noun Type x Gender.

Planned mean comparisons revealed that, within genders, this interaction was due to the children's better performance on real feminine nouns than on nonsense feminine nouns ($F(1, 33) = 56.898, p < .001$). (There was only a near-significant effect between the children's performance on real and nonsense masculine nouns ($F(1, 33) = 3.893, p = .057$).)

Figure 6.15 shows performance per Test, Noun Type, and Gender.

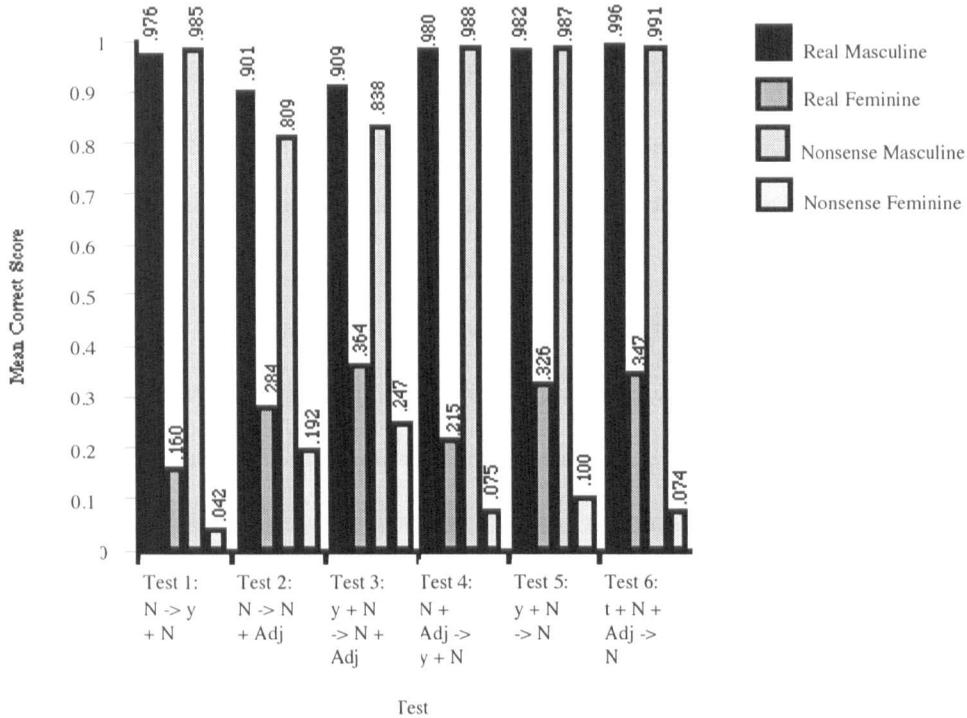


Figure 6.15: Children’s Mean Proportions per Test x Noun Type x Gender.

Post hoc analysis revealed that the interaction was due to the following significant effects across tests for real masculine nouns:

Test 6 vs. Test 2, Test 6 vs. Test 3, and Test 1 vs. Test 3 (Student Newman Keuls, $p < .05$). The children were better at giving the basic form of real masculine nouns given gender-marked contexts (Test 6) than they were at giving the basic form of adjectives (Tests 2 and 3) after real masculine nouns. They were also better at producing the basic form of real masculine nouns after the definite article (Test 1) than they were at producing the basic form of adjectives after masculine nouns (Test 3). Post hoc analysis also revealed that the interaction was due to the children being better at giving the basic form of real feminine nouns from gender-marked contexts (Test 6) than they were at producing the SM form of feminine nouns after the article without a cue (Test 1) (Student Newman Keuls, $p < .05$). Post hoc analysis also revealed that the interaction was due to the following significant effects across tests for nonsense masculine nouns:

Tests 1, 4, 5, and 6 vs. Test 2, and Tests 1, 4, 5, and 6 vs. Test 3 (Student Newman Keuls, $p < .05$). Thus the children's worst performance was at producing adjectives after nonsense masculine nouns (Tests 2 and 3); their performance was better on all other tests. For nonsense feminine nouns, post hoc analysis revealed that the difference lay between the following tests:

Test 3 vs. Test 1, and Test 3 vs. Test 4 (Student Newman Keuls, $p < .05$).

The children were better at producing the SM form of adjectives after nonsense feminine nouns when given a cue (Test 3) than they were at producing the SM form of nonsense feminine nouns after the definite article (Tests 1 and 4). Figure 6.16 shows performance per Gender and per Age.

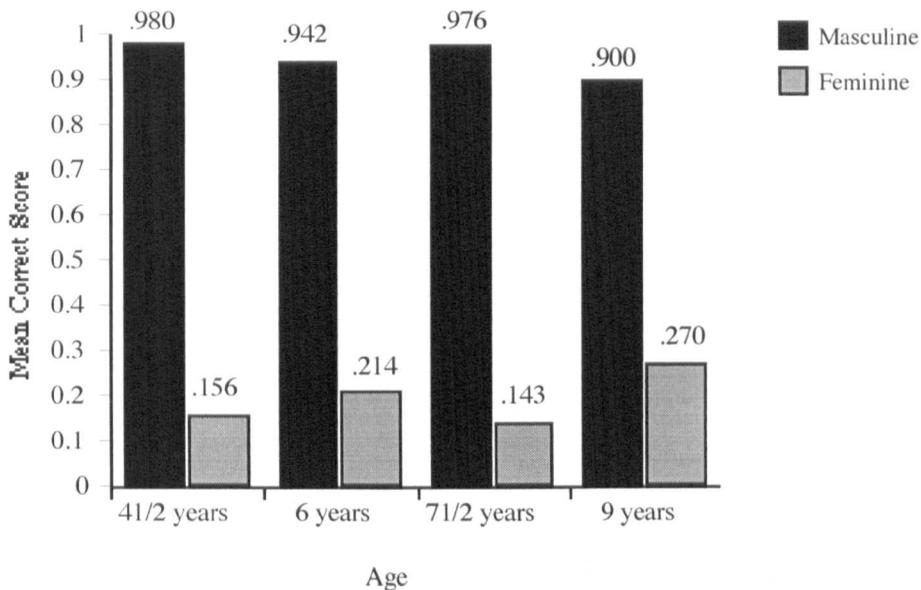


Figure 6.16: Children's Mean Proportions per Gender x Age.

Post hoc analysis revealed that the interaction was due to the 7 1/2-year-olds performing better than the 9-year-olds with masculine nouns (Student Newman Keuls, $p < .05$). There were no significant differences across ages for performance on feminine nouns. Figure 6.17 shows performance per Test, Gender, and Age.

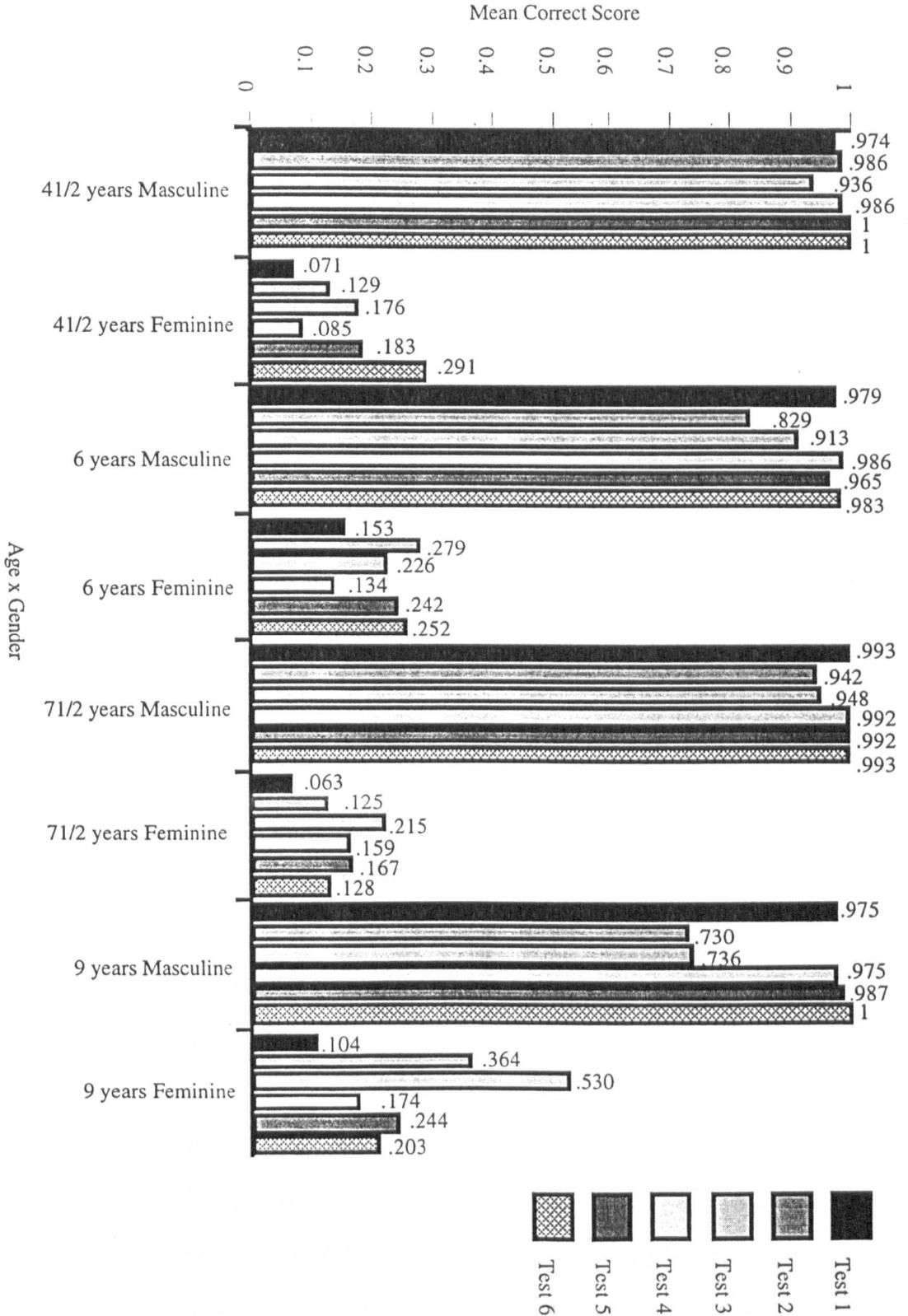


Figure 6.17: Children's Mean Proportions per Test x Gender x Age.

First, for masculine nouns, pairwise mean comparisons of the 6-year-olds' data revealed the following effects:

Test 1 vs. Test 2 ($F(1, 165) = 8.188, p < .01$), Test 4 vs. Test 2 ($F(1, 165) = 9.590, p < .01$), Test 5 vs. Test 2 ($F(1, 165) = 6.391, p < .05$), and Test 6 vs. Test 2 ($F(1, 165) = 9.350, p < .01$). Therefore, the 6-year-olds performed better on tests that involved the production of the basic form of nouns (Tests 1, 4, 5, and 6) than on tests that involved the production of the basic form of adjectives after masculine nouns without a cue (Test 2). The 9-year-olds' data revealed the following effects:

Test 1 vs. Test 2 ($F(1, 165) = 10.836, p < .01$), Test 1 vs. Test 3 ($F(1, 165) = 10.964, p < .01$), Test 4 vs. Test 2 ($F(1, 165) = 10.836, p < .01$), Test 4 vs. Test 3 ($F(1, 165) = 10.964, p < .01$), Test 5 vs. Test 2 ($F(1, 165) = 13.062, p < .001$), Test 5 vs. Test 3 ($F(1, 165) = 13.202, p < .001$), Test 6 vs. Test 2 ($F(1, 165) = 14.797, p < .001$), and on Test 6 vs. Test 3 ($F(1, 165) = 14.946, p < .001$). Therefore, the 9-year-olds also performed better on tests involving the production of the basic form of masculine nouns (Tests 1, 4, 5, and 6) than on tests involving the production of the basic form of the adjective after masculine nouns (Tests 2 and 3).

For feminine nouns, the only significant effects were found with the 9-year-olds' performance. The 9-year-olds' data revealed the following effects:

Test 3 vs. Test 1 ($F(1, 165) = 13.565, p < .001$), Test 3 vs. Test 4 ($F(1, 165) = 10.047, p < .01$), Test 3 vs. Test 5 ($F(1, 165) = 6.716, p < .05$), and Test 3 vs. Test 6 ($F(1, 165) = 7.908, p < .01$). Therefore, the 9-year-olds performed significantly better on the production of adjectives after feminine nouns given a cue (Test 3) than on tests involving the production of the noun form (Tests 1, 4, 5, and 6).

Summary: Child data.

Overall, the children performed better on masculine nouns than on feminine nouns. They were also better at marking real feminine nouns than nonsense feminine nouns; there was no significant difference between performance on real masculine nouns vs. nonsense masculine nouns. Across tests, the children's

performance was better overall on Tests 5 and 6; that is, they were better at giving the basic form of nouns from gender-marked contexts than they were at producing the appropriate form of nouns after the definite article and adjectives after nouns. They were also better at producing the appropriate form of the noun after the article given a cue (Test 4) than of the adjective following the noun given no cue (Test 2), and better at giving the basic form of nouns (Test 6) than at producing the appropriate form of nouns after the article given a cue (Test 4). When their performance on the tests was separated by Gender, the children's performance overall with masculine nouns only was again poorest on tests that required the appropriate form of adjectives after the masculine nouns; that is, they produced more errors on the adjectives than they did on the noun forms. As was found with the adults' data, the children's overall performance across tests with feminine nouns was the opposite to their performance with masculine nouns: the children's performance was better on tests that required the appropriate form of the adjective after feminine nouns than tests that required the production of the noun after the definite article.

When the children's responses were separated across tests by Noun Type, for real nouns the children's best performance was with the production of the basic form of nouns (Tests 5 and 6). Their performance on these tests was better overall than on the production of the appropriate form of nouns after the article and of the adjectives after the nouns. With the nonsense nouns, the children were better at giving the basic form in Tests 5 and 6 than at producing the adjective form given no cue (Test 2). However, their performance was better on the production of the adjective, given a cue to gender status (Test 3), than on the production of the noun after the article (Test 4 -- given a cue) and the production of the basic form (Test 6).

As was found for the adults' data, when the children's performance across Test, Noun Type, and Gender was investigated, for real and nonsense masculine nouns, the children's worst performance was with the production of the appropriate form of the adjectives. For real feminine nouns, the children were better at giving the basic form than at producing the appropriate form of feminine nouns after the article.

For nonsense feminine nouns, the children were better at producing the SM form of adjectives after feminine nonsense nouns when given a cue (Tests 3) than they were at producing the SM form of nonsense feminine nouns after the article (Tests 1 and 4).

The children's data also revealed that, across Gender and Age, the 7 1/2-year-olds performed significantly better than the 9-year-olds on masculine nouns; no significant effects were found with feminine nouns.

When the children's performance across Test, Gender, and Age were investigated, the 6- and 9-year-olds performed worst overall on tests that required the basic form of adjectives after masculine nouns. For feminine nouns, the 9-year-olds' better overall performance was on the production of the SM form of adjectives.

Set 1 Analysis: Real and Nonsense Nouns

Adults vs. children.

To explore any differences in responses between adults and children, a repeated measures ANOVA was applied to the data of both adults and children. The same independent and dependent variables were applied to the data.

The analysis revealed significant main effects of Gender ($F(1, 46) = 1087.229$, $p < .001$), Noun Type ($F(1, 46) = 54.379$, $p < .001$), and Test ($F(5, 230) = 11.385$, $p < .001$). The analysis also revealed significant interactions of Test x Gender ($F(5, 230) = 17.956$, $p < .001$), Noun Type x Gender ($F(1, 46) = 20.628$, $p < .001$), and Test x Noun Type x Gender ($F(5, 230) = 8.243$, $p < .001$). However, since these effects have been fully investigated in previous sections, they will not be discussed further here.

The analysis also showed a significant main effect of Age ($F(4, 46) = 4.173$, $p < .01$). Figure 6.18 illustrates these data.

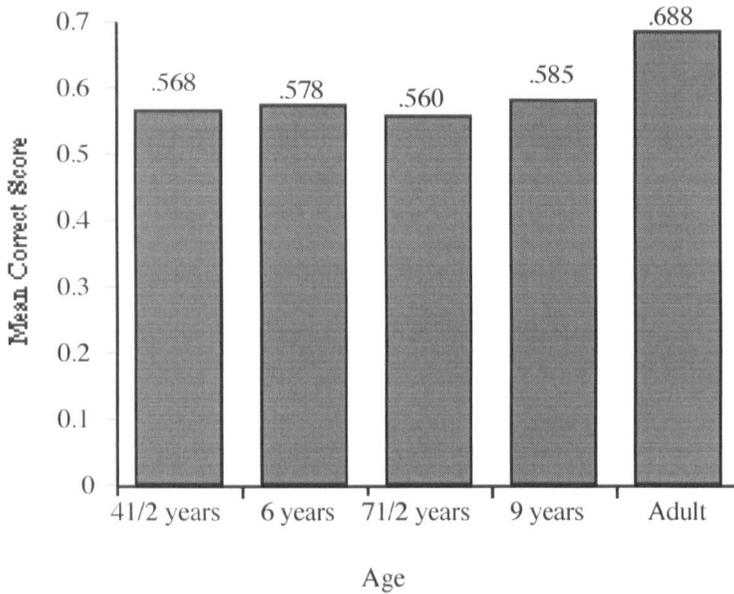


Figure 6.18: Adults' and Children's Mean Proportions by Age.

Post hoc analysis revealed that this effect was due to the adults' better overall performance than children in each of the children's age groups (Student Newman Keuls, $p < .05$). The analysis also revealed a significant interaction of Noun Type x Age ($F(4, 46) = 8.666, p < .001$). Figure 6.19 illustrates these data.

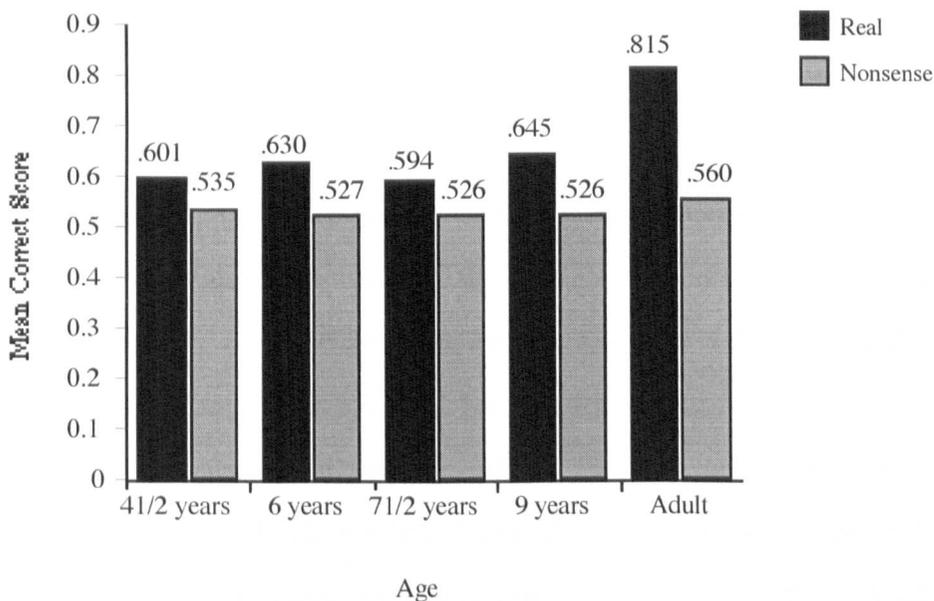


Figure 6.19: Adults' and Children's Mean Proportions per Noun Type x Age.

Post hoc analysis revealed that the interaction was due to the adults' better overall performance on real nouns than the children in each of the children's age groups (Student Newman Keuls, $p < .05$). There was no significant difference between the adults' and the children's overall performance on nonsense nouns.

The analysis also revealed a significant interaction of Gender x Age ($F(4, 46) = 21.361, p < .001$). Figure 6.20 illustrates these data.

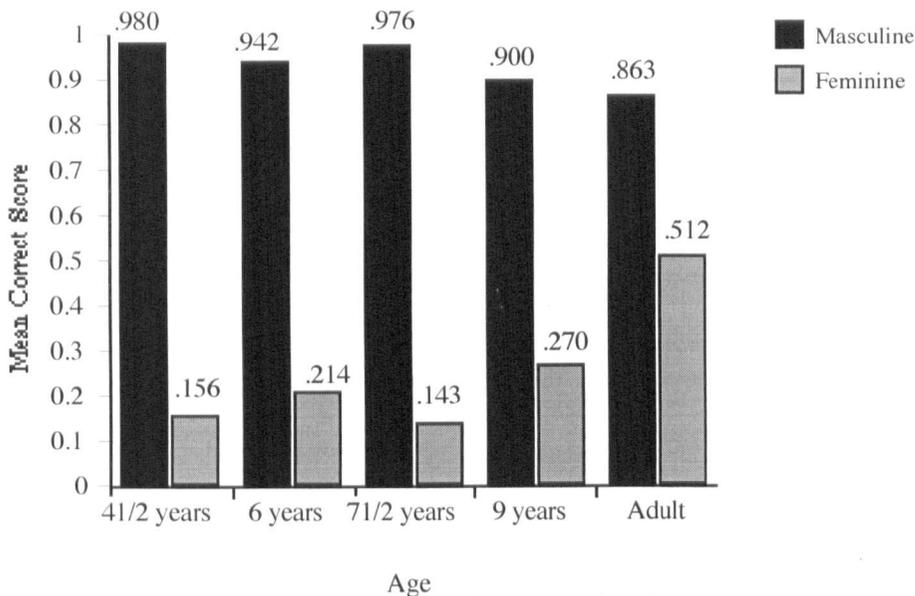


Figure 6.20: Adults' and Children's Mean Proportions per Gender x Age.

Post hoc analysis revealed that this interaction was due to the adults' overall worse performance on masculine nouns than that of the children in each of the children's age groups (Student Newman Keuls, $p < .05$), as well as the 7 1/2-year-olds' and the 4 1/2-year-olds' better performance on masculine nouns than the 9-year-olds' (Student Newman Keuls, $p < .05$). For feminine nouns, the adults performed significantly better overall than the children in each of the children's age groups (Student Newman Keuls, $p < .05$). The analysis also revealed a significant interaction of Test x Gender x Age ($F(20, 230) = 2.962, p < .001$). Tables 6.2a and 6.2b report the mean proportions for this interaction.

Table 6.2a: Adults' vs. Children's Mean Proportions for Masculine Nouns
for the Interaction of Test x Gender x Age.

Masculine	4 1/2-year-olds		6-year-olds		7 1/2-year-olds		9-year-olds		Adults	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Test 1	.974	.061	.979	.052	.993	.032	.975	.068	.879	.152
Test 2	.986	.048	.829	.249	.942	.118	.730	.315	.684	.297
Test 3	.936	.133	.913	.105	.948	.074	.736	.274	.700	.300
Test 4	.986	.048	.986	.044	.992	.037	.975	.068	.964	.074
Test 5	1	0	.965	.075	.992	.037	.987	.061	.979	.053
Test 6	1	0	.983	.051	.993	.032	1	0	.974	.068

Table 6.2b: Adults' vs. Children's Mean Proportions for Feminine Nouns
for the Interaction of Test x Gender x Age.

Feminine	4 1/2-year-olds		6-year-olds		7 1/2-year-olds		9-year-olds		Adults	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Test 1	.071	.090	.153	.237	.063	.139	.104	.172	.501	.373
Test 2	.129	.144	.279	.351	.125	.256	.364	.292	.591	.319
Test 3	.176	.267	.226	.274	.215	.267	.530	.340	.736	.215
Test 4	.085	.115	.134	.183	.159	.209	.174	.241	.279	.336
Test 5	.183	.210	.242	.267	.167	.168	.244	.317	.456	.368
Test 6	.291	.236	.252	.267	.128	.194	.203	.297	.508	.361

Pairwise mean comparisons revealed that with masculine nouns, the effects found for the 6-year-olds were as follows:

Test 1 vs. Test 2 ($F(1, 230) = 13.332, p < .001$), Test 1 vs. Test 3 ($F(1, 230) = 5.504, p < .05$), Test 4 vs. Test 2 ($F(1, 230) = 16.264, p < .001$), Test 4 vs. Test 3 ($F(1, 230) = 7.440, p < .01$), Test 5 vs. Test 2 ($F(1, 230) = 11.111, p < .01$), Test 5 vs. Test 3 ($F(1, 230) = 4.113, p < .05$), Test 6 vs. Test 2 ($F(1, 230) = 15.764, p < .001$), and Test 6 vs. Test 3 ($F(1, 230) = 7.103, p < .05$). These effects were due to the 6-year-olds' worst performance on the production of the basic form of adjectives after masculine nouns (Tests 2 and 3) and their better performance on the production of the noun form (Tests 1, 4, 5, and 6). The effects found for the 7 1/2-year-olds were as follows:

Test 1 vs. Test 3 ($F(1, 230) = 7.234, p < .01$), Test 4 vs. Test 3 ($F(1, 230) = 7.038, p < .05$), Test 5 vs. Test 3 ($F(1, 230) = 7.038, p < .05$), and Test 6 vs. Test 3 ($F(1, 230) = 7.234, p < .01$). These effects were also due to the 7 1/2-year-olds' better performance on noun production than on adjective production. The effects found for the 9-year-olds were as follows:

Test 1 vs. Test 2 ($F(1, 230) = 17.628, p < .001$), Test 1 vs. Test 3 ($F(1, 230) = 17.745, p < .001$), Test 4 vs. Test 2 ($F(1, 230) = 17.628, p < .001$), Test 4 vs. Test 3 ($F(1, 230) = 17.745, p < .001$), Test 5 vs. Test 2 ($F(1, 230) = 22.893, p < .001$), Test 6 vs. Test 2 ($F(1, 230) = 26.985, p < .001$), Test 5 vs. Test 3 ($F(1, 230) = 22.972, p < .001$), and Test 6 vs. Test 3 ($F(1, 230) = 27.130, p < .001$). These effects were again due to the 9-year-olds' better performance with producing the appropriate form of masculine nouns than with producing the appropriate form of adjectives after masculine nouns. Finally, the effects found for the adults were as follows:

Test 1 vs. Test 2 ($F(1, 230) = 14.852, p < .001$), Test 1 vs. Test 3 ($F(1, 230) = 11.479, p < .001$), Test 4 vs. Test 2 ($F(1, 230) = 44.957, p < .001$), Test 4 vs. Test 3 ($F(1, 230) = 38.927, p < .001$), Test 5 vs. Test 2 ($F(1, 230) = 51.762, p < .001$), Test 6 vs. Test 2 ($F(1, 230) = 50.335, p < .001$), Test 5 vs. Test 3 ($F(1, 230) = 45.276, p < .001$), Test 6 vs. Test 3 ($F(1, 230) = 43.942, p < .001$), Test 5 vs. Test 1 ($F(1, 230) = 11.160, p < .01$), and Test 6 vs. Test 1 ($F(1, 230) = 10.503, p < .01$). These effects were due to the adults' better performance on noun forms than on adjective forms; therefore both children (with the exception of the 4 1/2-year-olds) and adults performed the least consistent with the norm with the adjective forms. Within tests that elicited the noun form, the adults were also better at giving the basic form of masculine nouns (Tests 5 and 6) than at producing the basic form of masculine nouns after the article given no cue (Test 1).

With feminine nouns, the effects found for the 4 1/2-year-olds were as follows:

Test 5 vs. Test 1 ($F(1, 230) = 5.108, p < .05$), Test 6 vs. Test 1 ($F(1, 230) = 9.521, p < .01$), Test 6 vs. Test 2 ($F(1, 230) = 6.270, p < .05$), and Test 6 vs. Test 4 ($F(1, 230) = 5.341, p < .05$). These effects were due to the 4 1/2-year-olds' better performance on giving the basic form from a gender-marked context (Test 5 and 6) than on producing the SM form of feminine nouns after the article given no cue (Test 1). They were also better on Test 6 than on producing the SM form of nouns after the article given a cue (Test 4). Finally, they were better on Test 6 than they were at producing the SM form of adjectives after feminine nouns, given no cue (Test 2). The effects found with the 9-year-olds were as follows:

Test 2 vs. Test 1 ($F(1, 230) = 6.130, p < .05$), Test 3 vs. Test 1 ($F(1, 230) = 23.220, p < .001$), Test 3 vs. Test 2 ($F(1, 230) = 5.489, p < .05$), Test 3 vs. Test 4 ($F(1, 230) = 17.265, p < .001$), and Test 3 vs. Test 5 ($F(1, 230) = 12.566, p < .001$). These effects were due to the 9-year-olds' best performance on the production of the SM form of adjectives after feminine nouns given a cue (Test 3), although their performance given no cue was also very good (Test 2), although not as good. The effects found with the adults were similar to the 9-year-olds'. These were as follows:

Test 3 vs. Test 1 ($F(1, 230) = 12.276, p < .001$), Test 3 vs. Test 2 ($F(1, 230) = 4.541, p < .05$), Test 3 vs. Test 4 ($F(1, 230) = 37.766, p < .001$), Test 3 vs. Test 5 ($F(1, 230) = 15.662, p < .001$), Test 1 vs. Test 4 ($F(1, 230) = 6.978, p < .05$), Test 2 vs. Test 4 ($F(1, 230) = 16.115, p < .001$), Test 5 vs. Test 4 ($F(1, 230) = 4.787, p < .05$), and Test 6 vs. Test 4 ($F(1, 230) = 7.946, p < .01$). These effects were due to the adults' better performance on the production of the SM form of adjectives after feminine nouns when given a cue (Test 3) than on the production of the noun form (Tests 1, 4, and 5) and the production of the SM form of adjective without a cue (Test 2). Their poorest performance was on the production of the SM form of feminine nouns after the article, given a cue (Test 4).

Summary: adults vs. children.

In addition to the effects found for the adults' and the children's separate analysis of the data, the comparison of both adults' and children's data revealed that, overall, the adults performed significantly better than the children from each of the children's age groups with feminine forms. This was also the case for their responses on real nouns. However, there was no significant effect across ages for their overall performance on nonsense nouns. When their performance across Gender and Age was investigated, whereas the adults' performance was better than all the children's with feminine forms, the adults' performance differed from the children with masculine nouns in that they produced more SM on adjectives after masculine nouns. (Within the children's age groups, the 7 1/2-year-olds and the 4 1/2-year-olds were better on masculine nouns than the 9-year-olds also.)

Finally, when the adults' and the children's performance across Test, Gender, and Age was investigated, with masculine forms, the children seemed to perform progressively less in line with the norm on the production of the basic form of the adjectives, where the 9-year-olds and the adults performed at a similar level (Test 2, 9-year-olds: $M = .730$, Test 2, Adults: $M = .684$; Test 3, 9-year-olds: $M = .736$; Test 3, Adults: $M = .7$). That is, performance on Tests 2 and 3 was significantly poorer than performance on the tests that elicited the noun form. This suggests that the older children (9-year-olds) and adults were producing more SM forms with adjectives that were inappropriate with masculine nouns (therefore incur more errors) but appropriate (therefore incur more correct responses) with feminine nouns. Conversely, with feminine forms, the children's performance seemed to progress with age on Tests 2 and 3. However, unlike with the masculine data, the 9-year-old children's performance had not reached that of the adults for the feminine nouns. Finally, the adults were also better at giving the basic form of nouns when given gender-marked contexts (Tests 5 and 6) than at giving the basic form of masculine nouns after the article when not given a cue (Test 1).

Set 2 Analysis: Unambiguous Forms

As noted earlier, one problem with the Set 1 analysis is that the form provided with both real and nonsense forms in Tests 1 to 6 was often ambiguous with regards to gender (see under “Ambiguity of Surface Forms of Nouns” above). In order to explore whether the ambiguity of some of the nouns provided had an effect on the results of the Set 1 analysis, an additional set of analysis was conducted to include only those cues that provided unambiguous cues to gender. In this second set of analysis, only responses to stimuli with the following forms were analysed:

Tests 3 and 5:

Feminine:

y + /ð/

y + /v/ (/b/-initial basic form)

y + /v/ (/m/-initial basic form)

Masculine:

y + /p/

y + /t/

y + /k/

y + /m/

Tests 4 and 6:

Feminine:

/p/, /t/, /k/, /b/, /d/, /g/, /m/ + mutated adjective

Masculine:

/p/, /t/, /k/, /b/, /d/, /g/, /m/ + non-mutated adjective

Participants’ responses were given a score of 1 if they marked the form appropriately for its gender and a score of 0 if they did not.

Set 2 Analysis: Unambiguous Forms**Adults.**

A repeated measures ANOVA was conducted in which Test (Tests 3, 4, 5, and 6), Gender (masculine, feminine), Noun Type (real, nonsense), and Age (16- to 30-year-olds, 31- to 50-year-olds, 51+ year-olds) were treated as independent variables. The dependent variable was the adults' ability to mark the nouns for their genders in each of the tests. Since the data were in proportions, arcsin transformations were applied.

Again, as observed in the Set 1 analysis for the adult data, the Set 2 analysis also revealed a significant main effect of Gender ($F(1, 11) = 35.060, p < .001$), Noun Type ($F(1, 11) = 23.311, p < .001$), and Test ($F(3, 33) = 4.430, p < .05$). The analysis also revealed the interactions Test x Gender ($F(3, 33) = 33.205, p < .001$), and Test x Noun Type x Gender ($F(3, 33) = 13.478, p < .001$). Since these interactions have already been investigated under the Set 1 analysis, they will not be discussed here. However, the Set 2 analysis also revealed the interaction Test x Noun Type ($F(3, 33) = 3.397, p < .05$). Figure 6.21 shows the interaction Tests x Noun Type.

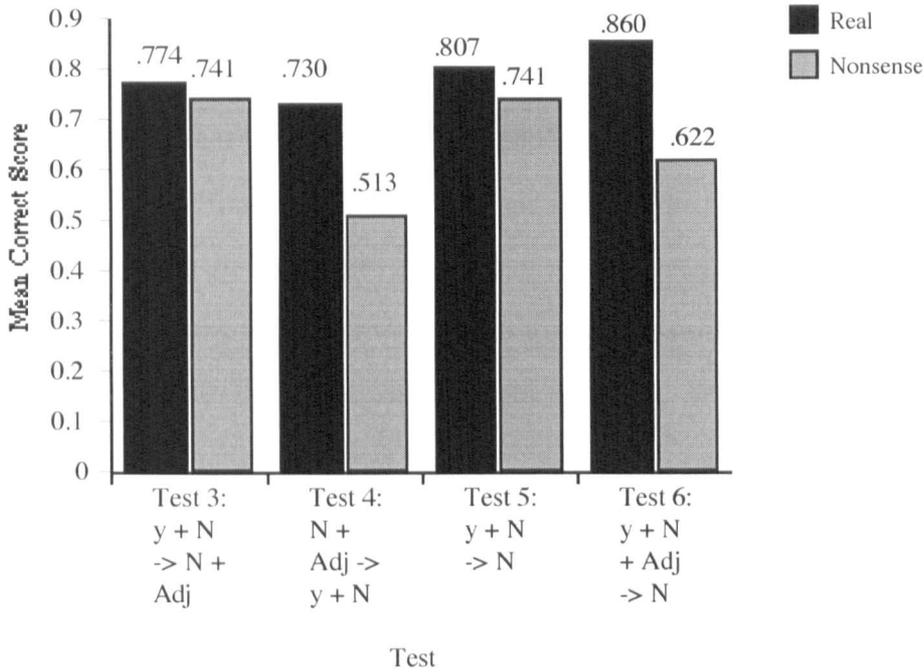


Figure 6.21: Adults' Mean Proportions per Test x Noun Type for Unambiguous Cues.

This interaction was due to the following significant effects for real nouns:

Tests 6 vs. Test 3 ($F(1, 33) = 5.236, p < .05$) and Test 6 vs. Test 4 ($F(1, 33) = 5.390, p < .05$). Therefore the adults were better at giving the basic form of real nouns when given in gender-marked contexts (Test 6) than they were at marking nouns (Test 4) and adjectives (Test 3) appropriately, given cues. For nonsense nouns, the following were significant:

Test 3 vs. Test 4 ($F(1, 33) = 12.537, p < .01$) and Test 5 vs. Test 4 ($F(1, 33) = 12.548, p < .01$). With nonsense nouns, the adults' weakest performance was on the production of the appropriate form of nouns after the article (Test 4). In particular, they were better at producing the appropriate form of adjectives (Test 3) and better at giving the basic form of nouns when given in a gender-marked context (Test 5).

Summary: adults.

The analysis revealed the same effects as those found in the Set 1 analysis for Gender, Noun Type, Test, Test x Gender, and Test x Noun Type x Gender. The only difference found in the Set 2 analysis was that the adults were significantly better at giving the basic form of real nouns when given in gender-marked contexts (Test 6) than they were at producing the appropriate form of real nouns after the article (Test 4) or the adjectives after nouns (Test 3). With nonsense nouns, the adults were better at producing the appropriate form of adjectives (Test 3) and at giving the basic form of nouns when given in a gender-marked context (Test 5) than they were at producing the appropriate form of nouns after the article (Test 4).

Set 2 Analysis: Unambiguous Forms**Children.**

A repeated measures ANOVA was conducted in which Test (Tests 3, 4, 5, and 6), Gender (masculine, feminine), Noun Type (real, nonsense), and Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, 9-year-olds) were treated as independent variables. The dependent variable was the children's ability to mark the nouns for their genders in each of the tests. Since the data were in proportions, arcsin transformations were applied.

As was the case under the Set 1 analysis for the children's data, there were significant main effects of Gender ($F(1, 33) = 857.251, p < .001$), Noun Type ($F(1, 33) = 39.296, p < .001$), and Test ($F(3, 99) = 4.384, p < .01$). The analysis also revealed significant interactions of Test x Gender ($F(3, 99) = 12.368, p < .001$), Noun Type x Gender ($F(1, 33) = 32.279, p < .001$), Test x Noun Type x Gender ($F(3, 99) = 4.930, p < .01$), Gender x Age ($F(3, 33) = 2.918, P < .05$), and Test x Gender x Age ($F(9, 99) = 4.488, p < .001$). Since these effects have already been described under the Set 1 analysis, they will not be discussed further here.

Unlike the Set 1 analysis, however, there was no significant effect of Test x Noun Type in the Set 2 analysis ($F(3, 99) = 1.787, p > .05$). Recall that in the Set 1

analysis, a number of the nonsense nouns would be ambiguous in terms of gender. Therefore performance was expected to be low here, especially for the younger children. Moreover, the Set 1 analysis included performance on Tests 1 and 2 that provided no cues to gender status. These tests were eliminated from the Set 2 analysis. This possibly shaped the data in a less variable way across the tests.

Summary: children.

Again, as with the Set 1 analysis, the children's data revealed a significant effect of Gender, Noun Type, Test, Test x Gender, Noun Type x Gender, Gender x Age, Test x Noun Type x Gender, and Test x Gender x Age. The only difference between Set 1 and Set 2 analyses was that the Set 2 analysis did not reveal a significant interaction of Test x Noun Type. This was possibly due to the reduced ambiguity of the gender of real and nonsense forms in the Set 2 analysis.

Set 2 Analysis: Unambiguous Forms

Adults vs. children.

As was the case with the Set 1 analysis comparing the adults' and the children's data, the Set 2 analysis revealed significant main effects of Gender ($F(1, 46) = 816.366, p < .001$), Noun Type ($F(1, 46) = 60.592, p < .001$), Test ($F(3, 138) = 7.565, p < .001$), and Age ($F(4, 46) = 2.652, p < .05$). The analysis also revealed the significant interactions Noun Type x Gender ($F(1, 46) = 13.471, p < .001$), Test x Gender ($F(3, 138) = 28.956, p < .001$), Gender x Age ($F(4, 46) = 23.053, p < .001$), Test x Noun Type x Gender ($F(12, 138) = 5.554, p < .001$), and Test x Gender x Age ($F(12, 138) = 6.460, p < .001$). Since these effects have been discussed under the Set 1 analysis, individual analysis of each effect will not be discussed further here.

In addition to these effects, the Set 2 analysis revealed a significant interaction of Test x Noun Type x Age ($F(12, 138) = 2.175, p < .05$). Figure 6.22 illustrates these data.

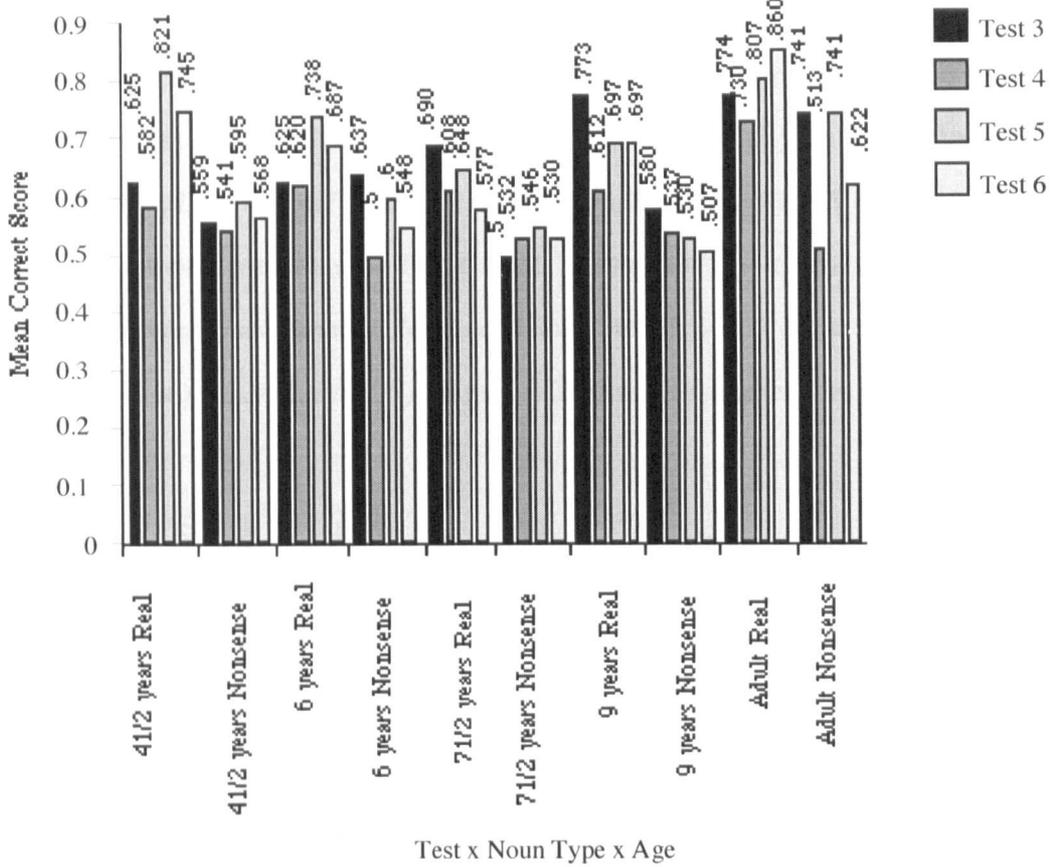


Figure 6.22: Adults’ and Children’s Mean Proportions per Test x Noun Type x Age.

This interaction was due to the following significant effects for the 6-year-olds and the adults:

First, the 6-year-olds’ best performance was on Tests 5 and 6 for real nouns. In particular, they were better on Test 5 than on Test 3 ($F(1, 138) = 13.377, p < .01$), on Test 6 than Test 3 ($F(1, 138) = 6.546, p < .05$), and on Test 5 than on Test 4 ($F(1, 138) = 8.637, p < .01$). With nonsense nouns, they were better on Test 3 than on Test 4 ($F(1, 138) = 9.939, < .01$) and on Test 3 than on Test 6 ($F(1, 138) = 5.407, p < .05$). Similarly, the adults’ performance was best on tests that required the abstraction of the basic form (Tests 5 and 6) with real nouns, and best with adjective forms with nonsense nouns. In particular, for real nouns, the adults were better on

Test 5 than Test 3 ($F(1, 138) = 10.365, p < .01$), on Test 6 than Test 3 ($F(1, 138) = 20.199, p < .001$), on Test 5 than Test 4 ($F(1, 138) = 4.497, p < .05$), and on Test 6 than Test 4 ($F(1, 138) = 11.530, p < .01$). With the nonsense forms, adults were better on Test 3 than on Test 4 ($F(1, 138) = 15.795, p < .001$), on Test 3 than on Test 6 ($F(1, 138) = 6.367, p < .05$), on Test 5 than on Test 4 ($F(1, 138) = 15.812, p < .001$), and on Test 5 than on Test 6 ($F(1, 138) = 6.378, p < .05$).

The analysis also revealed a significant interaction of Noun Type x Gender x Age ($F(4, 46) = 2.933, P < .05$). Figure 6.23 illustrates these data.

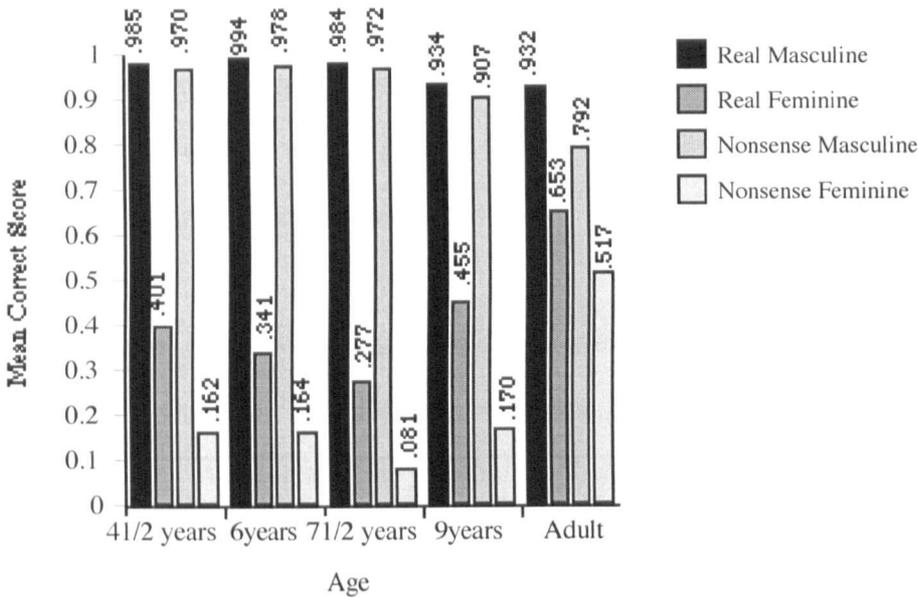


Figure 6.23: Adults' and Children's Mean Proportions per Noun Type x Gender x Age for Unambiguous Cues.

This interaction was due to the following significant effects. First, the 6-year-olds' performance was better on real masculine nouns than on real feminine nouns ($F(1, 46) = 479.787, p < .001$), on nonsense masculine nouns than on nonsense feminine nouns ($F(1, 46) = 632.978, p < .001$), and on real feminine nouns than on nonsense feminine nouns ($F(1, 46) = 18.809, p < .01$). There was no significant difference between their performance on real masculine nouns and nonsense masculine nouns.

Second, the 7 1/2-year-olds were significantly better on real masculine nouns than on real feminine nouns ($F(1, 46) = 475.719, p < .001$), on nonsense masculine than on nonsense feminine nouns ($F(1, 46) = 704.938, p < .001$), and on real feminine nouns than on nonsense feminine nouns ($F(1, 46) = 21.131, p < .01$). Again, there was no significant difference between performance on real masculine and nonsense masculine nouns.

Third, the 9-year-olds were also significantly better on real masculine than on real feminine nouns ($F(1, 46) = 231.317, p < .001$), on nonsense masculine nouns than on nonsense feminine nouns ($F(1, 46) = 446.205, p < .001$), and on real feminine than on nonsense feminine nouns ($F(1, 46) = 43.859, p < .001$).

Finally, the analysis revealed a significant four-way interaction of Test x Noun Type x Gender x Age ($F(12, 138) = 5.554, p < .001$). Tables 6.3a and 6.3b show the mean proportions per condition.

Table 6.3a: Adults' and Children's Mean Proportions per Test x Noun Type x Gender x Age With Masculine Nouns.

	4 1/2-year-olds		6-year-olds		7 1/2-year-olds		9-year-olds		Adult	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Real Masculine										
Test 3	.964	.094	1	0	.972	.083	.818	.276	.786	.216
Test 4	.976	.063	1	0	.981	.056	.964	.083	.990	.038
Test 5	1	0	.975	.079	1	0	.955	.151	.982	.067
Test 6	1	0	1	0	.984	.048	1	0	.969	.083
Nonsense Masculine										
Test 3	.881	.209	.975	.079	.889	.333	.644	.386	.625	.336
Test 4	1	0	.971	.060	1	0	.985	.050	.939	.092
Test 5	1	0	1	0	1	0	1	0	.625	.336
Test 6	1	0	.967	.070	1	0	1	0	.980	.052

Table 6.3b: Adults' and Children's Mean Proportions per Test x Noun Type x Gender x Age With Feminine Nouns.

	4 1/2-year-olds		6-year-olds		7 1/2-year-olds		9-year-olds		Adult	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Real Feminine										
Test 3	.286	.405	.250	.362	.407	.401	.727	.291	.762	.275
Test 4	.187	.257	.240	.207	.236	.224	.259	.287	.470	.370
Test 5	.643	.378	.5	.360	.296	.309	.439	.423	.631	.404
Test 6	.489	.224	.375	.296	.170	.235	.394	.322	.750	.332
Nonsense Feminine										
Test 3	.238	.371	.300	.358	.111	.166	.515	.398	.857	.252
Test 4	.082	.113	.029	.060	.063	.138	.090	.156	.087	.137
Test 5	.190	.262	.200	.270	.093	.188	.061	.135	.857	.252
Test 6	.136	.103	.129	.171	.059	.090	.013	.043	.265	.185

It appears, from the tables, that this effect was due to the fact that on Test 3 (elicited adjective) with both real and nonsense masculine nouns, the adults and the 9-year-olds seemed to perform worse than the other children (i.e., produced more SM on the adjective). With both real and nonsense feminine nouns, on the other hand, the adults and the 9-year-olds seemed to be performing better than the other children (again by producing more SM on the adjective). For Test 5, the adults seemed to be performing worse than all the children with nonsense masculine nouns (i.e., produced more SM), but performed better than all of the other children with nonsense feminine nouns (i.e., produced more basic forms). Therefore the adults tended to produce more mutated forms than the children overall. (All relevant mean proportion scores are shaded in the tables.)

Summary: adults vs. children.

In addition to the effects found for the adults' and the children's separate analyses of the data, and in addition to the effects found for the adults' and the

children's combined analysis under the Set 1 analysis, the Set 2 analysis revealed that the 6-year-olds' and adults' performance was best on Tests 5 and 6 (giving the basic form when given in a gender-marked context). With nonsense nouns, the 6-year-olds and the adults were better at producing the adjective form than the noun form. The 6-, 7 1/2-, and the 9-year-olds were also better on real and nonsense masculine than real feminine nouns, and better on real feminine than on nonsense feminine nouns. Finally, a 4-way interaction of Test x Noun Type x Gender x Age indicated that the adults and the 9-year-olds produced more SM form of adjectives than the other children; this produced better results with feminine nouns and worse performance with masculine nouns. Moreover, the adults produced more SM form of masculine nouns in Test 5 (elicited basic form) than the children, but more basic form of feminine nouns in Test 5.

Noun Recognition

Recall from Chapter 5 that one of the major concerns with Study 2 was the selection of appropriate nouns. The constraints for noun inclusion that were set out for this study (e.g., nouns with unambiguous basic forms, nouns that are not of common gender, native nouns; see Chapter 5) limited the number of nouns from which the nouns for the study could be chosen. However, because it was not always possible to extract suitable nouns from the pool of nouns that could be used, it was feasible that some of the nouns chosen would be more familiar to children (and maybe adults) than others. Therefore, the Exploratory Test Phase 1 (see Chapter 5) was designed to provide this information. The results of the test indicated that some of the children did have problems recognising some of the nouns. If the children responded differently to some nouns in the exploratory test, then it might be that their response patterns would also reflect their differential knowledge in the tests for Study 2. Therefore this information was used to conduct further analysis of the data for Study 2 (this chapter).

Analysis was conducted to investigate whether the children's responses on real feminine nouns were different for those nouns that children recognised at least 80% of the time ("High Recognition" nouns) and those that they recognised 70% or less of the time ("Low Recognition" nouns). This analysis was conducted on feminine nouns only; this was because the children's responses in Study 2 on the forms for masculine nouns and adjectives were always near 100%. Therefore, we would expect that the children retained the basic form of masculine nouns regardless of the children's familiarity with those nouns. The feminine nouns analysed here were /p, t, k, b, d, g, m/-initial nouns; this was because these were the nouns analysed elsewhere in this chapter. Figure 6.24 illustrates the performance on "High Recognition" vs. "Low Recognition" feminine nouns.

A repeated measures ANOVA was conducted in which Recognition (High Recognition (80%+), Low Recognition (70%>)), Test (Tests 1 to 6), and Age (4 1/2-, 6-, 7 1/2-, and 9-year-olds) were treated as independent variables. Although the analysis did not reveal a main effect of Recognition, it revealed an interaction of Recognition x Test ($F(5, 115) = 3.82, p < .01$). Figure 6.24 illustrates these data.

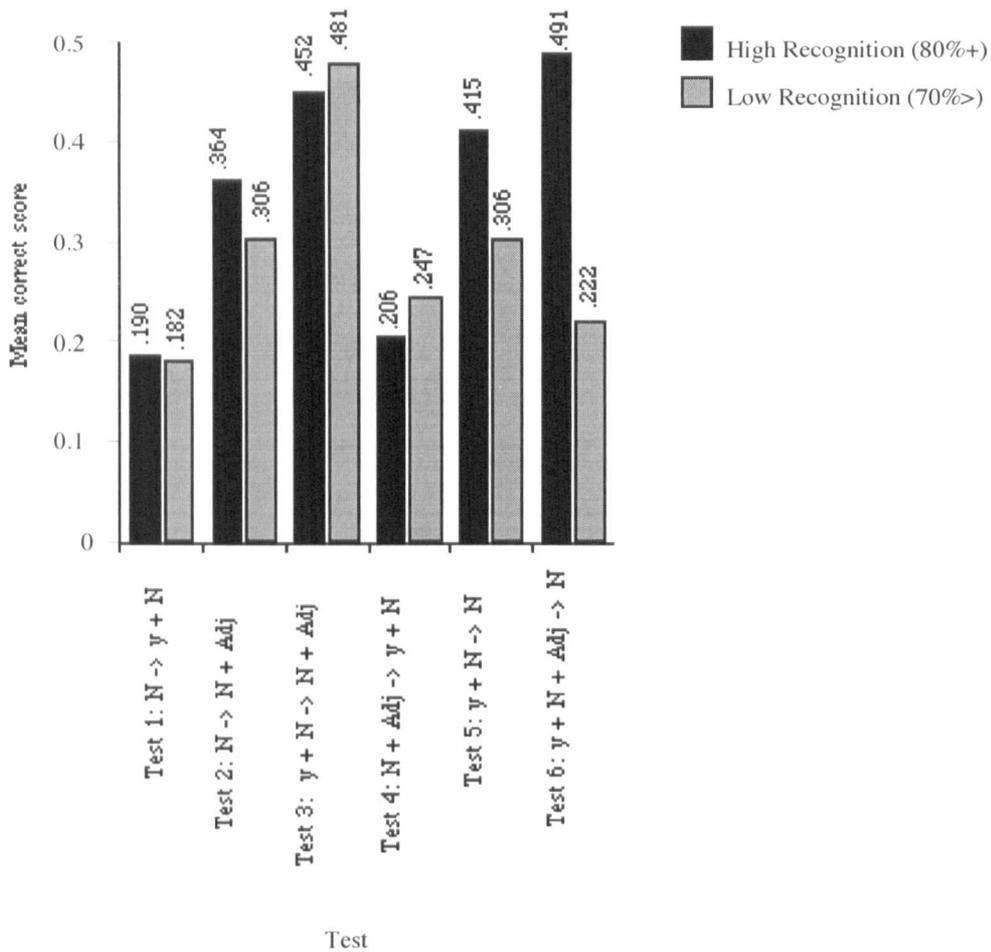


Figure 6.24: Children’s Noun Form Responses on Familiar vs. Less Familiar Feminine Nouns.

Pairwise mean comparisons revealed that this interaction was due to the children’s better performance on the high recognition nouns (80% +) than the low recognition nouns (70%>) in Test 6 ($F(1, 115) = 14.326, p < .001$) and, conversely, the better performance on the low recognition nouns than the high recognition nouns in Test 3 ($F(1, 115) = 4.155, p < .05$). There were no significant effects between performance on both sets of nouns in Tests 1, 2, 4, and 5. The children were able to provide the basic form of high recognition nouns given in gender-marked contexts better than they were able to produce the basic form of low recognition nouns in the same contexts. Generally, what this analysis tells us is that familiarity with real nouns can have an effect on children’s ability to perceive that a noun is in its basic, or its

mutated form. This provides evidence to support the notion of piecemeal learning: children are not able to apply any systematic knowledge that might help them produce the basic form of familiar nouns from gender-marked contexts to less familiar nouns. Rather, they seem to be generating what knowledge they have about the basic form of nouns and when these are less familiar nouns, presented in sometimes ambiguous contexts, children will rely on the form given as the basic form of that noun, and will not be able to systematically work out the “correct” basic form.

Interestingly, the children were also significantly better at producing the appropriate form of adjectives after low-recognition feminine nouns than after high recognition feminine nouns. This could be interpreted as a process whereby the children were more likely to produce the mutated form of adjectives after low recognition feminine nouns as a product of their overextension of the mutated adjective, thus opting for the default response simply because they do not know the gender of low recognition nouns.

Discussion

Generally, Study 2 set out to investigate children’s knowledge of gendered forms. The aim was to explore to what extent, and at what phase in development, children rely on specific cues for gender categorisation available in the input. This would have been shown if children and adults performed well on nonsense forms. The answer to this question is that they generally did not. Initially, this indicates a protracted path to acquisition. More importantly, the adults did not seem to attend to the cues either. This strongly suggests that what the children are acquiring is not an abstract, rule-based knowledge of the Welsh gender system, but rather a more piecemeal, item-by-item learning process.

A second question this study set out to investigate was whether one type of contextual information is more useful as a cue than another. This would have been shown if children (and adults) performed better on Test 4, that gave the noun

followed by the adjective as a cue, than on Test 3, that gave the article followed by the noun as a cue, or vice versa. The answer to this question is unclear. As will be discussed below when I discuss the specific predictions laid out at the beginning of this chapter, there is a strong suggestion that the article followed by a noun when used as a cue elicited more appropriate responses (Test 3) than did the noun followed by an adjective (Test 4). That is, initially, the analysis seems to suggest that both children and adults generally perform better on tests that elicit the adjective form (either given the article + noun as a cue or given no cue) than tests that elicit the noun after the article (either given the noun followed by an adjective as the cue or given no cue). However, when I looked at the interaction of Gender x Test in particular, the children and adults frequently produced SM on adjectives after feminine nouns, thus indicating good performance, and also frequently produced SM on adjectives after masculine nouns, thus indicating poor performance. This suggests that the SM form of adjectives is being overextended to masculine contexts. If we think of frequencies as possible information that can aid their particular response pattern, it seems that in Welsh, adjectives are possibly heard most frequently after the predicative particle *yn* -- a particle that triggers SM. However, it is surprising for such errors to occur with such common adjectives (i.e., colours) in children as old as 9 years, and even more surprising in the adult language. This raises the question of methodological error. However, methodological error is unlikely since this overextension was a peculiar response pattern to adjectives and occurred on tests that elicited the adjective form only (and not to nouns), and all six tests, regardless of the item elicited, were similar both linguistically and non-linguistically.

A third question this study set out to investigate was the extent to which children's knowledge of gender is productive. This would have been shown if children and adults were able to use the cues given to determine the gender of nonsense nouns. The answer to this question is that it appears not to be for children and adults. Both children's and adults' performance on nonsense nouns was poor.

That is, they were unable to attend to the cues to gender status given to determine the gender of novel nouns (however, see Chapters 1 and 9 for discussion of novel nouns as stimuli to indicate gender productivity). This, along with the answer to the first question asked, lends support to the suggestion that children are not learning a formal, rule-based system; rather, they are acquiring the system in piecemeal, item-by-item manner. All of these issues will become clearer as I discuss the predictions laid out at the beginning of this chapter. These predictions will be discussed in turn below.

First, the design of Study 2 allowed the prediction that, if children are using cues to gender to inform themselves about the gender of a noun, they should perform better on tests that provided a cue to gender status (i.e., Tests 3, 4, 5, and 6) than on tests that did not provide a cue to gender status (i.e., Tests 1 and 2). The answer to this prediction is yes, they performed better on tests that provided a cue, although not consistently so. For example, from results indicating main effects of Test for adults and children separately, the children performed better on both Tests 5 and 6 (given a cue) than on Tests 1 and 2 (no cue), the adults performed better on Test 6 than on Tests 1 and 2, on Test 5 than on Test 2, but not better on Test 5 than on Test 1. The children also performed better on Test 4 than on Test 2. Therefore it is probably more accurate to say that, out of eight possible combinations of Tests 3, 4, 5, and 6 with Tests 1 and 2, both adult and children were better on giving the basic form of nouns (when given gender-marked contexts -- Tests 5 and 6) than they were at producing the appropriate forms of nouns and their modifiers given no cue (Tests 1 and 2). In fact, when all interactions were analysed, the only place in which performance on either Test 1 or Test 2 was better than performance on Test 5 or Test 6 was on nonsense feminine nouns produced by the adults. Here, the adults produced more SM forms of adjectives after feminine nouns given no cue (Test 2) than the basic form of nonsense feminine nouns abstracted from gender-marked contexts (Tests 5 and 6). This performance was not surprising given two facts. First, as already mentioned, adults overextended SM on adjectives; this would

account for the better performance on adjectives with feminine nonsense nouns.

Second, as discussed under “Noun Recognition” under the results section above, if children are not familiar with a noun, then when it is presented in an ambiguous context as was provided here, there is no reason why a child, or even an adult, would be able to determine that a noun was in its mutated, or basic form, and hence be able to abstract gender information about the noun. The analysis under “Noun Recognition” indicated that, even with real feminine nouns, if they were not very familiar, children tended to perform poorly on giving the basic form of the nouns (i.e., on Tests 5 and 6). Moreover, the noun recognition analysis revealed that children were better at producing the appropriate form of the adjective with less familiar nouns than with familiar nouns in Test 3. Therefore, given that there is a strong tendency to overextend the SM form of adjectives in the adult data, it is not surprising that adults apply more SM form of adjectives after nonsense nouns as a default form.

Across genders, the adults’ and the children’s responses on Tests 3, 4, 5, and 6 vs. Tests 1 and 2 varied slightly in terms of the direction of the effect. The children were not much better on marking masculine forms in Tests 3, 4, 5, and 6 than they were on Test 1 that elicited the nouns after the article. When the analysis looked at Test x Noun Type x Gender, similar patterns emerged. However, the adults were better with masculine forms on Tests 5 and 6 (elicited basic form) than on Tests 1 and 2 (elicited noun and adjective), and on Test 4 (elicited noun given a cue) than on Test 2 (elicited adjective given no cue). The children were better with masculine nouns on Tests 4, 5, and 6 than on Test 2. For the adults, performance was better on Test 1 (elicited noun given no cue) than on Test 3 (elicited adjective given a cue). Again, given that adults and children overextended the SM of adjectives, it is not surprising that the adults’ performance was better on Test 1 (elicited noun) than on Test 3 (elicited adjective) with masculine forms. The opposite trend was found with feminine forms: both adults and children were better on Test 3 than on Test 1. However, contrary to the prediction, the adults were better

on Test 2 with feminine forms than on Test 4. Again, it is not surprising that they were better on Test 2 given that it elicited the adjective.

Finally, within the no cue tests -- Tests 1 and 2 -- there were some significant effects. This is not surprising given that Test 1 elicited the noun and Test 2 elicited the adjective. Unsurprisingly, both adults and children were better on Test 1 than Test 2 with nonsense masculine nouns since they overextended SM onto the adjectives in Test 2. In contrast, the children were better on Test 2 than on Test 1 with feminine nouns, again, possibly due to the overextension of SM on adjectives.

Therefore it seems that responses on the cued tests were better than responses on the non-cued tests, although this was not consistently so. Moreover, this difference depends on the linguistic item elicited: nouns or adjectives. Because of the peculiarity of responses on adjectives, it is difficult to say whether any significant effects were due to the cueing involved, or simply to the peculiarity of responding on the adjective form.

A second prediction for Study 2 was that if children are using the cues to determine the gender status of nouns, children should perform better when multiple cues are provided (Test 6) than when a single cue is provided (Test 5). Since Tests 5 and 6 required the participants to perform the same procedure to achieve the elicited goal, I will restrict my discussion here to performance between Tests 5 and 6. This will reduce any complications in the interpretations of performance on tests that required different responses (e.g., the peculiarity of responding on adjectives). (However, since Tests 1 and 4, and Tests 2 and 3 elicited the same forms (only one test provided a cue and the other did not), any difference on these tests will be discussed.)

From the adult data, there was no significant effect between performance on both tests in the Set 1 analysis. That is, when the gender, and therefore the potential basic form of the noun, could be ambiguous, there was no difference in responding. This is not to say that the adults' performance here was equally poor. On the contrary, the adults' overall ability seems to have been predominantly best on Tests 5

and 6. However, there was a difference in responding on Tests 5 and 6 when the analysis looked at unambiguous contexts only (the Set 2 analysis). When the adults' and the children's data were analysed together, there was a main effect of Test whereby performance was significantly better on Test 5 than on Test 6. The interaction Test x Gender revealed that the adults were better on Test 6 than on Test 5 with masculine nouns, but better on Test 5 than on Test 6 with feminine nouns. The children were also better on Test 5 than on Test 6 with feminine nouns here. The interaction Test x Noun Type x Gender further revealed that this difference was to be found within the nonsense nouns: the adults were better on Test 6 than on Test 5 with nonsense masculine nouns and on Test 5 than on Test 6 with nonsense feminine nouns. Although this effect was found only in unambiguous contexts, it seems that for nonsense forms, the children might have more problems with producing the basic form of feminine nonsense nouns when given in multiple-cued contexts than in single-cued contexts. This could be due to the added attention that is required when there is more than one item that can mark gender, especially when marking the feminine form (i.e., attention to the presence of mutation on each item). For masculine nouns, on the other hand, the more cues that are present (i.e., the more non-mutation on the items) seems to better indicate that the noun is masculine. Another possible reason for this performance could be due to another overextension process. Because the response patterns seem to be the reverse of each other in this way, additional analysis was conducted on the adult data of Test 5 for nonsense nouns to see if the response pattern was the same for both genders, only "correct" for one gender and "incorrect" for another. Results showed that the response patterns were different; the response pattern was not a product of overextension.

Contradictory results were found when analysing cued versus non-cued tests. Adults performed better on Test 1 than on Test 4. However, it is more difficult to explain why the adults' performance would be better on Test 1 that elicited the noun after the article given no cue, than on Test 4 that also elicited the noun after the article given a cue. One explanation might be procedural. Test 4 was

originally designed to elicit the adjective (i.e., elicited article + noun + adjective) and therefore required more attention to their answer: the fact that participants had to name the colour might have taken their attention away from the noun. Also, it could be that giving the noun followed by an adjective as a cue and eliciting the article followed by the noun does not work: the elements do not follow sequentially as giving the article followed by the noun and eliciting the adjective does. This in itself might have been confusing to the participants. The individual analysis of the adults' data in the Set 1 analysis revealed that the adults were better with the marking of feminine forms in Test 3 than in Test 2. Here, the fact that the adults were given the article followed by the noun as the trigger might have automated the SM response since the elicited responses followed logically from the triggering elements.

Therefore, it seems that the benefit of multiple cues over a single cue is gender-dependent. Performance is better on masculine nouns when multiple cues are provided, but performance is better on feminine nouns when a single cue is provided. In addition, the benefit of having a cue over having no cue is context-specific. In some cases, giving a cue can add confusion rendering more errors than if a cue was not given; in other cases, when a cue forms the beginning elements of a sequential expression, it might be useful in triggering the appropriate form that follows logically in the sequence.

A third prediction from Study 2 was if gender is a property of nouns, then children should perform better on tests that elicited the noun form (i.e., Tests 1, 4, 5, and 6) than on tests that elicited the adjective form (i.e., Tests 2 and 3). Answering this prediction is again difficult. For the Set 1 analysis, the main effect of Test indicated that the adults were better on Test 6 than on Test 3, on Test 6 than on Test 2, and on Test 5 than on Test 2. For children, the main effect of Test for the Set 1 analysis indicated that the children were better on Tests 5 and 6 than on Tests 2 and 3, and better on Test 4 than on Test 2. However, for the Set 2 analysis, the adults' overall better performance was on Test 3 than on Test 4 (recall that Tests 1 and 2 were not analysed in the Set 2 analysis). Therefore it seems that overall, across the

two sets of analysis, children and adults rarely performed better on adjective production (Tests 2 and 3) than on the basic forms of nouns (Tests 5 and 6). However, interaction effects indicated that when participants performed better on adjectives than on basic form, it was with feminine nouns. When children's and adults' responses were investigated within interactions with Gender, performance seemed predominantly better on adjectives than on the noun form with feminines and better on nouns than on adjectives with masculines. Again, it is difficult to determine whether this performance has to do specifically with gender because of the peculiarity of responding with the adjectives.

A fourth prediction of Study 2 was if gender is a property of nouns, children should perform better on real nouns than on nonsense forms. The answer to this prediction is yes: both adults and children performed better overall on real nouns than on nonsense nouns. There was an overall main effect for both sets of analyses and for the adults' and children's data separately. For the adults, although both Set 1 and Set 2 analyses revealed significant effects, the difference in means between real and nonsense nouns in the Set 2 analysis was smaller than in the Set 1 analysis (Set 1: real = .815, nonsense = .560; Set 2: Real = .793, Nonsense = .654). This is not surprising given that the nonsense nouns appeared in more ambiguous contexts in Set 1 and were unambiguous in the Set 2 analysis. The adults were also better on real masculine nouns than on nonsense masculine nouns and on real feminine nouns than on nonsense feminine nouns.

The children's responses were lower than the adults' responses for real nouns in the Set 1 analysis. There was not much difference between the adults' and the children's responses for the nonsense nouns. Again, this indicates that neither children nor adults are basing their choices on their formal knowledge of the system (the children's mean score for real nouns was .620 (Adults = .815) and their mean score for nonsense nouns was .527 (Adults = .560); this indicates that the adults' and the children's knowledge is not productive with nonsense nouns). For the Set 2 analysis, on the other hand, the children's mean score for responses on both real and

nonsense nouns increased (Set 2: real = .671, nonsense = .550), although the increase in responses on real nouns was greater than the increase in responses on nonsense nouns, and the marking of the nonsense forms was at chance. Across adults and children, the difference between the adults' and the children's responses on real nouns was smaller in the Set 2 analysis (difference = .122) than in the Set 1 analysis (difference = .195). However, for nonsense nouns, the difference between the adults and children was smaller in the Set 1 analysis (difference = .033) than in the Set 2 analysis (difference = .104).

Like the adults, the children in both sets of analyses performed better on real feminine nouns than on nonsense feminine nouns. However, unlike the adults, the children's performance for real masculine and nonsense masculine did not differ. Familiarity with real masculine nouns was not always enough to indicate gender to the children in the Set 1 analysis ($M = .957$ for real nouns and .933 for nonsense nouns). The children's performance when all contexts were unambiguous (i.e., Set 2 analyses) was marginally better ($M = .972$ for real nouns and .954 for nonsense nouns). Compared to the adults, the children marked masculine nonsense nouns appropriately more often ($M = .797$ for adults). This was due to the adults' overextension of SM onto adjectives after nonsense masculine nouns.

A fifth prediction of Study 2 was that if children are learning an abstract, rule-based system, their performance on nonsense nouns should improve with age. To answer this prediction, I will discuss any differences in performance by age, with special attention to performance on nonsense nouns where the results revealed such effects.

Set 1 analyses revealed no main effect of age within the children's age groups. This indicates that the children are not improving as they get older, either with real, or with nonsense forms. However, the analysis revealed a few interaction effects. First, 7 1/2-year-olds were better than the 9-year-olds on masculine nouns. Second, there was an effect of Test on masculine nouns for the 6-year-olds. They were significantly better on Tests 1, 4, 5, and 6 (elicited the noun form) than they

were on Tests 2 and 3 (elicited the adjective form). Third, there was also an effect of Test for masculine and feminine nouns at age 9 years: the 9-year-olds' performance on masculine nouns was due to better performance on tests that elicited the noun form than on tests that elicited the adjective form. Their performance on feminine nouns was the reverse of this. What these age effects mean is that the 9-year-olds produced more overextensions of SM on adjectives than the 7 1/2-year-olds, hence their lower performance on masculine nouns. The 9-year-olds' performance on masculine nouns is similar to the adults' in terms of the overextension of SM on adjectives. This performance was also present in the 6-year-olds, although not to the same extent as the 9-year-olds. Therefore this initially indicates that performance on masculine forms becomes worse as the children get older. However, a second explanation of this behaviour is that the older children are starting to make the same overextension errors on the adjectives as the adults. Developmentally, this indicates that children's behaviour with masculine nouns gradually becomes more in line with the adult behaviour, under these experimental conditions, as they get older.

Set 1 analyses also revealed that the adults performed better overall than all of the children. However, further analysis revealed that this difference was in the performance on real nouns. There were non-significant effects across ages on nonsense nouns. Across genders, the adults were better than the children on both masculine and feminine nouns. Across Test, Gender, and Age, performance on masculine nouns in Tests 2 and 3 that elicited the adjective form decreased with age. With feminine nouns on the other hand, performance on these two tests more or less increased with age (performance on all tests was low on feminine nouns for the 7 1/2-year-olds, lower than for the 6-year-olds). Performance on Test 4 (elicited noun given a cue) gradually increased from 4 1/2-years to adulthood.

Set 2 analyses revealed an interaction of Test x Gender x Age for the children. This analysis revealed that the 9-year-olds performed badly with masculine nouns on Test 3 (i.e., overextension of SM onto adjectives after masculine nouns). This again indicates that performance on Test 3 either decreased with age, or

approached the adult behaviour. Performance on Test 3 increased with age for feminine nouns since the 9-year-olds performed the best on Test 3, again, due to their preference for the SM form of adjectives. Performance with feminine nouns on Test 4 remained approximately the same across ages. Finally, performance on Tests 5 and 6 seemed to get worse with age.

Overall, the adults were significantly better than the children in the Set 2 analysis. However, they were not different from the 4 1/2-year-olds. This was possibly due to the nature of the data produced by the 4 1/2-year-olds. Their data were less consistent than those of the other children. When performance across genders was analysed, the analysis revealed that the adults were significantly better than all of the children with feminine nouns, but significantly worse than the 4 1/2-, the 6-, and the 7 1/2-year-olds with masculine nouns. This gives more prominence to the suggestion that the children are not getting worse with masculine nouns as they get older. Rather, they are gradually performing in line with the adult behaviour, hence the lack of difference between the 9-year-olds' and the adults' performance on masculine nouns. Performance on real nouns on Tests 3 seems to increase with age, where the 9-year-olds perform the same as the adults. Performance on Test 4 seems to stay at the same level across children's age groups, well below the adults' mean response. Performance on Test 5 seems to decrease with age, although the 4 1/2-year-olds and the adults perform the same (although again, this was probably due to the nature of the 4 1/2-year-olds' data). Finally, performance on Test 6 seems to reflect a U-shaped curve, where the adults are still responding better than all of the children. The interaction Noun Type x Gender x Age indicated that performance on real masculine nouns seems to be level across ages, whereas performance on nonsense masculine nouns seems to decrease. Performance on feminine real nouns seems to reflect a U-shaped curve, whereby the adults are performing better than all of the children. Finally, performance on nonsense feminine nouns indicates that the children performed much worse than the adults, although the adults are only performing at chance.

When the participants' performance across Test x Noun Type x Gender x Age was examined, again, the 9-year-olds and the adults performed the worst on Test 3 (adjective), on both real and nonsense masculine nouns. Surprisingly, for nonsense masculine nouns, the adults performed the worst on Test 5. This response pattern coincides with the results found with the second prediction discussed above (discussion of multiple cues vs. a single cue). With feminine nouns, performance on Test 3 increases with age. Performance on Test 5 decreases with age; however, with nonsense feminine nouns the adults perform much better than the children.

Finally, Study 2 predicted that children will perform better when given unambiguous cues than when given ambiguous cues to gender status. This would have been shown if participants' responses were better on Tests 4 and 6 than on Tests 1, 2, 3, and 5 (see "Ambiguity of Surface Forms of Nouns" under the method section above). Results indicated mixed responses. Both adults and children were always better on masculine nouns when unambiguous cues were given than when ambiguous cues were given. However, performance on feminine nouns was mixed. Whenever the analysis indicated an effect of test (either as a main or as an interaction effect), performance on Test 3 (ambiguous cues) was always better than on tests providing unambiguous cues. However, again, this might have to do with the peculiarity of responding on adjective forms on Test 3 than the ambiguity of the cues.

Summary

Overall, the children's performance did not reach the level of the adults' performance. With the marking of masculine nouns, the children responded similarly to the adults. However, there were a few places in which the children were more consistent with expected forms than the adults, namely on nonsense masculine nouns and the overextension of the SM form of the adjectives after masculine nouns. The peculiar response patterns of the adults here, which the 9-year-olds also showed more than the other children, indicates that the children are gradually performing as

the adult on the marking of adjectives after masculine nouns under these test conditions. This does not indicate that the children have reached the adult system of marking masculine nouns, however. Recall from Chapter 4 that adults performed better than children on the marking of adjectives under semi-naturalistic conditions. Therefore, it is likely that what the adults and the 9-year-olds might be doing here is overextending the SM form of adjectives, maybe as a product of the frequency of SM form of adjectives in the language (and in the tests) and as a product of their increased knowledge of the language.

It is difficult to discuss and interpret some of the predictions laid out at the beginning of this chapter because of the peculiar response patterns on the adjectives. Nevertheless, what the results strongly suggest is that Welsh-speaking children are not learning an abstract, rule-based system of gender marking. Rather, the acquisition is a long, drawn-out process that seems to be acquired for the masculine gender around about 9-years of age, although imperfectly. However, children have not acquired the marking of feminine gender to the adult ability even at 9 years of age. Finally, the results indicate that neither children's nor adults' knowledge of gender is productive. This indicates a more piecemeal, item-by-item learning route to the acquisition of Welsh grammatical gender.

However, since it is the feminine gender that is marked by SM in the contexts investigated here, and it is the feminine gender that is marked the least consistently according to the adult norm by children, one concern is whether the children's performance here had anything to do with gender knowledge. It could be that children even by the age of 9 years have not yet fully acquired the SM system to the adult ability. I will return to this issue in Chapter 8.

The contexts investigated in this chapter were the noun after the article and the adjective after the noun. These perform a "local" lexical concord function. But gender can also involve distant marking in the form of pronouns and possessives. Distant gender marking in Welsh is particularly complex. It involves the production of three different noun forms after the possessive adjective *ei* "his, her": the SM

form, the AM form, and the basic form. Contrary to what happens with local gender marking in Welsh, SM in distant marking is involved with the masculine gender, whereas the AM and the basic form are involved with the feminine. Therefore, another study, Study 3, was designed to investigate children's ability with the distant marking of grammatical gender. Inanimate nouns were deliberately chosen as the stimuli so that it was possible to investigate the extent to which distant gender marking in spoken Welsh still reflects a grammatical gender system or has gradually come to reflect a more semantic gender system.

CHAPTER 7

Study 3: Distant Gender MarkingIntroduction

In Chapters 1 and 2 we saw that grammatical gender not only has to do with local lexical concord but also with distant reference in the choice of pronouns and possessives. These distant elements must agree with the gender of the noun to which they refer. This chapter presents data on children's elicited productions of the distant gender linkage between nouns and the possessive form *ei* "his, her, its (masculine, feminine)".

Recall from Chapter 2 that the masculine possessive *ei* triggers SM on /p, t, k, b, d, g, ʔ, ʃ, m/-initial nouns, and the feminine possessive *ei* triggers AM on /p, t, k/-initial nouns. /b, d, g, ʔ, ʃ, m/-initial nouns remain in their basic form after the feminine *ei*. The following examples illustrate these:

1. *Cath* "cat" is feminine, therefore *pen* "head" will undergo AM after *ei*:

Syrthiodd y gath ar ei phen

Fall-the-cat-on-its (feminine)-head

"the cat fell on its (feminine) head"

2. *Ci* "dog" is masculine, therefore *trwyn* "nose" will undergo SM after *ei*:

Syrthiodd y ci a brifo ei drwyn

Fall-the-dog-and-hurt-its (masculine)-nose

" the dog fell and hurt its (masculine) nose"

3. *Basged* “basket” is feminine, therefore *gwaelod* “bottom” will retain its basic form after *ei*:

Dyma'r fasged sydd â thwll yn ei gwaelod

here is the-basket-Aux. be-with-hole-in-its (feminine)-bottom

“here’s the basket with a hole in its (feminine) bottom”

4. *Llyfr* “book” is masculine, therefore *tudalennau* “pages” will undergo SM after *ei*:

Mae'r llyfr hwn wedi colli un o'i dudalennau

Aux. be the-book-this (masculine)-has-lost-one-of-its (masculine)-pages

“this book has lost one of its (masculine) pages”

5. *Llong* “ship” is feminine, therefore *angor* “anchor” can undergo AM after *ei*:

Dyma'r llong, a dyma'i hangor

Here is the-ship-and-here is its (feminine)-anchor

“here’s the ship, and here’s its (feminine) anchor”

6. *Cadair* “chair” is feminine, therefore *ochr* “side” can undergo AM after *ei*:

Mae'r gadair wedi disgyn ar ei hochr

Aux. be the-chair-has-fallen-on-its (masculine)-side

“the chair had fallen on its (feminine) side”

Throughout this chapter, I will refer to the possessor in the sentence (*cath* “cat”, *ci* “dog”, *basged* “basket”, *llyfr* “book”, *llong* “ship”, and *cadair* “chair” in the examples above) as the *possessor*; the co-referential noun that is used in

conjunction with the possessive *ei* (*pen* “head”, *trwyn* “nose”, *gwaelod* “bottom”, *tudalennau* “pages”, *angor* “anchor”, and *ochr* “side” in the examples above) will be referred to as the *elicited noun*.

Recall from Chapter 1 that gender research has shown that children perform better on localised marking than on distant marking of gender (e.g., Mulford & Morgan, 1983; Mills, 1986a, 1986b). If Welsh-speaking children follow the trend of other languages to the effect that they will perform better on local constructs than on distant constructs, we would expect poor performance on distant forms given their performance on local gender constructs. On the other hand -- in line with the adult data presented in Chapter 2 in which adults were shown to produce AM after the feminine possessive *ei* “her” more than any other trigger -- Welsh-speaking children might perform better on the marking of possessive forms solely because of the functional load they carry (see Chapter 2). An inappropriate use of form after *ei* changes the meaning of the possessor from something that is masculine or feminine to something that is the reverse. For local gender constructs, the use of the appropriate form of the noun after the definite article and of adjectives modifying nouns does not interfere with the meaning: the “correct” form *y gath* and the “incorrect” form **y cath* “the cat (feminine)” will both mean “the cat”. For possessives, on the other hand, constructs such as *ei phen* < *pen* “her/its head”, *ei choes* < *coes* “her/its leg”, and *ei throed* < *troed* “her/its foot” indicates a feminine possessor because of the AM of the word following *ei*. Constructs such as *ei ben* < *pen* “his/its head”, *ei goes* < *coes* “his/its leg”, *ei droed* < *troed* “his/its foot” always indicate a masculine possessor because of the SM on the word following *ei*; constructs such as *ei braich* < *braich* “her/its arm”, *ei drws* < *drws* “her/its door”, *ei gwallt* < *gwallt* “her/its hair”, *ei llaw* < *llaw* “her/its hand”, *ei rhosyn* < *rhosyn* “her/its rose”, and *ei maneg* < *maneg* “her/its glove” always indicate a feminine possessor because of the non-mutation of the word following *ei*; and constructs such as *ei fraich* < *braich* “his/its arm”, *ei ddrws* < *drws* “his/its door”, *ei wallt* < *gwallt* “his/its hair”, *ei law* < *llaw* “his/its hand”,

ei rosyn < *rhosyn* “his/its rose”, and *ei faneg* < *maneg* “his/its glove” always indicate masculine possession because of the SM on the word following *ei*. This is especially the case for human possessors that carry a clear biological cue to gender. For inanimate possessors, however, the appropriate use of the word form after *ei* depends on the speaker’s knowledge of the gender of the possessor to which it refers. The data presented in this chapter focus on inanimate possession.

Aims

This study employed a set of inanimate nouns, nouns that were also used in Study 2. The aims of this study were to investigate the following:

- To what extent do children (and adults) mark distant gender constructs in Welsh?
- To what extent are children (and adults) able to attend to a specific cue to gender status of the possessor to determine the appropriate marking of the distant construct?

Based on what was found in Study 2, the following two predictions can be made.

- Welsh-speaking children will mark the possessive *ei* for its gender at the same rate when they are given a cue to gender as when they are not -- this is because they appear not to find cues to the gender of the noun useful.
- Because children do not appear to find linguistic cues useful as a guide to gender, and do not mark nouns for their genders regularly and productively, they will depend on the masculine form (i.e., *ei* followed by SM) as the default (given that SM is triggered by more items and affects more sounds).

Method

Participants

Adults.

The same 15 L1 Welsh-speaking adults who took part in Study 2 took part in this study. All adults were L1 Welsh-speakers. The same age groups were employed here: Group 1 included adults between the ages of 16 and 30 years ($N = 5$, mean age 20 years); Group 2 included adults between the ages of 31 and 50 years ($N = 5$, mean age 38 years); and Group 3 included adults between the ages of 51 and 60+ years ($N = 5$, mean age 53 years).

Children.

All 48 children who took part in Study 2 were encouraged to take part in this study. However, some of the children ($N = 3$) did not respond well to the test, and some ($N = 9$) refused to take part. The children who did take part in Study 5 fell into the four age groups as follows: Group 1, which comprised 4 1/2-year-old children ($N = 7$, age range = 4;4 to 5;4 years, mean age = 4;11 years); Group 2, which comprised 6-year-old children ($N = 9$, age range = 5;9 to 6;7 years, mean age = 6;3 years); Group 3, which comprised 7 1/2-year-old children ($N = 9$, age range = 6;9 to 7;9 years, mean age = 7;3 years); and Group 4, which comprised 9-year-old children ($N = 11$, age range = 8;4 to 9;7 years, mean age = 8;9 years). All children were L1 Welsh-speakers.

Linguistic Stimuli

Possessors.

A set of 88 real nouns, 44 masculine and 44 feminine, was selected as the possessors for this study. These were made up of four masculine and four feminine nouns for each of the following initial sounds: /p, t, k, b, d, g, ʔ, ɹ, m, n/. An additional set of eight vowel-initial nouns (four masculine and four feminine)

was also selected. All nouns were names of inanimate objects. For ease of clarification, these are termed the *possessors*.

Table 7.1 shows the possessor nouns used in the study. Half the masculine possessors and half the feminine possessors were presented with a cue to their gender; the remaining nouns were presented with no cues to gender. In the cued condition, each possessor noun was presented in a definite noun phrase, for example:

yn y llun yma fedri di weld y gadair
 in-the-picture-this-can-you-see-the-chair
 “in this picture you can see the chair”

In the non-cued condition, each possessor noun was presented in an indefinite noun phrase, for example:

yn y llun yma fedri di weld coeden
 in-the-picture-this-can-you-see-(a) tree
 “in this picture you can see (a) tree”

Table 7.1: The Possessor Nouns Used in Each of the Conditions in the Study.

Initial Phoneme	Cue		No Cue	
	Feminine	Masculine	Feminine	Masculine
/p/	<i>pabell</i> “tent” <i>pêl</i> “ball”	<i>poptry</i> “oven” <i>plât</i> “plate”	<i>pais</i> “petticoat” <i>pedol</i> “horseshoe”	<i>papur</i> “paper” <i>pwrs</i> “purse”
/t/	<i>trol</i> “cart” <i>telyn</i> “harp”	<i>to</i> “roof” <i>tecell</i> “kettle”	<i>taten</i> “potato” <i>torth</i> “loaf”	<i>tegan</i> “toy” <i>tŷ</i> “house”
/k/	<i>cadwyn</i> “necklace” <i>cadair</i> “chair”	<i>cwch</i> “boat” <i>caws</i> “cheese”	<i>coeden</i> “tree” <i>cyllell</i> “knife”	<i>crys</i> “shirt” <i>cetyn</i> “pipe”
/b/	<i>brechdan</i> “sandwich” <i>basged</i> “basket”	<i>bath</i> “bath” <i>bwrdd</i> “table”	<i>bricsen</i> “brick” <i>breichled</i> “bracelet”	<i>blodyn</i> “flower” <i>barcut</i> “kite”
/d/	<i>dol</i> “doll” <i>daear</i> “earth”	<i>drws</i> “door” <i>drwm</i> “drum”	<i>diod</i> “drink” <i>deilen</i> “leaf”	<i>drych</i> “mirror” <i>dis</i> “die”
/g/	<i>gwe</i> “web” <i>gwobr</i> “prize”	<i>gwn</i> “gun” <i>goleudy</i> “lighthouse”	<i>gwialen</i> “rod” <i>gwasgod</i> “waistcoat”	<i>gwely</i> “bed” <i>glaw</i> “rain”
/h/	<i>llaw</i> “hand” <i>llong</i> “ship”	<i>lliain</i> “cloth” <i>llyfr</i> “book”	<i>llif</i> “saw” <i>llawes</i> “sleeve”	<i>llythyr</i> “letter” <i>llwyn</i> “bush”
/ʃ/	<i>rhaw</i> “shovel” <i>rhwyd</i> “net”	<i>rhosyn</i> “rose” <i>rhuban</i> “ribbon”	<i>rhewgell</i> “freezer” <i>rhwyf</i> “oar”	<i>rhew</i> “ice” <i>rhif</i> “number”
/m/	<i>modrwy</i> “ring” <i>matsien</i> “match”	<i>map</i> “map” <i>morthwyl</i> “hammer”	<i>mellten</i> “bolt of lightning” <i>moronen</i> “carrot”	<i>mynydd</i> “mountain” <i>mat</i> “mat”
/n/	<i>nant</i> “brook” <i>neuadd</i> “hall”	<i>napcyn</i> “napkin” <i>nenfwd</i> “ceiling”	<i>nodwydd</i> “needle” <i>nofel</i> “novel”	<i>nionyn</i> “onion” <i>nodyn</i> “musical note”
Vowel	<i>awyren</i> “aeroplane” <i>weiren</i> “wire”	<i>wŷ</i> “egg” <i>inc</i> “ink”	<i>ysgol</i> “ladder” <i>esgid</i> “shoe”	<i>ysbyty</i> “hospital” <i>asgwrn</i> “bone”

An additional set of possessor nouns comprised the warm-up items. All warm-up items were objects familiar to children. These were *tedi* “teddy”, *cwpan* “cup”, and *siglen*¹ “swing”. These nouns were carefully selected so that it was possible for their co-referential part nouns (the elicited nouns) to have non-mutable initial sounds (see below). To replicate the conditions in the experimental session, one of the warm-up nouns -- *siglen* “swing” -- was presented with a definite article; the other two were presented without an article.

¹ If a child did not respond to *siglen* “swing”, I proceeded to name the object by its more familiar term borrowed from English -- *swing* “swing”.

Elicited nouns.

All words elicited after *ei* were nouns². For ease of clarification, these nouns will be called the *elicited nouns*. The elicited nouns were the names of parts of the objects depicted. The elicited nouns were paired with the possessor nouns according to the following criteria: (a) the elicited nouns were names of salient parts of the referents of the possessors; (b) not all possessors beginning with a given sound were paired with the same part word; and (c) the number of part nouns that began with a given sound and referred to masculine possessors was approximately the same as the number of part nouns that began with that sound and referred to feminine possessors.

Table 7.2 shows the elicited nouns that were paired with the possessors.

² It was decided to elicit nouns after *ei* since in his study, Thomas (1984) found that adult Welsh speakers tend to mutate nouns more frequently after *ei* than verbal nouns.

Table 7.2: The Elicited Nouns Selected to be Used in Conjunction With the Possessor Nouns.

	Feminine Possessor	Elicited Modified Noun	Masculine Possessor	Elicited Modified Noun
/p/	<i>pabell</i> “tent” <i>pêl</i> “ball” <i>pais</i> “petticoat” <i>pedol</i> “horseshoe”	<i>drws</i> “door” <i>canol</i> “middle” <i>gwaelod</i> “bottom” <i>diwedd</i> “end”	<i>popty</i> “oven” <i>plât</i> “plate” <i>papur</i> “paper” <i>pwrws</i> “purse”	<i>drws</i> “door” <i>canol</i> “middle” <i>top</i> “top” <i>ochr</i> “side”
/t/	<i>trol</i> “cart” <i>telyn</i> “harp” <i>taten</i> “potato” <i>torth</i> “loaf”	<i>olwyn</i> “wheel” <i>lliny</i> “string” <i>canol</i> “middle” <i>top</i> “top”	<i>to</i> “roof” <i>tecell</i> “kettle” <i>tegan</i> “toy” <i>tŷ</i> “house”	<i>corn</i> “chimney” <i>caead</i> “lid” <i>bocs</i> “box” <i>to</i> “roof”
/k/	<i>cadwyn</i> “necklace” <i>cadair</i> “chair” <i>coeden</i> “tree” <i>cylllell</i> “knife”	<i>diwedd</i> “end” <i>cefn</i> “back” <i>brigyn</i> “branch” <i>min</i> “blade edge”	<i>cwch</i> “boat” <i>caws</i> “cheese” <i>crys</i> “shirt” <i>cetyn</i> “pipe”	<i>rhwyf</i> “oar” <i>ochr</i> “side” <i>coler</i> “collar” <i>mwg</i> “smoke”
/b/	<i>brechdan</i> “sandwich” <i>basged</i> “basket” <i>bricsen</i> “brick” <i>breichled</i> “bracelet”	<i>pen</i> “end” <i>gwaelod</i> “bottom” <i>ochr</i> “side” <i>diwedd</i> “end”	<i>bath</i> “bath” <i>bwrdd</i> “table” <i>blodyn</i> “flower” <i>barcut</i> “kite”	<i>gwaelod</i> “bottom” <i>ochr</i> “side” <i>petal</i> “petal” <i>lliny</i> “string”
/d/	<i>dol</i> “doll” <i>daear</i> “earth” <i>diod</i> “drink” <i>deilen</i> “leaf”	<i>llaw</i> “hand” <i>canol</i> “middle” <i>rhew</i> “ice” <i>gwaelod</i> “bottom”	<i>drws</i> “door” <i>drwm</i> “drum” <i>drych</i> “mirror” <i>dis</i> “die”	<i>gwaelod</i> “bottom” <i>canol</i> “middle” <i>top</i> “top” <i>ochr</i> “side”
/g/	<i>gwe</i> “web” <i>gwobr</i> “prize” <i>gwialen</i> “rod” <i>gwasgod</i> “waistcoat”	<i>canol</i> “middle” <i>ochr</i> “side” <i>pen</i> “end” <i>poced</i> “pocket”	<i>gwn</i> “gun” <i>goleudy</i> “lighthouse” <i>gwely</i> “bed” <i>glaw</i> “rain”	<i>pen</i> “end” <i>pen</i> “end” <i>gwaelod</i> “bottom” <i>canol</i> “middle”
/h/	<i>llaw</i> “hand” <i>llong</i> “ship” <i>llif</i> “saw” <i>llawes</i> “sleeve”	<i>bys</i> “finger” <i>mwg</i> “smoke” <i>min</i> “blade edge” <i>botwm</i> “button”	<i>lliain</i> “cloth” <i>llyfr</i> “book” <i>llythyr</i> “letter” <i>llwyn</i> “bush”	<i>patrwm</i> “pattern” <i>top</i> “top” <i>amlen</i> “envelope” <i>brigyn</i> “branch”
/r/	<i>rhaw</i> “shovel” <i>rhwyd</i> “net” <i>rhewgell</i> “freezer” <i>rhwyf</i> “oar”	<i>pen</i> “end” <i>gwaelod</i> “bottom” <i>caead</i> “lid” <i>gwaelod</i> “bottom”	<i>rhosyn</i> “rose” <i>rhuban</i> “ribbon” <i>rhew</i> “ice” <i>rhif</i> “number”	<i>petal</i> “petal” <i>diwedd</i> “end” <i>bocs</i> “box” <i>diwedd</i> “end”
/m/	<i>modrwy</i> “ring” <i>matsien</i> “match” <i>mellten</i> “bolt of lightning” <i>moronen</i> “carrot”	<i>bocs</i> “box” <i>pen</i> “end” <i>pen</i> “end” <i>gwaelod</i> “bottom”	<i>map</i> “map” <i>morthwyl</i> “hammer” <i>mynydd</i> “mountain” <i>mat</i> “mat”	<i>gwaelod</i> “bottom” <i>diwedd</i> “end” <i>top</i> “top” <i>pen</i> “end”
/n/	<i>nant</i> “brook” <i>neuadd</i> “hall” <i>nodwydd</i> “needle” <i>nofel</i> “novel”	<i>top</i> “top” <i>llwyfan</i> “stage” <i>pen</i> “end” <i>ochr</i> “side”	<i>napcyn</i> “napkin” <i>nenfwd</i> “ceiling” <i>nionyn</i> “onion” <i>nodyn</i> “musical note”	<i>bocs</i> “box” <i>golau</i> “light” <i>ochr</i> “side” <i>gwaelod</i> “bottom”
vowel	<i>awyren</i> “aeroplane” <i>weiren</i> “wire” <i>ysgol</i> “ladder” <i>esgid</i> “shoe”	<i>blaen</i> “front” <i>diwedd</i> “end” <i>gwaelod</i> “bottom” <i>ochr</i> “side”	<i>wy</i> “egg” <i>inc</i> “ink” <i>ysbyty</i> “hospital” <i>asgwrn</i> “bone”	<i>bocs</i> “box” <i>gwaelod</i> “bottom” <i>llawr</i> “floor” <i>diwedd</i> “end”

The number of “part” words that began with each mutable sound is shown in Table 7.3 according to their occurrence with feminine or masculine possessors.

Table 7.3: The Number of Nouns With Particular Word-Initial Sounds That Were Elicited for Use in Conjunction With Feminine and Masculine Possessors.

Initial Phoneme of Elicited Nouns	Feminine Possessors	Masculine Possessors	Total
/p/	7	6	13
/t/	2	5	7
/k/	6	6	12
/b/	5	5	10
/d/	5	5	10
/g/	7	7	14
/ʎ/	3	2	5
/r/	1	1	2
/m/	3	1	4
Vowel-Initial	5	6	11
Total	44	44	88

The data in Table 7.3 were grouped into three sets according to initial sound type. This was because the unaspirated stops (/p, t, k/) undergo SM when in reference to masculine possessors and AM when in reference to feminine possessors. The voiced stops (/b, d, g/), the liquids (/ʎ, r/), and /m/ undergo SM when in reference to masculine possessors but retain their basic form when in reference to feminine possessors. Finally, vowels do not undergo mutation when in reference to masculine possessors, but undergo AM when in reference to feminine possessors.

An additional set of elicited “part” nouns comprised the warm-up items. These were *hosan* “sock” (in reference to the teddy), *soser* “saucer” (in reference to the cup), and *sêt* “seat” (in reference to the swing). These “part” nouns were chosen as the elicited forms in the warm-up trials because their initial sounds do not undergo mutation.

Non-Linguistic Stimuli

The same drawings of the objects that were used in Study 2 were used in this study. Copies of the 6" x 4" cards used for Study 2 were placed on A5-sized pieces of blank card and were individually placed in A5 plastic pockets and presented in an A5 snap folder (see Appendix 7.1). For the warm-up items pictures were drawn on 6" x 4" paper.

Procedure

Each participant was seen individually. The children were told that they were going to see a game, and that this game was called *gêm ei* “ei game”. The adults were given only the instructions below. All participants were told that they were going to see some pictures, and that the experimenter would say what the picture was. These instructions were as follows:

‘Da ni’n mynd i gael chwarae gêm wahanol rwan; gêm ‘ei’ ydi hon³. Be’ sy’n mynd i ddiwydd rwan ydi ‘dw i am ddangos lluniau i ti. ‘Dw i am ddweud be’ sydd yn y llun bob tro.

“We’re going to play a different game now; this one is the ‘ei’ game. What’s going to happen is that I’m going to show you some pictures. I’m going to say what’s in the picture each time.”

The participants were then told that one part of the object would be coloured in red and that their task was to say each time “and here’s its . . .” using the part coloured in red as the filler noun. These instructions were as follows:

Mae ‘na un rhan o’r llun yn mynd i fod mewn coch, iawn? A be’ ‘dw i eisiau i ti ei ddweud bob tro ydi ‘a dyma ei. . .’ a dweud pa ran sydd mewn coch, iawn?

³ This part of the instructions was only given to the children.

“One part of the picture is going to be in red, okay? And what I want you to say each time is ‘and here’s its . . .’ and say which part is in red, okay?”

The experimenter then went on to introduce the warm-up items in the following way:

Reit ta, efo’r llun yma ‘dw i’n dweud ‘yn y llun yma fedri di weld dedi’, iawn? A ‘dw i eisiau i ti ddweud ‘a dyma ei. . .’ [experimenter points to red part] a be sydd yna mewn coch? [child says hosan “sock”] na chdi, felly ti’n dweud ‘a dyma ei hosan’. Fedri di ddweud hynny?

“Right then, with this picture I say ‘in this picture you can see (a) teddy’, okay? And I want you to say ‘and here’s its. . .’ [experimenter points to red part] and what’s here in red? [child says *hosan* “sock”] there you are, so you say ‘and here’s its sock’. Can you say that?”

Once the participants understood and produced the elicited response for the first warm-up item, the experimenter proceeded to introduce the other trial items in the same way. After all the warm-up items were administered, the experimenter explained to the participants that some pictures would have an arrow that points to a specific location (the top, the bottom, etc.) on the object. This was to ensure that the participants did not always expect that the elicited part was an object in itself as the saucer, sock, and seat were in the warm-up items. Once the participants understood the instructions, the experimenter proceeded to introduce the experimental items.

Results

Scoring.

All data were scored according to whether the participants’ responses on the elicited nouns were marked consistently according to the gender of the

possessor nouns. Thus /p, t, k, b, d, g, ʈ, ɽ, m/-initial elicited nouns with masculine possessors that underwent SM after *ei* were given a score of 1; any other form of such nouns (e.g., the basic form, or the AM form) was given a score of 0. Vowel-initial nouns with masculine possessors that retained their basic forms after *ei* were given a score of 1; any other form of such nouns was given a score of 0. In the same way, /p, t, k/- and vowel-initial elicited nouns with feminine possessors that underwent AM after *ei* were given a score of 1; any other form of such nouns was given a score of 0. Finally, /b, d, g, ʈ, ɽ, m/-initial elicited nouns with feminine possessors that retained their basic form after *ei* were given a score of 1; any other form of such nouns was given a score of 0. Inter-rater reliability agreement of 98.82% was obtained with the adult data. Raw statistical figures for this study are shown in Appendix 7.2.

Adults.

For the purpose of analysis, responses were grouped into three sets according to the initial sound type of the elicited nouns. Set 1 consisted of the unaspirated stops (/p, t, k/), which undergo SM with masculine possessors and AM with feminine possessors; Set 2 consisted of the voiced stops (/b, d, g/), the liquids (/ʈ, ɽ/), and /m/, which undergo SM with masculine possessors, but no mutation with feminine possessors; and Set 3 consisted of the vowels, which do not mutate with masculine possessors, but undergo AM with feminine possessors.

A repeated measures ANOVA was conducted in which Initial Mutable Sound Type (/p, t, k/, /b, d, g, ʈ, ɽ, m/, and vowels), Gender (masculine or feminine possessor), Cue Type (cued condition, non-cued condition), and Age (16 to 30 years, 31 to 50 years, 51+ years) were treated as independent variables. The dependent variable was the participants' observance of mutation in the elicited noun according to the expected norm. Since the data values were in proportions, arcsin transformations were applied to the data.

The analysis showed a significant main effect of Gender ($F(1,11) = 36.177, p < .001$) and a significant interaction of Initial Mutable Sound Type x Gender ($F(2,22) = 8.929, p < .01$). There were no significant main effects of Age ($F(2,11) = 1.158, p > .05$), Initial Mutable Sound Type ($F(2,22) = .351, p > .05$), or Cue Type ($F(1,11) = 3.75, p > .05$). Figure 7.1 shows adults' performance by gender.

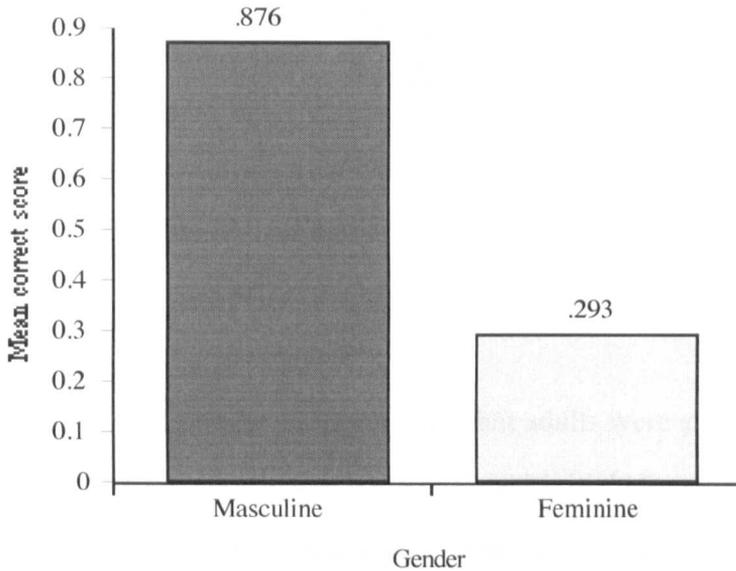


Figure 7.1: Adults' Mean Proportions by Gender.

The adults mutated elicited nouns appropriately when the possessor was masculine ($M = .876, SD = .229$) more than when the possessor was feminine ($M = .293, SD = .357$). Figure 7.2 illustrates the performance by Initial Mutable Sound Type and Gender.

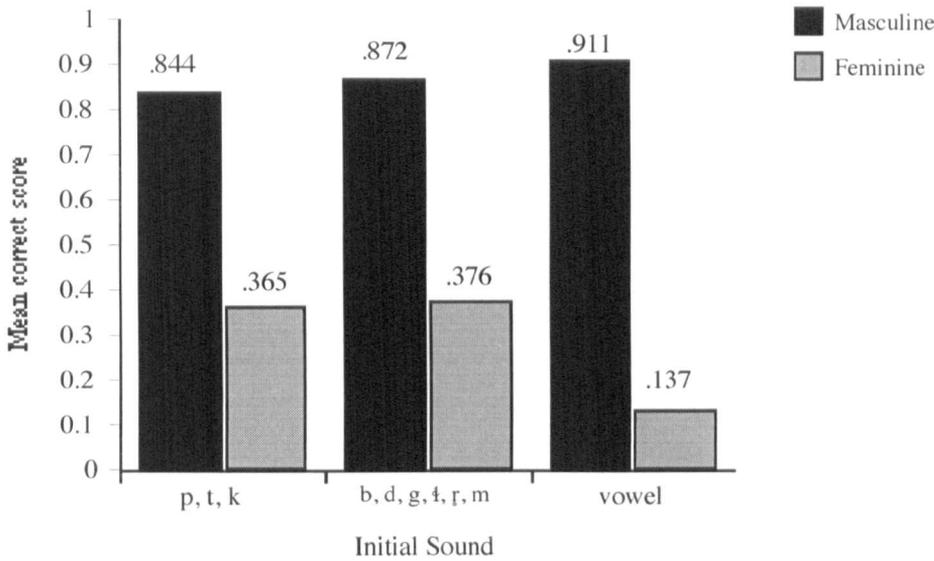


Figure 7.2: Adults' Mean Proportions per Initial Mutable Sound Type x Gender.

This interaction was due to the fact that adults were significantly better at producing the appropriate form of vowel-initial elicited nouns with masculine possessors than they were at producing the appropriate form of /p, t, k/-initial elicited nouns with masculine possessors ($F(1, 22) = 6.430, p < .05$), but when the elicited nouns were in reference to feminine possessors, the adults were better at producing the appropriate form of /p, t, k/-initial nouns than vowel-initial nouns ($F(1, 22) = 8.575, p < .01$), and better at producing the appropriate form of /b, d, g, ʒ, ʃ, m/-initial nouns than vowel-initial nouns ($F(1, 22) = 8.783, p < .01$). That is, with masculine possessors, the adults were better at producing the basic form of vowel-initial nouns than the SM form of /p, t, k/-initial nouns, and, with feminine possessors, they were better at producing AM of /p, t, k/-initial elicited nouns and the basic form of /b, d, g, ʒ, ʃ, m/-initial elicited nouns than the AM form of vowel-initial elicited nouns.

It is instructive to examine patterns of responses that differed from the expected norm; these patterns depended on the Initial Mutable Sound Type.

Table 7.4 presents adults' responses that differed from the expected norm when the Initial Mutable Sound Type was /p/, /t/, or /k/.

Table 7.4: Adults' Percent Noun Form Errors for /p, t, k/-Initial Elicited Nouns

Out of all Errors Produced After *ei*.

	Masculine Possession	Feminine Possession
16-to 30-year-olds	100% (1/1) AM	100% (64/64) SM
31-to 50-year-olds	68.75% (11/16) AM 31.25% (5/16) basic form	95.35% (41/43) SM 4.65% (2/43) basic form
51+ year-olds	95.65% (22/23) AM 4.35% (1/23) basic form	97.5% (39/40) SM 2.5% (1/40) basic form
Total	15% (6/40) basic form 85% (34/40)AM	2.04%(3/147) basic form 97.96%(144/147) SM

Table 7.5: Adults' Percent Noun Form Errors for /p, t, k/-Initial Elicited Nouns

Out of the Total Number of Productions After *ei*.

	Masculine Possession	Feminine Possession
16- to 30-year-olds	1.25% (1/80) AM	84.21%(64/76) SM
31- to 50-year-olds	15.94% (11/69) AM 7.25% (5/69) basic form	62.12% (41/66) SM 3.03% (2/66) basic form
51+ year-olds	27.16% (22/81) AM 1.23% (1/81) basic form	31.87% (29/91) SM 1.1% (1/91) basic form
Total	14.78% (34/230)AM 26.09% (6/230) basic form	57.51% (134/233) SM 1.29% (3/233) basic form

For /p, t, k/-initial elicited nouns that were co-referential with a masculine possessor, Group 1 adults produced AM instead of SM on only one occasion. Group 2 adults produced 11 forms in which AM was used (68.75% AM of all errors, 15.94% of all responses after *ei*) and 5 forms in which the basic form was used (31.25% of all errors, 7.25% of all responses). Group 3 adults produced 22 forms in which AM was used (95.65% of all errors, but only 27.16% of all responses) and 1 basic form (4.35% of all errors, 1.23% of all responses). For /p, t, k/-initial elicited nouns that were co-referential with a feminine possessor, all age groups frequently applied SM instead of AM. All Group 1 forms that did not show AM involved the use of SM; Group 2 adults produced 41 forms in which SM was used instead of AM (95.35% of all errors, 62.12% of all responses

analysed), and 2 forms in which the basic form was used (4.65% of all errors, 3.03% of all responses analysed); and Group 3 adults produced 39 forms in which SM was used instead of AM (97.5% of all errors, 31.87% of all responses analysed), and 1 form in which the basic form was used (2.5% of all errors, 1.1% of all responses analysed).

Therefore, with /p, t, k/-initial elicited nouns after *ei*, performance that varied from the expected norm with masculine forms consisted mainly of the substitution of the AM form for the SM form, although this was only 14.78% of all responses analysed. For feminine nouns, variation in performance consisted mainly of the substitution of the SM form for the AM form. This made up 57.51% of all responses analysed. Table 7.6 presents adults' responses that differed from the expected norm when the initial sound type was /b/, /d/, /g/, /ʒ/, /r/, or /m/.

Table 7.6: Adults' Percent Noun Form Errors for /b, d, g, ʒ, r, m/-Initial Elicited Nouns Out of all Errors Produced After *ei*.

	Masculine Possession	Feminine Possession
16- to 30-year-olds	100%(4/4) basic form	(79/79) SM
31- to 50-year-olds	100% (6/6) basic form	(60/60) SM
51+ year-olds	100% (26/26) basic form	(37/37) SM
Total	100% (36/36) basic form	100% (176/176) SM

Table 7.7: Adults' Percent Noun Form Errors for all /b, d, g, ʒ, r, m/-Initial Elicited Nouns Out of the Total Number of Productions After *ei*.

	Masculine Possession	Feminine Possession
16- to 30-year-olds	45.45%(4/88) basic form	79% (79/100) SM
31- to 50-year-olds	8.7% (6/69) basic form	65.93% (60/91) SM
51+ year-olds	27.08%(26/96) basic form	43.02% (37/86) SM
Total	14.23% (36/253) basic form	63.54%(176/277) SM

The forms produced for /b, d, g, ʒ, r, m/-initial elicited nouns when there was a masculine possessor involved the overgeneralization of the basic form. However, this was relatively infrequent (14.23% of all responses). With feminine

reference, differences from the expected basic form were widespread (63.54% of all responses), and always involved the use of the SM form.

Vowel-initial elicited nouns that mark feminine possession were aspirated only 5 times out of a total 54 productions. All other vowel-initial elicited nouns were produced in their basic form. The aspiration of vowel-initial elicited nouns, usually reserved for feminine nouns, was slightly overextended to vowel-initial elicited nouns that mark masculine possession.

Summary: adult data.

The adults' distant marking of masculine forms in the context *ei* + noun was significantly more consistent with expected forms than their performance on the marking of feminine forms (65.85% to 100% vs. 15% to 68.09%). The main variation on /p, t, k/-initial elicited nouns with masculine possessors was the use of AM instead of SM. The main difference when such nouns referred to a feminine possessor was the use of SM instead of AM. The adults sometimes used the basic form with masculine possessors and the SM form with feminine possessors.

Children.

The children's data were scored in the same way as the adults' data: all data were scored according to whether the children's responses on the elicited nouns were marked consistently according to the gender of the possessor. Thus /p, t, k, b, d, g, ʔ, r, m/-initial elicited nouns that referred to masculine possessors and underwent SM after *ei* were given a score of 1; any other form of such nouns (e.g., the basic form, or the AM form) was given a score of 0. Vowel-initial nouns that referred to masculine possessors and retained their basic forms after *ei* were given a score of 1; any other form of such nouns was given a score of 0. In the same way, /p, t, k/-initial and vowel-initial elicited nouns that referred to feminine possessors and underwent AM after *ei* were given a score of 1; any other form of such nouns was given a score of 0. Finally, /b, d, g, ʔ, r, m/-initial elicited nouns

that referred to feminine possessors and retained their basic form after *ei* were given a score of 1; any other form of such nouns was given a score of 0. Inter-rater reliability agreement of 95.2% was obtained with the child data.

As was done with the adults' data, the children's data were also grouped into three sets for the purpose of analysis. Set 1 contained /p, t, k/-initial elicited nouns, Set 2 contained /b, d, g, ʒ, ʒ, m/-initial elicited nouns, and Set 3 contained vowel-initial elicited nouns.

A repeated measures ANOVA was conducted in which Initial Mutatable Sound Type (/p, t, k/, /b, d, g, ʒ, ʒ, m/, and vowels), Gender (masculine or feminine possessor), Cue Type (cued condition, non-cued condition), and Age (4 1/2-year-olds, 6-year-olds, 7 1/2-year-olds, 9-year-olds) were treated as independent variables. The dependent variable was the participants' observance of mutation in the elicited noun according to the expected norm. Since the data values were in proportions, arcsin transformations were applied to the data.

The analysis revealed a significant main effect of Gender ($F(1,12) = 44.756, p < .001$) and Initial Mutatable Sound Type ($F(2, 24) = 4.766, p < .05$), and an interaction of Initial Mutatable Sound Type x Gender ($F(2,24) = 13.085, p < .001$). There were no significant main effects of Age ($F(3,12) = 2.595, p > .05$) or of Cue Type ($F(1,12) = .011, p > .05$). Figure 7.3 shows children's performance by Gender.

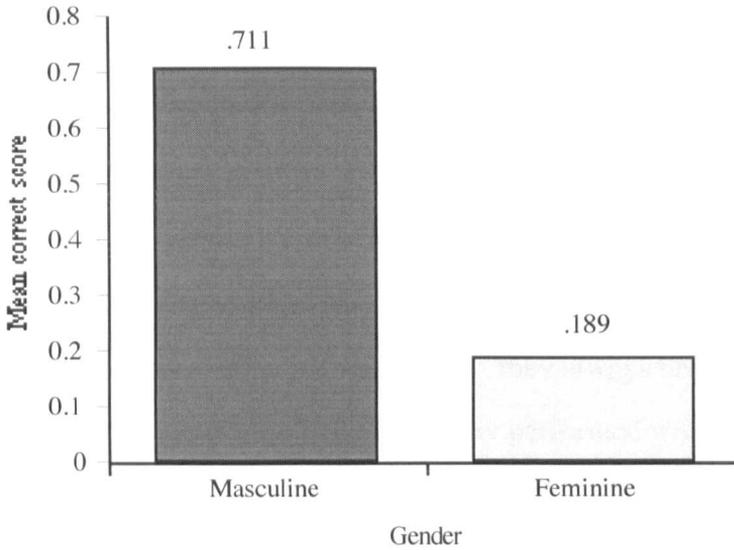


Figure 7.3: Children’s Mean Proportions by Gender.

The children mutated elicited nouns appropriately when the possessor was masculine ($M = .711, SD = .376$) more than when the possessor was feminine ($M = .189, SD = .305$). Figure 7.4 shows the children’s performance by Initial Mutable Sound Type.

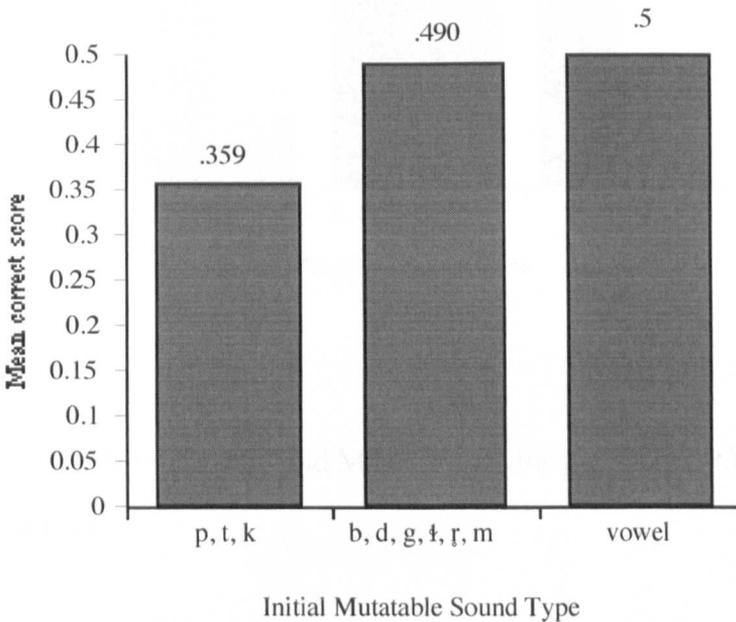


Figure 7.4: Child Mean Proportions by Initial Mutable Sound Type.

Planned mean comparisons revealed that this was due to the children's better overall performance on vowel-initial elicited nouns than on /p, t, k/-initial elicited nouns ($F(1, 24) = 9.526, p < .01$). The children's apparent superior ability on vowel-initial elicited nouns was due to (a) the fact that there were no deviations from the expected norm for their performance of vowel-initial elicited nouns that referred to masculine possessors (i.e., they always produced the basic form of these nouns), and (b) the fact that they performed worse on /p, t, k/-initial elicited nouns that referred to feminine possessors (i.e., there were very few productions of the AM form of /p, t, k/-initial elicited nouns in reference to feminine possessors). Figure 7.5 charts the children's performance across Initial Mutable Sound Type and across Gender.

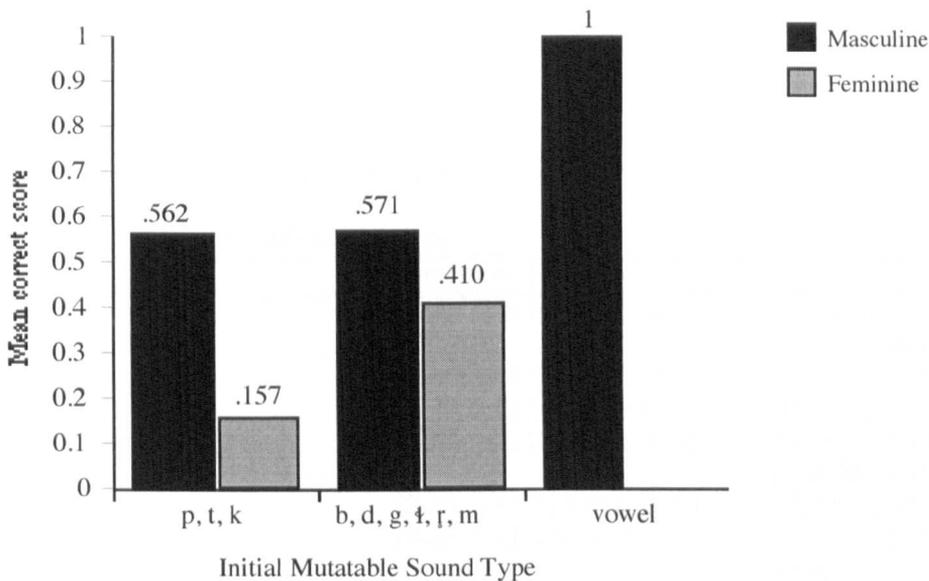


Figure 7.5: Child Mean Proportions per Initial Mutable Sound Type x Gender.

With masculine possessors, children were significantly better at producing the appropriate form of vowel-initial elicited nouns than they were at producing the

appropriate form of /p, t, k/- and /b, d, g, ʃ, r, m/-initial elicited nouns ($F(1, 24) = 20.711, p < .001$; and $F(1, 24) = 19.484, p < .001$ respectively). That is, the children were, like the adults, better at producing the basic form of vowel-initial elicited nouns than they were at producing the SM form of /p, t, k/-initial elicited nouns. Unlike the adults, the children were also better at producing the basic form of vowel-initial elicited nouns than they were at producing the SM of /b, d, g, ʃ, r, m/- initial elicited nouns. With feminine possessors, the children were better at producing the appropriate form (i.e., the basic form) of /b, d, g, ʃ, r, m/-initial elicited nouns than vowel-initial nouns ($F(1, 24) = 6.092, p < .05$); that is, the children were better at producing the basic form of /b, d, g, ʃ, r, m/-initial elicited nouns than of vowel-initial elicited nouns.

Again, follow-up analysis was conducted on children's responses that differed from the expected norms. Table 7.8 presents children's responses that differed from the expected norm when the initial sound was /p/, /t/, or /k/.

Table 7.8: Children's Percent Noun Form Errors for /p, t, k/-Initial Elicited Nouns out of all Errors Produced After *ei*.

	Masculine Possession	Feminine Possession
4 1/2-year-olds	100% (10/10) basic form	75% (36/48) SM 25% (12/48) basic form
6-year-olds	67.6% (48/71) basic form 32.39% (23/71) AM	50% (37/74) SM 50% (37/74) basic form
7 1/2-year-olds	100% (18/18) basic form	83.15% (74/89) SM 16.85% (15/89) basic form
9-year-olds	85.71% (12/14) basic form 14.29% (2/14) AM	82.24% (88/107) SM 17.76% (19/107) basic form
Total	77.88% (88/113) basic form 22.12% (25/113) AM	26.18% (83/317) basic form 73.82% (234/317) SM

Table 7.9: Children's Percent Noun Form Errors for /p, t, k/-Initial Elicited Nouns
Out of the Total Number of Productions After *ei*.

	Masculine Possession	Feminine Possession
4 1/2-year-olds	23.26% (10/43) basic form	72%(36/50) SM 24%(12/50) basic form
6-year-olds	59%(48/96) basic form 23.96%(23/96) AM	37.37% (37/99) SM 37.37% (37/99) basic form
7 1/2-year-olds	18.18% (18/99) basic form	83.15%(74/89) SM 16.85% (15/89) basic form
9-year-olds	11.88%(12/101) basic form 1.98% (2/101) AM	72.13% (88/122) SM 15.57%(19/122) basic form
Total	25.96% (88/339) basic form 7.37% (25/339) AM	65.28% (235/360) SM 23.06% (83/360) basic form

Overall, for /p, t, k/-initial elicited nouns with masculine possessors, all ages frequently applied the basic form (77.88% of all errors, 25.96% of all responses after *ei*) instead of SM. The only error type was the basic form for the 4 1/2-year-olds. The 6-year-olds produced 48 forms in which the basic form was used (67.6% of all errors, 59% of all responses analysed), and 23 forms in which the AM was used (32.39% of all errors, 23.96% of all responses analysed). The only error type that the 7 1/2-year-olds produced was the basic form. Finally, the 9-year-olds produced 12 forms in which the basic form was used (85.71% of all errors, 11.88% of all responses analysed), and 2 forms in which the AM was used (14.29% of errors, 1.98% of all responses analysed).

For /p, t, k/-initial elicited nouns with a feminine possessor the children showed a strong preference for the SM form (73.82% of all errors, 65.28% of all responses). In particular, the 4 1/2-year-old children produced 36 forms in which the SM was used (75% of all errors, 72% of all responses analysed), and 12 forms in which the basic form was used (25% of all errors, 24% of all responses analysed). The 6-year-olds produced 37 forms in which the SM form was used and 37 forms in which the basic form was used (50% of all errors for both, 37.37% of all responses analysed for both). The 7 1/2-year-olds produced 74

forms in which the SM form was used (83.15% of all errors, 83.15% of all responses), and 15 forms in which the basic form was used (16.85% of all errors, 16.85% of all responses analysed). Finally, the 9-year-olds produced 88 forms in which the SM form was used (82.24% of all errors, 72.13% of all responses analysed), and 19 forms in which the basic form was used (17.76% of all errors, 15.57% of all responses analysed). Therefore, with /p, t, k/-initial elicited nouns after *ei*, children's performances that varied from the expected norm with masculine possessors differed from the adults' in that the children's responses consisted mainly of the substitution of the basic form for the SM form (77.88% of all errors, 25.96% of all responses analysed); the adults' responses consisted mainly of the AM. For feminine possessors, variation in the children's performance, like the adults', consisted largely of the substitution of the SM form for the AM form (73.82% of all errors, 65.28% of all responses analysed).

Table 7.10 presents children's responses that differed from the expected norm when the initial sound was /b/, /d/, /g/, /t/, /ʃ/, or /m/.

Table 7.10: Children's Percent Noun Form Errors for /b, d, g, t, ʃ, m/-Initial

Elicited Nouns Out of all Errors Produced After *ei*.

	Masculine Possession	Feminine Possession
4 1/2-year-olds	100%(14/14) basic form	100%(37/37) SM
6-year-olds	100%(62/62) basic form	100%(34/34) SM
7 1/2-year-olds	100%(34/34) basic form	100%(65/65) SM
9-year-olds	100%(25/25) basic form	100%(85/85) SM
Total	100% (135/135) basic form	100% (221/221) SM

Table 7.11: Children's Percent Noun Form Errors for /b, d, g, t, ʃ, m/-Initial

Elicited Nouns Out of the Total Number of Productions After *ei*.

	Masculine Possession	Feminine Possession
4 1/2-year-olds	35.9% (14/39) basic form	74% (37/50) SM
6-year-olds	70.45% (62/88) basic form	30.09% (34/113) SM
7 1/2-year-olds	35.05% (34/97) basic form	57.52% (65/113) SM
9-year-olds	20.33% (25/123) basic form	59.86% (85/142) SM
	38.9% (135/347) basic form	52.87% (221/418) SM

As was the case for the adult data, the forms produced on /b, d, g, ʈ, ɽ, m/-initial elicited nouns when in reference to masculine possessors involved the overgeneralization of the basic form. However, this tendency was much more frequent (38.9% of all responses) in the children's productions than in the adults' productions (14.23% of all responses). With feminine reference, differences from the expected basic form were widespread (52.87% of all responses) and always involved the use of the SM form. Note that the adults' productions of the SM form here instead of the basic form were also widespread (62.54% of all responses).

With regard to vowel-initial elicited nouns, these were always produced in their basic form when in reference to masculine possessors and were never aspirated when in reference to feminine possessors.

Summary: children's data.

The children's distant marking of masculine forms in the context *ei* + noun was significantly more consistent with expected norms than their performance on the marking of feminine possessors. With masculine possessors, the children produced the expected form of vowel-initial nouns more often than of /p, t, k/- or /b, d, g, ʈ, ɽ, m/-initial elicited nouns. With feminine possessors, the children were better at producing the expected form of /b, d, g, ʈ, ɽ, m/-initial nouns than of vowel-initial nouns. The main variation on /p, t, k/-initial elicited nouns when they referred to a masculine possessor was the use of the basic form instead of the SM form. The main difference when such nouns referred to a feminine possessor was the use of SM instead of AM. With /b, d, g, ʈ, ɽ, m/-initial elicited nouns, when these referred to a masculine noun the basic form was frequently used instead of SM. When these referred to a feminine noun the consistent deviation from the expected norm was the use of the SM form instead of the basic form. With vowel-initial nouns in reference to a masculine possessor, all productions

complied with the expected norm; that is, all productions involved the basic form. When these referred to feminine possessors, none of the productions followed the expected norm; that is, there were no productions of the AM form.

Adults vs. children.

In order to compare the children's performance with that of the adults, a repeated measures ANOVA was conducted on the adults' and the children's data together. The same scoring methods that were used with the separate analyses of the children's and the adults' data were employed. The same independent and dependent variables that were used in the separate analyses of the children's and the adults' data were also employed.

The analysis revealed a significant main effect of Gender ($F(1, 25) = 30.37, p < .001$) and an interaction of Initial Mutable Sound Type x Gender ($F(2, 50) = 22.509, p < .001$). However, as these effects are parallel to those already reported in the individual analysis, they will not be discussed further. The analysis also revealed a main effect of Initial Mutable Sound Type ($F(2, 50) = 5.267, p < .01$). There were two significant trends that contributed to a main effect of Initial Mutable Sound Type. Since this effect was not described under the separate analysis of the adults' data, it is reported below. Figure 7.6 illustrates the participants' performance per Initial Mutable Sound Type.

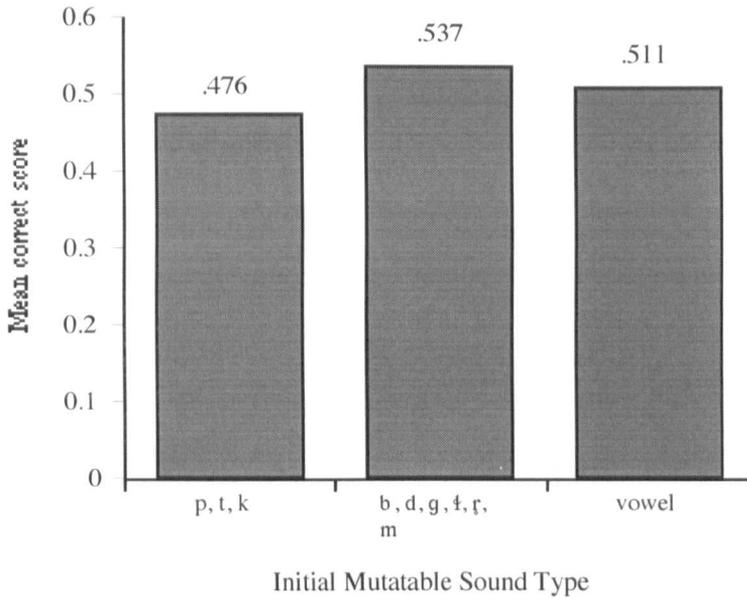


Figure 7.6: Adults' and Children's Mean Proportions by Initial Mutable Sound Type.

The first trend represented an overall better performance on vowel-initial nouns ($M = .511, SD = .491$) than on /p, t, k/-initial nouns ($M = .476, SD = .428$) ($F(1, 50) = 10.24, p < .01$). However, recall that the children did not aspirate vowel-initial nouns that referred to feminine nouns, and the adults did so infrequently. Recall also that all adults and children produced the correct form of vowel-initial nouns (i.e., the basic form) when in reference to masculine nouns. What this effect means, therefore, is that the approximately .5 mean score that the participants' data produced for the vowel-initial nouns was due to the consistent use of the basic form with masculine (and with feminine) possessors.

The second trend represented an overall better performance on /b, d, g, ʒ, ʒ, m/-initial nouns ($M = .537, SD = .371$) than on vowel-initial nouns ($F(1, 50) = 4.28, p < .05$). Again, since the participants' aspiration of vowel-initial nouns that were used in reference to feminine possessors was rare, what this means is that the participants produced the basic form of /b, d, g, ʒ, ʒ, m/-initial nouns referring to feminine possessors and the SM of /b, d, g, ʒ, ʒ, m/-initial nouns referring to masculine possessors more often than they aspirated vowel-initial nouns when in

reference to a feminine possessors. There was no significant difference between performance on /p, t, k/- and /b, d, g, ʒ, r, m/-initial nouns.

The analysis also revealed a significant main effect of Age ($F(4, 25) = 7.929, p < .001$). Figure 7.7 illustrates these data.

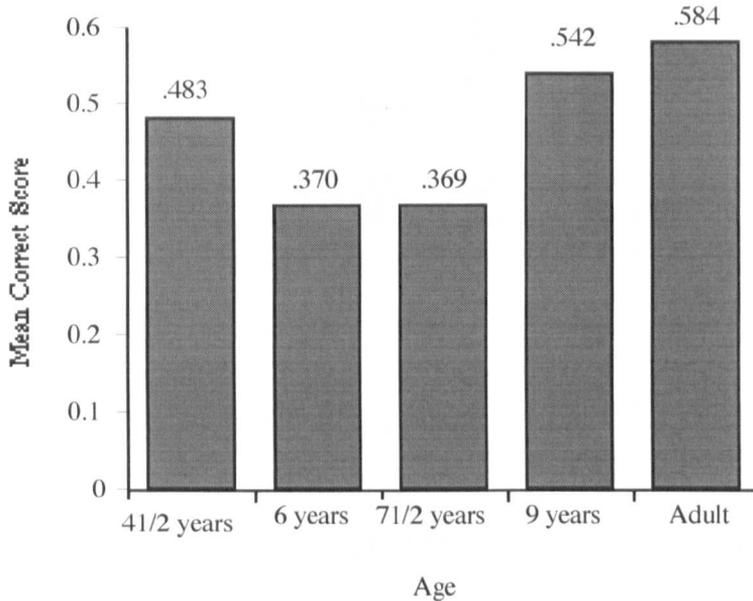


Figure 7.7: Mean Proportions by Age.

The main effect of Age was due to the fact that the adults' performance ($M = .584, SD = .419$) differed significantly from the performance of two of the children's groups -- the 6-year-olds ($M = .370, SD = .417, F(1, 25) = 23.67, p < .001$ for the 6-year-olds) and the 7 1/2-year-olds ($M = .369, SD = .445, F(1, 25) = 13.0, p < .01$ for the 7 1/2-year-olds). The adults' performance was not significantly different from the 4 1/2-year-olds' ($M = .483, SD = .419$) or the 9-year-olds' ($M = .542, SD = .438$). There were also significant differences between the 9-year-olds' responses and the 6-year-olds' ($F(1, 25) = 11.52, p < .01$) and the 7 1/2-year-olds' ($F(1, 25) = 7.07, p < .05$).

These data also revealed a significant interaction of Initial Mutable Sound Type x Age ($F(8, 50) = 2.54, p < .05$). Figure 7.8 illustrates the data for this interaction.

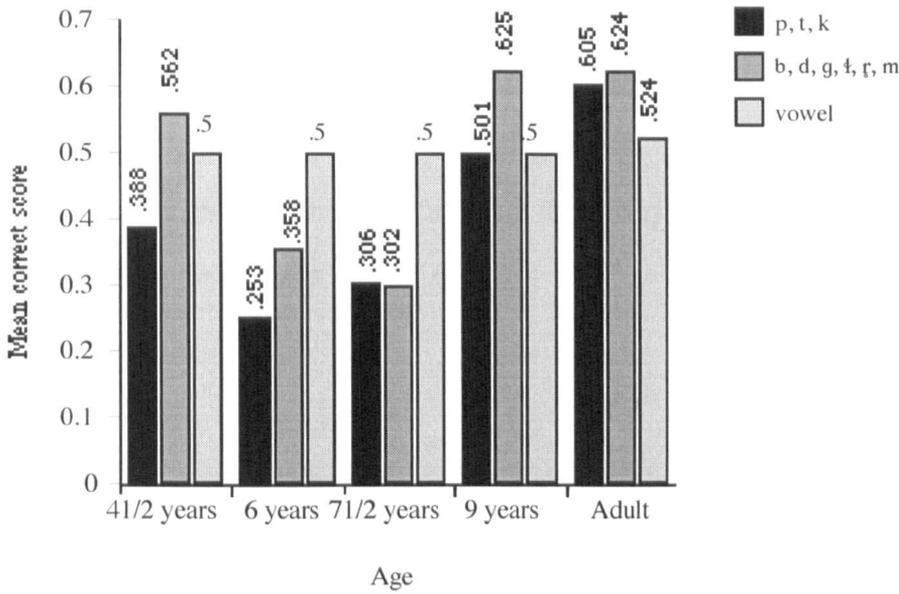


Figure 7.8: Mean Proportions per Initial Mutatable Sound Type x Age.

Post hoc analysis indicated that this interaction was due to the following three factors:

First, overall for /p, t, k/-initial nouns, the adults' performance ($M = .605$, $SD = .397$) was significantly different from that of each of the children's groups: Adults vs. 4 1/2-year-olds ($M = .388$, $SD = .347$, $F(1, 50) = 6.95$, $p < .05$), Adults vs. 6-year-olds ($M = .253$, $SD = .362$, $F(1, 50) = 20.55$, $p < .001$), Adults vs. 7 1/2-year-olds ($M = .306$, $SD = .460$, $F(1, 50) = 7.48$, $p < .01$), and Adults vs. the 9-year-olds ($M = .501$, $SD = .464$, $F(1, 50) = 5.08$, $p < .05$). Within the children's age groups, the 9-year-olds' ($M = .501$, $SD = .464$) performance was significantly different from that of the 6-year-olds ($M = .253$, $SD = .362$, $F(1, 50) = 4.66$, $p < .05$).

In contrast, overall for /b, d, g, ʒ, r, m/-initial nouns, the adults performed differently from the children in only two of the children's age groups: the 6-year-olds ($F(1, 50) = 10.19$, $p < .05$), and the 7 1/2-year-olds ($F(1, 50) = 10.41$, $p < .05$). Within the children's age groups, the 9-year-olds performed better than the

6-year-olds ($F(1, 50) = 6.91, p < .05$) and the 7 1/2-year-olds ($F(1, 50) = 7.07, p < .05$).

Finally, there were no significant differences across ages for the participants' performance on vowel-initial nouns.

These results were modified by a three-way interaction of Gender x Initial Mutable Sound Type x Age ($F(8, 50) = 2.793, p < .05$). Figure 7.9 illustrates these data.

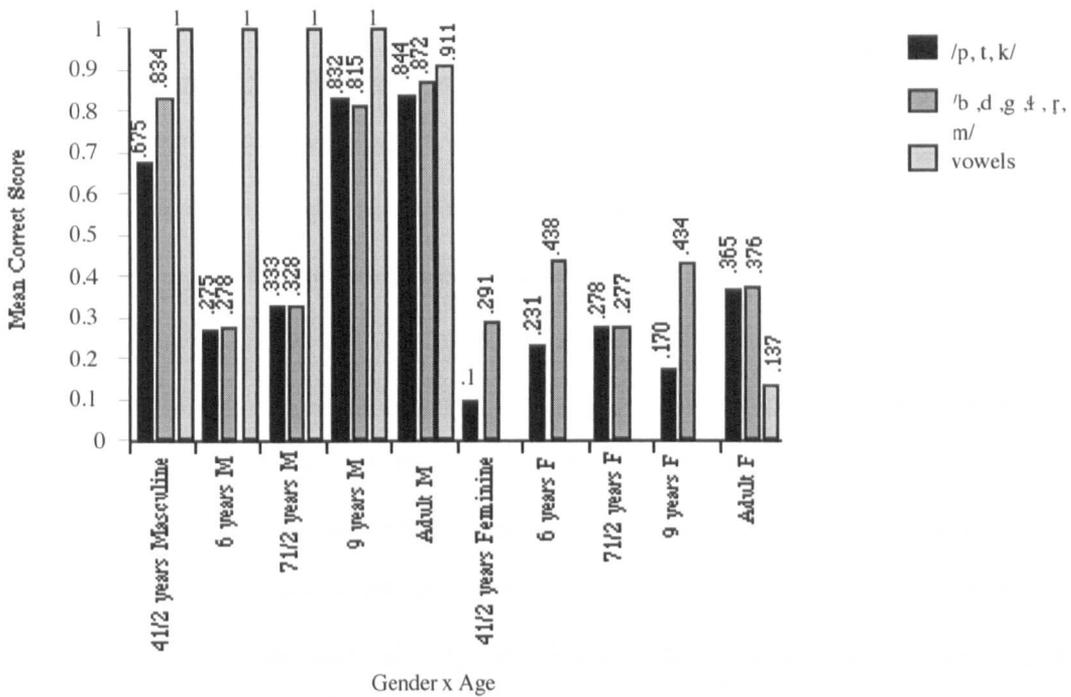


Figure 7.9: Mean Proportions per Gender x Initial Mutable Sound Type x Age.

Post hoc analysis indicated that for /p, t, k/-initial nouns with masculine possessor nouns, the adults performed significantly better than the 6-year-olds; there was no significant difference between the adults' performance and that of the 4 1/2-, 7 1/2-, and 9-year-old children. Within the children's age groups, the 6-year-olds performed the least consistent with the norm: the 4 1/2-, 7 1/2-, and 9-year-old children performed significantly better than the 6-year-olds (Student Newman

Keuls, $p < .05$). In contrast, there were no significant effects by age for /p, t, k/-initial nouns that referred to feminine possessors.

For /b, d, g, ʈ, ɽ, m/-initial nouns referring to masculine possessors, the adults performed significantly better than the 6-year-olds and the 7 1/2-year-olds (Student Newman Keuls, $p < .05$). The adults did not perform significantly better than the 4 1/2- or the 9-year-old children.

On vowel-initial elicited nouns, there were no significant differences in the participants' performance across Gender and Age.

Summary: adults vs. children.

Again, the adults' and the children's combined analysis revealed that distant marking of masculine forms in the context *ei* + noun was significantly more consistent with expected norms than their performance on the marking of feminine forms. There was an overall significant effect of Initial Mutable Sound Type whereby the participants performed better on vowel-initial nouns than on /p, t, k/-initial nouns. However, this was due to the children's lack of AM forms for /p, t, k/-initial nouns in reference to feminine possessors, and to the children's 100% basic form productions for vowels in reference to masculine possessors. They were also better on /b, d, g, ʈ, ɽ, m/-initial nouns than on vowel-initial nouns. However, this was due to the children's lack of aspiration of vowels.

Overall, the adults performed better than the 6-year-olds and the 7 1/2-year-olds. The adults performed significantly better than the children from each of the children's age groups on /p, t, k/-initial nouns, and the 9-year-olds were significantly better than the 6-year-olds. For /b, d, g, ʈ, ɽ, m/-initial nouns the adults were significantly better than the 6- and the 7 1/2-year-olds only; the 9-year-olds were again significantly better than the 6-year-olds. Finally, both the adults and the other age groups were significantly better than the 6-year-olds on /p, t, k/-initial nouns with masculine possessors. In addition, adults and the 9-year-olds were significantly better than the 6-year-olds and the 7 1/2-year-olds on

/b, d, g, t, r, m/-initial nouns. All children's age groups performed significantly better than the 6-year-olds. There were no significant differences in responses on feminine nouns across Age or Initial Mutable Sound Type.

Discussion

This chapter set out to investigate Welsh-speaking children's (and adults') productive use of a distant gender-marking construct -- *ei* "his/her/its" -- when in reference to inanimate possessor nouns. The data provided initial answers to questions regarding (a) the extent to which children (and adults) are able to mark distant gender constructs in Welsh, and (b) the extent to which children (and adults) are able to attend to a specific cue (the use of the definite article +/- SM) to gender status of the possessors to determine the appropriate marking of the distant construct.

In answer to the second question posed above, neither children nor adults were observed to attend to the cued condition (nouns presented in a definite noun phrase) more than the non-cued condition (nouns presented in an indefinite noun phrase). In other words, explicit marking of the gender of the possessor noun made no difference to participants' performance.

In answer to the first question posed above, both the adults and the children were better able to mark masculine forms in distant gender constructions than feminine forms. This is not surprising for three reasons.

First, to mark the masculine, all mutable consonants undergo SM. To mark feminine, on the other hand, there are two types of processes involved: (a) the AM of /p, t, k/- and vowel-initial nouns, and (b) retaining of the basic form of /b, d, g, t, r, m/-initial nouns.

Second, numerous studies indicate that SM is the mutation that is realised most often (possibly due to it having the most triggering environments) in speech (e.g., Ball, 1984; see also Chapter 2). AM is reported to be used very rarely (e.g., Roberts, 1972, 1988; see also Chapter 2), except after *ei*.

However, as observed in this study, when *ei* refers back to an inanimate possessor both children and adults use AM infrequently.

Third, since there are reports of SM being used at the expense of other mutations (i.e., used in contexts that are reserved for AM or NM), it is not surprising to expect children and adults to overextend the use of SM to the distant marking contexts for feminine forms. If children and adults do not know the gender of a particular possessor (given that they did not attend to the cue given) and given that they freely overextend SM where AM should take place, they should feel at ease using mostly SM throughout the test. This was one of the predictions made at the beginning of this chapter. The data from this study indicate that with /p, t, k/-initial elicited nouns in reference to feminine possessors, both the adults' and the children's errors were mostly the production of the SM form instead of the AM form (97.96% of all errors and 57.51% of all responses for the adults; 73.82% of all errors and 65.28% of all responses for the children). With /b, d, g, ʈ, ɽ, m/-initial nouns in reference to feminine possessors, both the adults' and the children's errors consisted of the production of the SM form. Overall, the SM instead of the basic form here made up the majority of the responses for both adults and children (63.54% of all responses for the adults, and 52.87% of all responses for the children). Therefore the children produced more basic forms of /b, d, g, ʈ, ɽ, m/-initial nouns than the adults, although this does not necessarily mean that the children performed better than the adults -- the children produced more basic form responses for /p, t, k/-initial nouns in reference to feminine possessors than the adults.

With the marking of elicited nouns in reference to masculine possessor nouns, a difference was found in the type of errors made by the adults and the type of errors made by the children. For /p, t, k/-initial elicited nouns in reference to masculine possessors, the adults' preferred error type was the production of the AM form instead of the SM form (85% of all errors), although the use of the AM made up only 14.78% of all responses after *ei*. Children, on the other hand, opted

for the basic form as an error (77.88% of all errors); this was 25.96% of all responses after *ei*. With /b, d, g, ʔ, r, m/-initial nouns in reference to masculine possessors, the only errors produced were the use of the basic form instead of the SM form; this was for adults (14.23% of all responses analysed) and children (38.9% of all responses analysed). The adults' responses that did not include the SM form were mostly the AM form; the children's responses that did not include the SM form were mostly the basic form. Therefore the adults' responses for masculine forms alternated mostly between the SM and the AM form for /p, t, k/-initial nouns and the children's responses alternated mostly between the SM and the basic form.

This indicates one clear difference between adults and children: adults seem to know that /p, t, k/-initial nouns can mark the gender of inanimate possessors by use of AM more than children do. Children's productions of nouns in reference to masculine possessors seem to alternate between the SM and the basic form, whereas the adults' productions seem to alternate between the AM and the SM form. Therefore adults seem to be looking for gender distinctions and are attempting to mark these gender distinctions in the conventional way more than do children. Indeed, when the adults' and the children's productions of nouns in reference to feminine possessors were analysed, the analysis revealed that the adults were better than the children at producing AM on /p, t, k/-initial nouns, although both the adults' and the children's scores were very low ($M = .365$ for adults and $.157$ for children). Therefore, again, adults seem to be more inclined than children to show gender distinction in inanimate possessors, although even adults are not very consistent in doing so. For feminine possessors, both adults and children were better at producing the basic form of /b, d, g, ʔ, r, m/-initial nouns than of producing the AM form of vowel-initial nouns, and the adults were also better at producing the AM form of /p, t, k/-initial nouns than the AM form of vowel-initial nouns. Given that the adults produced little AM on /p, t, k/-initial nouns ($M = .365$) then the AM performed on vowel-initial nouns was extremely

low ($M = .137$). This means that adults are also more inclined to mark a gender distinction in inanimate possessors on vowels than children are, although this tendency is only small.

Finally, when the children's data were compared with the adults', the analysis indicated that there was a significant effect of age whereby the adults' performance was better overall than that of the 6-year-olds and the 7 1/2-year-olds. There was no difference between the adults' performance and that of the 4 1/2-year-olds and the 9-year-olds. The lack of difference between the adults and the 4 1/2-year-olds could be accounted for by the fact that the 4 1/2-year-olds' data were less voluminous than for the other children. The 9-year-olds were also significantly better than the 6-year-olds and the 7 1/2-year-olds. This indicates that, overall, the 6- and the 7 1/2-year-olds performed the worst on this task. It also indicates a U-shaped curve in development: the children perform well (although, as already mentioned, this could be a product of the amount and type of data obtained from these children) at 4 1/2 years of age, and perform worse by the ages of 6 and 7 1/2 years. There is an increase in ability by the age of 9 years, and performance here is not significantly different from the adults' overall performance. The weak performance by the 6- and the 7 1/2-year-olds is further highlighted in a series of interactions. The adults were significantly better at producing the appropriate forms of /p, t, k/-initial nouns than all of the children from each of the children's age groups, and the 9-year-olds were significantly better than the 6-year-olds. This is not surprising considering that the adults produced more AM forms for /p, t, k/-initial nouns in reference to feminine possessors than the children. With /b, d, g, ʒ, ʒ, m/-initial nouns, on the other hand, the adults were only significantly better than the 6- and the 7 1/2-year-olds; the 9-year-olds were also better than the 6- and the 7 1/2-year-olds here. The adults were not significantly better than the 4 1/2- and the 9-year-olds here. Again, this possibly due to the younger children's paucity of data, and to the 9-year-olds opting for the basic form more often than the adults when marking

masculine possessors. Unsurprisingly, given the lack of AM responses for vowel-initial nouns for feminine possessors and the almost 100% basic form responses for masculine possessors, there was no significant difference across ages for performance on vowel-initial nouns. When responses across Initial Mutable Sound Type, Gender, and Age were investigated, all ages (including adults) performed better on the production of /p, t, k/-initial nouns in reference to masculine possessors than the 6-year-olds. For /b, d, g, ʒ, r, m/-initial nouns that were used to mark masculine possessors, both the adults and the 9-year-olds were better than the 6-year-olds and the 7 1/2-year-olds. There were no significant differences for responses on /p, t, k/- or /b, d, g, ʒ, r, m/-initial nouns when in reference to feminine possessors.

What these results indicate is that 6-year-olds and 7 1/2-year-olds have not learned how to mark masculine and feminine forms in distant constructs when co-referential with inanimate possessors, at least not to the same level as the adults, or even the 9-year-olds.

Finally, all the data discussed above indicate that distant gender distinctions in reference to inanimate possessors is not stable in the language, even in the adult language. In reference to inanimate possessors, the data also suggest that the aspiration on vowels is quickly disappearing, occurring only minimally in the adult data here and not at all in the children's data. Overall, both children and adults are better at marking masculine forms (SM) than feminine forms (AM and the basic form). The adults are better overall than the children in marking the gender distinction on distant elements. Developmentally, children seem to start well (although this could reflect the low quantity of data obtained by the 4 1/2-year-olds) but reach a low point at the ages of 6- and 7 1/2-years, only to improve later by the age of 9 years.

Since performance seemed to be linked to the type of mutation involved, it was very difficult to infer whether these results were an indication of a lack of gender knowledge, or an indication of children's (and maybe adults') lack of

ability, or lack of consistency, with mutation in general. This was also my concern at the end of Chapter 6. Because of this, an additional study was designed to provide some answers to this question. This study, Study 4, involved two experiments. Experiment 1 investigated children's (and adults') ability with SM in non-gendered contexts, and Experiment 2 investigated children's (and adults') ability with AM in non-gendered contexts. (These data are reported in the next chapter.)

CHAPTER 8**Study 4: Soft Mutation and Aspirate Mutation -- Elicitation Experiments****Introduction**

In this chapter, I present two experiments from a study that investigated children's and adults' productions of SM and AM in non-gender contexts. The purpose of these experiments was to provide information about children's use of mutations in gender-free contexts; the juxtaposition of these data with the data from their productions of gendered contexts (Studies 1, 2, and 3) would provide parallel information regarding their use of gender mutations and non-gendered mutations at concurrent points in development. These experiments followed a similar format to that used in Studies 2 and 3 (see Chapters 6 and 7) in that children's and adults' responses were elicited in experiments specifically designed to elicit the constructs of interest. The two experiments for Study 5 were designed to test the knowledge of mutation after certain prepositions and conjunctions. Since most studies have investigated the spoken language of the dialects found in mid and South Wales, work on the use of SM and AM after prepositions and conjunctions in the spoken language of North Wales would provide valuable comparable data.

Studies 2 and 3 provided information regarding the productive use of gender rules in local and distant constructs and the potential value of local cues in aiding the acquisition of the gender system in Welsh. However, there was no indication in these studies of the extent to which children's performance reflected their ability, or lack of ability, with the SM and AM systems in general. The question concerns whether the poor performance in Studies 2 and 3 is a product of the children's immature mastery of the mutation system in general. That is, if a child does not mutate feminine nouns and adjectives in gender marked contexts and fails to make a clear distinction between masculine and feminine possessors,

could this be because his or her general knowledge of mutation is limited, rather than there being a specific problem with gender categories? Experiments 1 and 2 were designed to provide at least some initial answers to this question.

Because of the information we already have concerning adults' and children's use of mutations, the following predictions were made about children's possible responses on the experiments:

- Both children and adults would perform better on Experiment 1 (SM) than on Experiment 2 (AM).
- In both experiments, adults and children would produce the appropriate form of the nouns in contexts that require the basic form, and they would do this more consistently than in contexts that require SM and AM forms.
- By virtue of particular genders' association with particular mutation types, children and adults would perform better on feminine nouns than on masculine nouns in triggering contexts, but would perform better on masculine nouns than on feminine nouns in non-triggering contexts.

EXPERIMENT 1

Method

Participants

Adults.

The same 15 adults who took part in Studies 2 and 3 took part in this experiment. The adults were divided into three age groups. Group 1 consisted of 16- to 30-year-olds ($N = 5$, mean age 20 years); Group 2 consisted of 31- to 50-year-olds ($N = 5$, mean age 38 years); and Group 3 consisted of 51+ year-olds ($N = 5$, mean age 53 years). All adults were L1 speakers of Welsh.

Children.

The same 48 children selected to take part in Studies 2 and 3 took part in this experiment. Each child was assigned to one of four age groups. Group 1 consisted of 4 1/2-year-olds ($N = 12$, age range = 4;0 to 5;5 years, mean age = 4;9 years); Group 2 consisted of 6-year-olds ($N = 12$, age range = 5;7 to 6;7 years, mean age = 6;2 years); Group 3 consisted of 7 1/2-year-olds ($N = 12$, age range = 6;9 to 7;9 years, mean age = 7;2 years); and Group 4 consisted of 9-year-olds ($N = 12$, age range = 8;3 to 9;7 years, mean age = 8;9 years). All children were L1 speakers of Welsh.

Linguistic Stimuli

Participants were required to take part in a task in which they had to produce 20 nouns after four different prepositions. Two of the prepositions (*ar* "on" and *o* "from, out of") trigger SM, and two (*mewn* "in" and *efo* "with") do not. Prepositions were chosen above all other triggers for SM since a number of prepositions trigger SM, and a number of prepositions do not trigger mutation. Therefore it was possible to elicit similar types of constructions for contexts that require SM and the basic form of the nouns. Moreover, a number of studies have shown that SM is consistent after prepositions (e.g., Ball 1984) (however, other studies call this into question -- e.g., Ogwen & Jenkins, 1978).

Twenty nouns were elicited following each of these 4 prepositions, resulting in 80 productions in all. (Each noun was therefore elicited twice in its mutated form and twice in its basic form.) The 20 nouns were selected from the corpus of nouns used for Studies 2 and 3; this would allow for direct comparisons of responses across the studies. One real feminine and one real masculine noun for each of the following word-initial sounds was selected: /p, t, k, b, d, g, ʃ, ʒ, m/,

¹ According to Thomas (1996) and Rowland (1934), it is customary for *efo* "with" to trigger AM onto a following noun in the language of North Wales. However, it seems that this is customary only in the written works of some northern writers who write in that dialect (e.g., Kate Roberts). Since none of the 30 adults who took part in the picture-story task (Chapter 4) mutated /p/-, /t/-, or /k/-initial nouns when they appeared after *efo* in their narratives, and since it is a preposition children are likely to know, I decided to include *efo* in the experiment.

and one real masculine and one real feminine vowel-initial noun. Table 8.1 shows the nouns selected.

Table 8.1: The Nouns Elicited in Experiment 1.

Initial Phoneme	Feminine Noun	Masculine Noun
/p/	<i>pabell</i> "tent"	<i>popty</i> "oven"
/t/	<i>teisen</i> "cake"	<i>tŷ</i> "house"
/k/	<i>coeden</i> "tree"	<i>cwch</i> "boat"
/b/	<i>basged</i> "basket"	<i>bath</i> "bath"
/d/	<i>dysgl</i> "dish"	<i>deimwnt</i> "diamond"
/g/	<i>gwe</i> "web"	<i>gwely</i> "bed"
/ʃ/	<i>llong</i> "ship"	<i>lliain</i> "cloth"
/r̥/	<i>rhwyd</i> "net"	<i>rhew</i> "ice"
/m/	<i>maneg</i> "glove"	<i>melon</i> "melon"
Vowel-Initial	<i>esgid</i> "shoe"	<i>ŵ y</i> "egg"

In addition to these task stimuli, three nouns with non-mutable initial sound, and which were considered to be familiar to children, were used as warm-up items. These nouns were *lamp* "lamp", *haul* "sun", and *sosban* "saucepan".

In Experiments 1 and 2, masculine and feminine real nouns were used as target words in the tests. The reason for the inclusion of both classes of nouns was this: one might predict that, because of the gender-marked context where a determiner precedes the noun (in which feminine nouns are the only nouns that undergo SM), children hear feminine nouns in their SM form more often than they would for masculine nouns. Such authors as Davies (1999, p. 119) consider the most frequent instances of SM to occur with the gender contexts. Moreover, since AM is realised after *ei* (feminine possessive) more often than after any of the other triggers, it is reasonable to assume that AM is associated with feminineness, resulting in more AM forms of feminine nouns than of masculine nouns. It was decided to include both classes of nouns in these tests for these reasons.

Moreover, all nouns were elicited in their mutated and in their basic form. The elicitation of the mutated form would establish their ability to attend to a trigger for a mutation, and to subsequently produce the appropriate mutation in

that context. Eliciting the production of the basic form of the nouns would establish the extent to which children know which form of a word is the basic form. Since SM is the mutation that is triggered by the most environments, and affects the most word-initial sounds, it would be reasonable to assume that the child can take the SM as the default (see e.g., Zwicky, 1984, for discussion of SM as the default). If children produce the mutated form of feminine nouns more so than of masculine nouns in contexts eliciting the basic form, we could postulate that children assume the SM form as the basic form of feminine nouns (this because they undergo SM more often than masculine nouns).

Conversely, if the productions of feminine and masculine nouns in both SM- and AM-marked contexts are no different (i.e., if they do not associate feminine nouns with SM any more than masculine nouns), we would expect similar productions for all these nouns in the experiments for Study 4. That is, we would expect a similar number of “correct” responses in both SM-triggering contexts and in contexts that require the basic form, for all of the nouns. If the gender of the nouns has no effect on children's performance in this study, but their productions of the desired forms of the nouns in the different contexts are not the standard for their dialect, a possible alternative would be this: if the children's productions of SM forms after a SM trigger is low for both feminine and masculine nouns, the children's awareness and/or use of these prepositions as triggers for mutation must be questioned. If that were the case, it could be that children are not attentive to the different triggers for mutation, even when they are highlighted, rendering a more redundant role for some mutation triggers in their language.

Non-Linguistic Stimuli

Four sets of picture cards were devised, one set for each preposition. For *efo*, a set of cards was cut into the shape of a duck, with pictures of the target objects attached to the duck (see Appendix 8.1). For all other three prepositions, sets of rectangular cards (6" x 4" approx.) had objects drawn on them in black and white. For *ar* "on", each card had a small picture of a duck placed "on" the given objects; for *mewn* "in", each had a picture of a duck strategically placed to create the appearance of it being "in" the objects; and for *o* "from, out of", each card had a picture of a duck coming "out of" the objects. For this last set an animated card-pulling device attached to the cards allowed the duck to emerge from the given object. Each session was video-recorded to allow for post-session analysis of the data.

Procedure

All participants were seen individually. The procedure used was the same for adults and children, except that each child was asked if he or she would like to play a game. The instructions then proceeded in the following way for all participants:

The experimenter explained that they were going to see a lot of ducks, and that sometimes the ducks would be "on" things, sometimes they would be playing "with" things, sometimes they would be "in" things, and sometimes they would be coming "from, out of" things. The four card sets were presented in sequence. The order of presentation across the four card sets was randomised. In addition, the items within a particular set of cards were randomly administered.

Prior to the task items, the experimenter introduced three warm-up items. The procedure was similar for all of the prepositions and proceeded as follows:

1. For *o* "from, out of":

Y tro yma, mae'r hwyaden yn dod allan o bethau, iawn? Mae'r hwyaden yn dod allan o lamp. Fedri di ddweud hynny? Mae'r hwyaden yn dod allan . . .

"This time, the duck's coming out of things, okay? The duck's coming out of (a) lamp. Can you say that? The duck's . . ."

2. For *ar* "on":

Y tro yma, mae'r hwyaden ar bethau, iawn? Mae'r hwyaden ar lamp. Fedri di ddweud hynny? Mae'r hwyaden . . .

"This time, the duck's on things, okay? The duck's on (a) lamp. Can you say that? The duck's . . ."

3. For *mewn* "in":

Y tro yma, mae'r hwyaden mewn pethau, iawn? Mae'r hwyaden mewn lamp. Fedri di ddweud hynny? Mae'r hwyaden . . ."

"This time, the duck's in things, okay? The duck's in (a) lamp. Can you say that? The duck's . . ."

4. For *efo* "with":

Y tro yma, mae'r hwyaden efo pethau, iawn? Mae'r hwyaden efo lamp. Fedri di ddweud hynny? Mae'r hwyaden . . ."

"This time, the duck's got things, okay? The duck's got (a) lamp. Can you say that? The duck's . . ."

Once the participants understood the first warm-up item, the experimenter went on to the next two warm-up items. When the participants had produced the desired constructs for all three warm-ups, the experimenter proceeded to introduce the experimental stimuli.

Results

Results from the adult data are reviewed first, followed by the analysis performed on the child data. These are followed by a comparison of the adult and child data. Appendix 8.2 shows raw statistical figures for Experiment 1.

Adults.

A score of 1 was given whenever the appropriate form of an elicited noun appeared after the given preposition -- that is, whenever an elicited noun appeared in its SM form after *ar* “on” and *o* “from, out of” and whenever a noun appeared in its basic form after the prepositions *efo* “with” and *mewn* “in”. Any other form of an elicited noun after these task items was given a score of 0. Any other types of responses (other than the elicited noun after the elicited task item) were eliminated from the analysis. Since all vowel-initial nouns were produced in their basic form, these nouns were not included in the following analysis. An inter-rater reliability score of 94.87% was obtained for the adult data.

A repeated measures ANOVA was applied to the data, with Preposition (*ar* “on”, *o* “from, out of”, *mewn* “in”, *efo* “with”), Gender (masculine, feminine), and Age (16 to 30 years, 31 to 50 years, 51+ years) as independent variables. The data were calculated in proportions since all irrelevant responses (e.g., the use of semantically linked, but not elicited nouns -- *powlen* “bowl” instead of *dysgl* “dish” -- or the use of an English noun for the object -- *tent* instead of *pabell* -- were discarded). Thus arcsin transformations were applied to the data.

The analysis revealed a significant main effect of Preposition only ($F(3, 36)=11.691, p<.001$). Figure 8.1 shows the mean correct responses per Preposition.

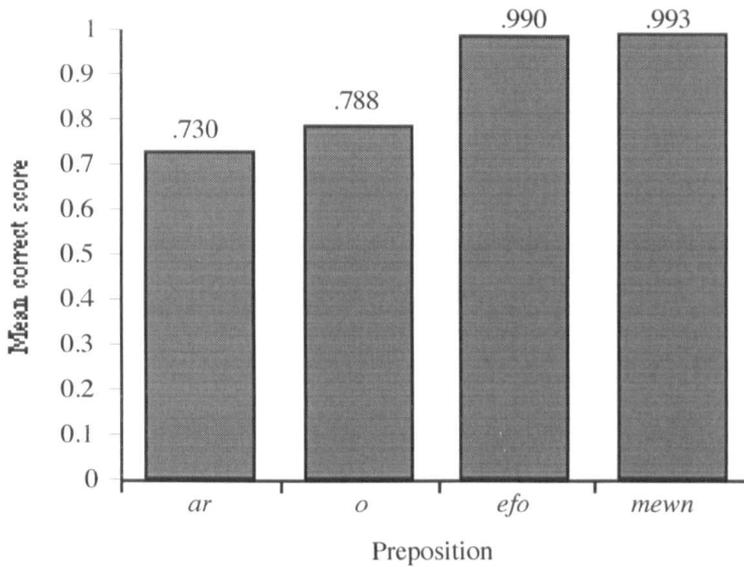


Figure 8.1: Adults' Mean Proportions by Preposition.

Planned mean comparisons indicated that the adults' performance was better on non-triggers to SM than on triggers to SM. The adults were better at producing the basic form of nouns after *efo* "with" ($M = .990$, $SD = .041$) than the SM of nouns after *ar* "on" ($M = .730$, $SD = .315$; $F(1, 36) = 20.791$, $p < .001$) and *o* "from, out of" ($M = .788$, $SD = .291$; $F(1, 36) = 13.484$, $p < .001$). The adults were also better at producing the basic form after *mewn* "in" ($M = .993$, $SD = .028$) than the SM of nouns after *ar* "on" ($F(1, 36) = 21.238$, $p < .001$) and *o* "from, out of" ($F(1, 36) = 13.845$, $p < .001$).

To explore these data further, participants' "errors" were examined. There were only a few errors in the appropriate choice of noun form after the non-triggers (2 errors after *efo* "with", 2 errors after *mewn* "in"); all of these were the use of an SM form rather than the basic form.

The errors produced in the triggering contexts involved the use of basic forms instead of SM forms. Generally, for both masculine and feminine nouns, and for both *ar* "on" and *o* "out of", the younger adults gave more SM responses

than the older adults (although this trend was not significant). Since younger speakers tended to use SM more than older speakers, it seems likely that SM is gradually becoming the dominant mutation in the language (see Chapter 2 for discussion). This difference was most salient after *ar* “on”. For masculine nouns produced in this context, the 16- to 30-year-olds produced SM 72.72% of the time, notably more often than the 31- to 50- and 51+ year-olds, who produced SM on masculine nouns only 59.38% and 57.5% of the time. This trend was again evident for the feminine nouns. The 16- to 30-year-olds produced the SM of feminine nouns 90% of the time whereas the 31- to 50- and the 51+ year-olds produced the SM forms of these nouns only 76.67% and 71.79% of the time. (Interestingly, for all age groups, performance on feminine nouns was better than on masculine nouns in the triggering context involving *ar* “on”, however, this trend was not significant.)

Summary: adult data.

The adults performed significantly better in contexts that required the basic form of a noun (i.e., after the prepositions *efo* “with” and *mewn* “in”) than in contexts that required the SM form (i.e., after the prepositions *ar* “on” and *o* “out of”). Within the different contexts for SM, there was a tendency for feminine nouns to be correctly marked for mutation more than masculine nouns, although this difference was not significant. Across age groups, percent data indicated that the youngest age groups produced more SM forms than the oldest age groups in contexts after *ar* “on” and *o* “from, out of”; however, this was not significant.

Children.

A repeated measures ANOVA with Preposition (*ar* “on”, *o* “from, out of”, *mewn* “in”, *efo* “with”), Gender (masculine, feminine), and Age (4 1/2 years, 6 years, 7 1/2 years, 9 years) as independent variables, was applied to the data. Again, arcsin transformations were performed on the data because of the

proportional nature of the data scores. An inter-rater reliability score of 95.6% was obtained for the child data.

The analysis revealed a significant main effect of Preposition ($F(3, 75) = 90.718, p < .001$) and an interaction of Preposition \times Age ($F(9, 75) = 2.251, p < .001$). Figure 8.2 illustrates the children's responses per Preposition.

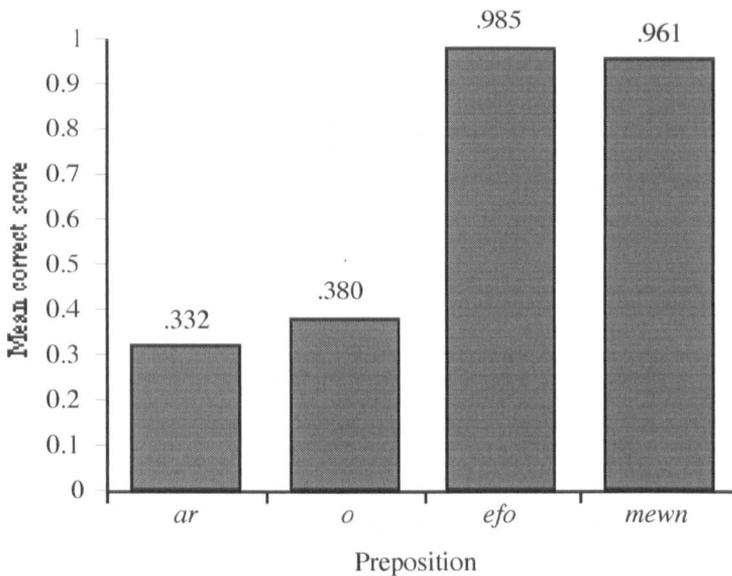


Figure 8.2: Children's Mean Proportions by Preposition.

As was observed from the adults' data, planned mean comparisons indicated that the children's performance was better on non-triggers to SM than on triggers to SM. The children were better at producing the basic form of nouns after *efo* "with" ($M = .985, SD = .046$) than the SM of nouns after *ar* "on" ($M = .332, SD = .367; F(1, 75) = 146.088, p < .001$) and *o* "from, out of" ($M = .380, SD = .386; F(1, 75) = 134.143, p < .001$). The children were also better at producing the basic form after *mewn* "in" ($M = .961, SD = .080$) than the SM of nouns after *ar* "on" ($F(1, 75) = 137.641, p < .001$) and *o* "from, out of" ($F(1, 75) = 126.054, p < .001$). Figure 8.3 illustrates children's performance across Preposition and across Age.

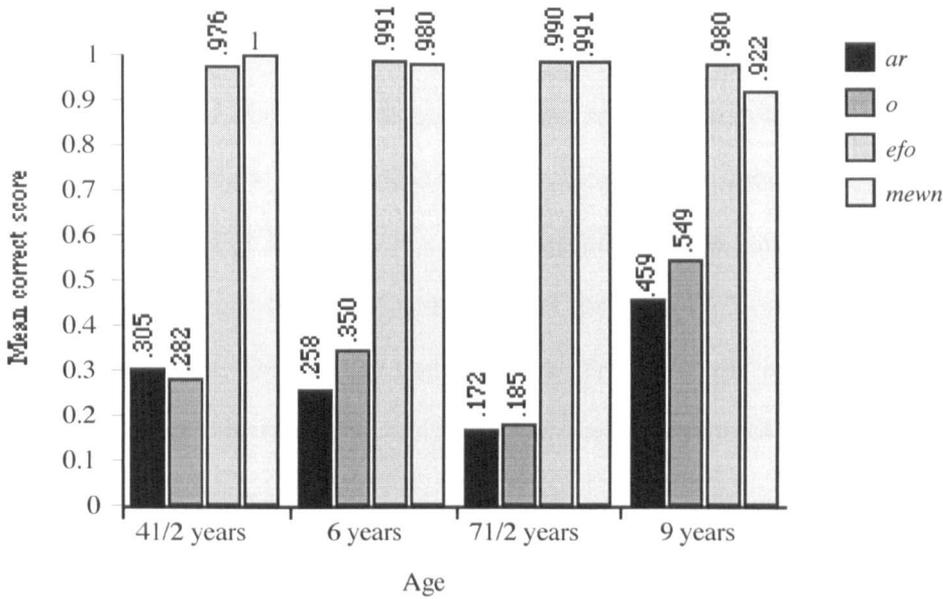


Figure 8.3: Child Mean Proportions per Preposition x Age.

Post hoc analysis revealed that the difference lay between the different age groups on two of the prepositions: *o* “from, out of” and *mewn* “in”. For *o* “from out of”, post hoc analysis revealed that the 9-year-olds performed better than the 4 1/2-year-olds (Student Newman Keuls, $p < .05$). For *mewn* “in”, post hoc analysis revealed that the 9-year-old children ($M = .922$, $SD = .105$) produced significantly less of the basic form of nouns after *mewn* “in” than the 4 1/2-year-olds ($M = 1$, $SD = 0$) the 6-year-olds ($M = .980$, $SD = .046$), and the 7 1/2-year-olds ($M = .991$, $SD = .036$) (Student Newman Keuls, $p < .05$). There was no significant difference for performance across ages on *ar* “on” or *efo* “with”.

Qualitative follow-up analysis revealed that the errors produced after the non-triggers to mutation consisted of the use of the SM form instead of the basic form. With the mutating prepositions *ar* “on” and *o* “from, out of”, all nouns that were not in their SM form were produced in their basic form.

Summary: Child data.

The analysis suggests that children perform better in contexts that require the basic form of nouns than in contexts that require the mutated form.

Interestingly, the analysis of the children's data indicated a significant interaction effect of Preposition x Age. This interaction was due to the oldest children, the 9-year-olds, performing better than the 4 1/2-year-olds on the production of the SM form of nouns after *o* "from, out of" and performing more errors after the non-trigger *mewn* "in" (the overextension of the SM form) than the other children.

Adults vs. children.

A repeated measures ANOVA was applied to the adults' and the children's data. Arcsin transformations were again applied to the data scores.

As with the separate analyses, the combined analysis revealed a significant effect of Preposition ($F(3, 117) = 105.454, p < .001$). Since this result is similar to that found in the previous analyses, it will not be discussed further. The analysis revealed a main effect of Age ($F(4, 39) = 5.104, p < .01$), and significant interactions of Preposition x Gender ($F(3, 117) = 2.816, p < .05$) and Preposition x Age ($F(12, 117) = 4.428, p < .001$). Figure 8.4 charts participants' performance across the age groups.

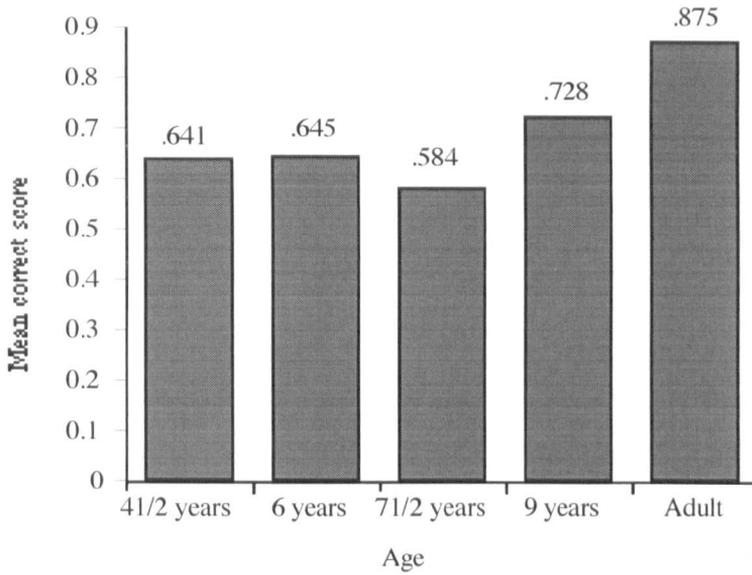


Figure 8.4: Adults' vs. Children's Mean Proportions by Age.

Planned mean comparisons indicated that the main effect of Age was due to the adults' better performance than children in two of the age groups: the 4 1/2- and the 7 1/2-year-olds (Student Newman Keuls, $p < .05$). Figure 8.5 charts the participants' performance across Prepositions and across Gender.

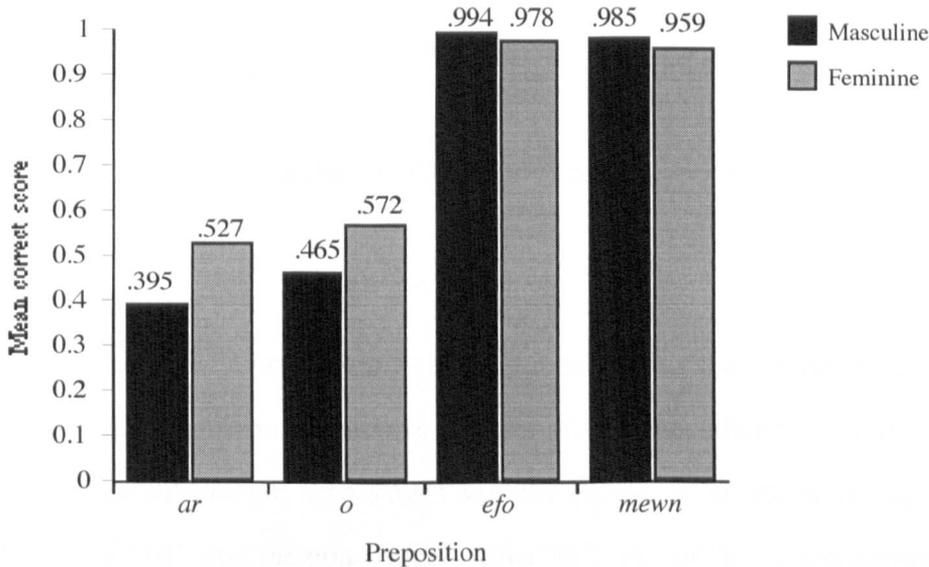


Figure 8.5: Adults' vs. Children's Mean Proportions per Prepositions x Gender.

The interaction of Preposition x Gender was due to the fact that while there was no significant difference between participants' performance on masculine and feminine nouns after *efo* "with" and *mewn* "in", with *ar* "on" performance on masculine nouns ($M = .395$, $SD = .4$) was worse than performance on feminine nouns ($M = .527$, $SD = .391$) ($F(1, 117) = 6.643$, $p < .05$); for *o* "from, out of", performance on masculine nouns ($M = .465$, $SD = .418$) was worse than performance on feminine nouns ($M = .572$, $SD = .390$) ($F(1, 117) = 3.831$, $p = .05$). Figure 8.6 charts the participants' performance per Preposition and per Age.

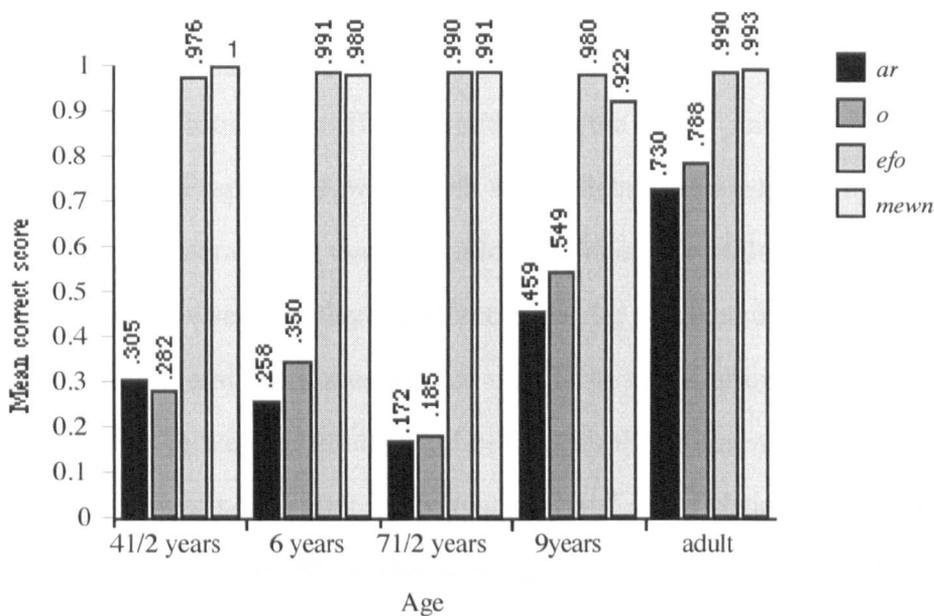


Figure 8.6: Adults' vs. Children's Mean Proportions per Preposition x Age.

The interaction Preposition x Age was due to the fact that, while there was no difference in performance across ages for productions after *efo* "with", there were significant differences across ages with the triggers to mutation *ar* "on" and *o* "from, out of", and the non-trigger *mewn* "in". For *ar* "on", post hoc analysis revealed that the adults performed significantly better than the 4 1/2-, 6-, 7 1/2-, and 9-year-olds (Student Newman Keuls, $p < .05$).

For *o* “from, out of”, post hoc analysis revealed that the adults performed significantly better than the 4 1/2-, 6-, 7 1/2-, and 9-year-olds (Student Newman Keuls, $p < .05$).

Finally, for the non-trigger to mutation, *mewn* “in”, post hoc analysis revealed that the 9-year-olds performed significantly worse than the other ages on the production of the basic form of nouns after *mewn* “in”: the 9-year-olds performed significantly worse than the 4 1/2-, 6-, 7 1/2-, and the adults (Student Newman Keuls, $p < .05$).

Summary: adults vs. children.

In addition to the effects found when the adults’ and the children’s data were analysed separately, when both sets of data were analysed together the adults performed better overall than the children. When the adults’ and the children’s data were analysed together, an effect of gender was found: more SM was produced on feminine nouns than on masculine nouns after *ar* “on” and *o* “from, out of”. Moreover, the adults were better than the children on the production of the SM form of nouns after the triggers *ar* “on” and *o* “from, out of”. Finally, the adults produced more SM forms after the triggers to mutation than the children, and the 9-year-olds did so more than the 7 1/2-year-olds also. Moreover, the 9-year-olds produced significantly fewer basic form of nouns after *mewn* “in” than did children of other ages.

Discussion of Experiment 1

This experiment aimed to investigate how children (and adults) performed with SM in non-gendered contexts. As you may recall from the analysis of the data from Studies 1 and 2 the children’s performance on the production of SM in gender-marked contexts was very low. Experiment 1 of Study 3 was designed to explore whether the children’s performance on Studies 1 and 2 was due to a

specific lack of ability with grammatical gender or due to a general lack of ability with marking mutation.

Results showed that both adults and children produced the appropriate form of the nouns in contexts that required the basic form of nouns (i.e., after *mewn* “in” and *efo* “with”) more consistently than in contexts that required the SM form (i.e., after *ar* “on” and *o* “from, out of”). This result was in accordance with one of the predictions laid out at the beginning of this chapter, namely that adults and children will produce the appropriate form of nouns in contexts that require the basic form, and that they will do this more consistently than in contexts that require the SM form. This result is not surprising given the complexity of the mutation system.

A second prediction laid out at the beginning of this chapter was that, by virtue of particular genders’ association with particular mutation types, children and adults will perform better on feminine nouns than on masculine nouns in triggering contexts, but will perform better on masculine nouns than on feminine nouns in non-triggering contexts. These data support the former prediction: participants provided more SM forms with feminine nouns after *ar* “on” and *o* “from, out of” than with masculine nouns. This indicates that SM may be associated with feminineness. However, there were no differences in responses on masculine and feminine nouns after the non-triggers to mutation: *mewn* and *efo*. Since the same nouns were elicited after each preposition, the prevalence of SM of the feminine nouns in the triggering contexts was not overextended into the non-triggering contexts.

From the children’s data it was evident that there were no significant effects across ages other than on the production of the basic form of nouns after *mewn*: the 9-year-olds performed significantly worse than the other children. Developmentally, the children seem to be at the same level as the adults in the production of the basic form of nouns after the non-triggers to mutation. The only exception was with the 9-year-olds’ productions after *mewn*. All forms other than

the basic form produced after *mewn* were the SM form. Therefore the 9-year-olds tended to overextend the SM form more than did the other age groups. However, although both adults and children were significantly better at producing the basic form of nouns after the non-triggers than they were at producing the SM of nouns after the triggers, the adults' ability to produce SM after the triggers was significantly better than the children's. In fact, the 9-year-olds were also better than the 7 1/2-year-olds here.

Children do use SM, but not regularly, and are yet to reach the adult norm. This suggests that children are still in the process of acquiring general mutation rules (i.e., other than gender), even at the age of 9 years.

EXPERIMENT 2

Method

Participants

Adults.

The same 15 adults who took part in Experiment 1 (and Studies 2 and 3) took part in this experiment. The adults were divided into three age groups. Group 1 consisted of 16- to 30-year-olds ($N = 5$, mean age 20 years); Group 2 consisted of 31- to 50-year-olds ($N = 5$, mean age 38 years); and Group 3 consisted of 51+ year-olds ($N = 5$, mean age 53 years). All adults were L1 speakers of Welsh.

Children.

The same 48 children who took part in Experiment 1 (and Studies 2 and 3) took part in this experiment. Each child was assigned to one of four age groups. Group 1 consisted of 4 1/2-year-old children ($N = 12$, age range = 4;0 to 5;5 years, mean age = 4;9 years); Group 2 consisted of 6-year-old children ($N = 12$, age range = 5;7 to 6;7 years, mean age = 6;2 years); Group 3 consisted of 7 1/2-year-

old children ($N = 12$, age range = 6;9 to 7;9 years, mean age = 7;2 years); and Group 4 consisted of 9-year-old children ($N = 12$, age range = 8;3 to 9;7 years, mean age = 8;9 years). All children were L1 speakers of Welsh.

Linguistic Stimuli

Participants were required to take part in a task in which they had to produce 24 nouns after three different linguistic items. These items were the conjunctions *a* “and” and *na* “nor” that trigger AM, and the preposition *rhwng* “between” that does not. These items were chosen above all other triggers and non-triggers to AM since many studies have shown that the most consistent trigger for AM (after the feminine possessive *ei*, which was the target construction of Study 3) is *a* “and” (e.g., Davies, 1982, 1984). In order to keep the task relatively coherent, it was also decided to look at adherence to AM after the negative conjunction *na* “nor” that was easily incorporated with *a* into the test. Moreover, in order to elicit the production of the basic form of the nouns, I decided to use another preposition, *rhwng* “between”; this would keep the linguistic constructs elicited across Experiments 1 and 2 as similar as possible.

A set of 24 nouns was elicited following each of the two conjunctions and the preposition, resulting in 72 productions in all. (Each noun was therefore elicited twice in its AM form and once in its basic form.) Three real feminine and three real masculine nouns for each of /p/-, /t/-, and /k/-initial nouns were selected as the corpus of nouns. Three real masculine and three real feminine vowel-initial nouns were also used. These 24 nouns were the elicited nouns. A further set of 24 nouns was used in conjunction with the elicited nouns. These additional nouns were required for the linguistic constructs that were elicited (i.e., two objects had to be used to elicit the production of the conjunctions *a* “and” and *na* “nor” and the preposition *rhwng* “between”). Since this was a production test, where the children were not given the name for the objects, the aim was for the elicited and accompanying nouns to be semantically related, such that the children would have

less difficulty in recalling the names of the objects in the pictures. Table 8.2 shows the elicited nouns with each of their accompanying nouns used in Experiment 2.

Table 8.2: The Nouns Elicited in Experiment 2.

Phoneme	Elicited Feminine Noun	Accompanying Noun
/p/	<i>pêl</i> "ball"	<i>raced</i> "racket"
	<i>pedol</i> "horseshoe"	<i>esgid</i> "shoe"
	<i>planed</i> "planet"	<i>roced</i> "rocket"
/t/	<i>teisen</i> "cake"	<i>brechdan</i> "sandwich"
	<i>taten</i> "potato"	<i>moronen</i> "carrot"
	<i>trol</i> "cart"	<i>olwyn</i> "wheel"
/k/	<i>cadair</i> "chair"	<i>bwrdd</i> "table"
	<i>calon</i> "heart"	<i>seren</i> "star"
	<i>cylllell</i> "knife"	<i>fforc</i> "fork"
vowel	<i>awyren</i> "aeroplane"	<i>cwmwl</i> "cloud"
	<i>wats</i> "watch"	<i>modrwy</i> "ring"
	<i>ysgol</i> "ladder"	<i>fffenest</i> "window"
Phoneme	Elicited Masculine Noun	Accompanying Noun
/p/	<i>popty</i> "oven"	<i>sinc</i> "sink"
	<i>plât</i> "plate"	<i>cwpan</i> "cup"
	<i>papur</i> "paper"	<i>pensel</i> "pencil"
/t/	<i>tân</i> "fire"	<i>glaw</i> "rain"
	<i>tap</i> "tap"	<i>bath</i> "bath"
	<i>to</i> "roof"	<i>drws</i> "door"
/k/	<i>crys</i> "shirt"	<i>trowsus</i> "trousers"
	<i>cwch</i> "boat"	<i>bws</i> "bus"
	<i>clo</i> "lock"	<i>goriad</i> "key"
vowel	<i>asgwrn</i> "bone"	<i>powlen</i> "bowl"
	<i>wy</i> "egg"	<i>tost</i> "toast"
	<i>inc</i> "ink"	<i>beiro</i> "biro"

Inspection of Table 8.2 shows that some of the accompanying nouns had /p/-, /t/-, and /k/-initial nouns. This was unavoidable for three reasons: first, some of the items used were often the only concrete objects that could be drawn; second, they were often the only objects that could be easily recognised by children, facilitating their recall of the elicited item also in some cases; third, they were the only "simple" objects that complied with the above criteria for inclusion that also formed a semantic link with the elicited noun. The distribution of these word-initial sounds in the accompanying nouns was balanced such that there were

two each of /p/-, /t/-, and /k/-initial nouns: *pensel* “pencil”, *powlen* “bowl”, *cwmwl* “cloud”, *cwpan* “cup”, *trowsus* “trousers”, and *tost* “toast”.

In addition to these task stimuli, three elicited nouns and three accompanying nouns that were considered to be familiar to children were used as warm-up items. None of these six additional nouns had initial mutable sounds. The nouns used as the warm-up items were *het* “hat”, *lamp* “lamp”, and *haul* “sun”; these nouns were accompanied by *hosan* “sock”, *siswrn* “scissors”, and *sbectol haul* “sunglasses”.

Non-Linguistic Stimuli

Three sets of picture cards were devised, one set for each linguistic item. For *rhwng* “between”, a set of cards had two different objects drawn directly onto the cards at either end. A small cut-out duck was placed between each pair of objects on each card. For the two conjunctions *a* “and” and *na* “not”, a set of laminated cards had pictures of two objects, also laminated and cut out, attached to the cards at either end with reusable sticky substance. This was in order that the children could pull the objects from the cards like stickers (see Appendix 8.3). Each session was video-recorded to allow for post-session analysis of the data.

Procedure

All participants were seen individually. The procedure used was the same for adults and children, only each child was asked if he or she would like to play a game. The experimenter explained to the participants that there would be two sets of cards, and that they were going to do three tasks with the cards. The two card sets (three tasks) were presented in sequence. The order of presentation across and within the three card sets was randomised. Prior to each task item, the experimenter provided the participants with a set of trial items. The procedures used with each of the items were as follows:

1. For *a* "and":

Y tro yma, ar y cardiau, mae 'na ddau beth. Be' 'dw i eisiau i ti ei wneud ydi dweud be' ydi'r ddau beth fel hyn, iawn? 'Lamp a siswrn'. Fedri di ddweud hynny?

"On these cards there are two things. What I want you to do is to say what the two things are like this, okay? '(A) lamp and scissors'. Can you say that?"

2. For *na* "nor":

Y tro yma, 'da ni am gael gwneud rhywbeth da. 'Da ni am gael tynnu'r lluniau yma i ffwrdd, iawn? Fel hyn: 'toes na'm lamp na siswrn'. Fedri di wneud hynny rwan?

"This time, we're going to do something good. We're going to take these pictures off, okay? Like this: 'there's no lamp [pulling off the picture of the lamp from the card] nor scissors' [pulling off the picture of the scissors from the card]. Can you do that now?"

3. For *rhwng* "between":

Y tro yma, mae yna hwyaden rhwng dau beth. Be' 'dw i eisiau i ti ei wneud ydi dweud wrtha i rhwng be' mae'r hwyaden, iawn? Fel hyn: 'mae'r hwyaden rhwng lamp a siswrn'. Fedri di ddweud hynny rwan?

"This time, there's a duck between two things. What I want you to do is to tell me what the duck's between, okay? Like this: 'the duck's between (a) lamp and scissors'. Can you say that now?"

Once the participants understood the first warm-up item, the experimenter went on to the next two warm-up items. Once the participants understood all warm-up items, the experimental items were introduced. Again, all items for a particular task were randomly presented.

Results

Results from the adult data are reviewed first, followed by the analysis performed on the child data. These results are followed by a comparison of the adult and child data.

Adults.

A score of 1 was given whenever the appropriate form of an elicited noun appeared after the task items -- that is, whenever an elicited noun appeared in its AM form after *a* "and" and *na* "nor", and whenever an elicited noun appeared in its basic form after *rhwng* "between". Any other form of an elicited noun after these task items was given a score of 0. Any other types of responses (other than the elicited noun after the elicited task item) were eliminated from the analysis. Since all vowels were produced in their basic forms, these nouns were not included in the analysis. For the adult data, an inter-rater reliability score of 97.9% was obtained. Raw statistical figures are shown in Appendix 8.2.

A repeated measures ANOVA was applied to the data, with Task Item (*a* "and", *na* "nor", *rhwng* "between"), Gender (masculine, feminine), and Age (16- to 30-year-olds, 31- to 50-year-olds, 51+ year-olds) as independent variables. These data were also calculated in proportions since all irrelevant responses (e.g., the use of a non-elicited noun or the use of the definite article after the task item) were discarded. Thus arcsin transformations were applied to the data.

The analysis revealed a significant main effect of Task Item only ($F(2,24) = 24.821, p < .001$). Figure 8.7 illustrates the adults' performance.

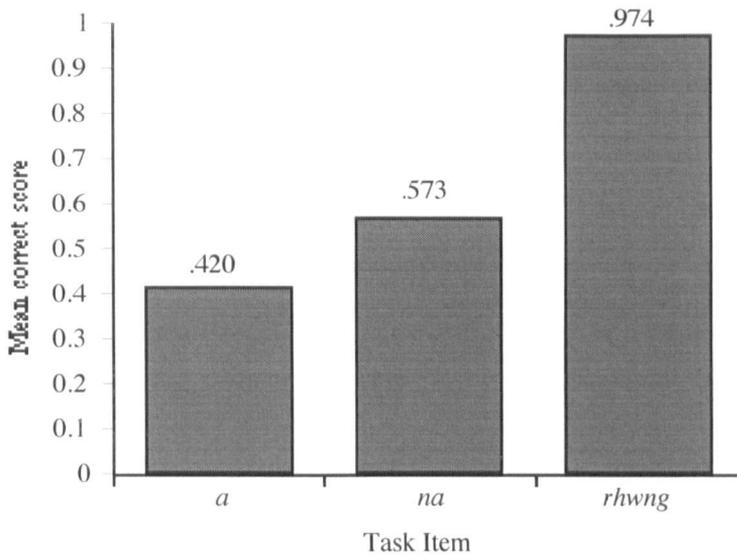


Figure 8.7: Adults' Mean Proportions by Task Item.

Planned mean comparisons indicated that the adults' performance was better when they were producing the basic form of nouns after *rhwnng* "between" ($M = .974$, $SD = .086$) than when they were producing the AM form after *a* "and" ($M = .420$, $SD = .425$; $F(1, 24) = 1079.509$, $p < .001$) and *na* "nor" ($M = .573$, $SD = .410$; $F(1, 24) = 1167.428$, $p < .001$). There were no other significant effects.

To explore these data further, participants' noun form productions that did not follow the expected norm were examined. After *rhwnng* "between", one participant from the 16-to 30-year-olds' age group produced the AM form of *tân* "fire" (therefore *rhwnng tân* "between (a) fire"). Another participant from the 51+ year-olds' age group produced five nouns in their SM instead of their basic form after *rhwnng* "between".

All substitution errors performed after *a* "and" and *na* "nor" consisted of the substitution of the basic form for the AM form.

Summary: adults' data.

Again, the adults performed significantly better in contexts that required the basic form of nouns (i.e., after the preposition *rhwnng* "between") than in

contexts that require the AM form (i.e., after the conjunctions *a* “and” and *na* “nor”). There was only a slight tendency for the adults to overextend SM onto a non-triggering context (i.e., after *rhwng* “between”) and all responses that did not contain the AM form of nouns after *a* “and” and *na* “nor” consisted of the overextension of the basic form.

Children.

A repeated measures ANOVA with Task Item (*a* “and”, *na* “nor”, *rhwng* “between”), Gender (masculine, feminine), and Age (4 1/2 years, 6 years, 7 1/2 years, 9 years) as independent variables, was applied to the data. Arcsin transformations were applied to the data. For the children’s data, an inter-rater reliability score of 96.8% was obtained. As with the adults’ data, the children’s data revealed a significant main effect of Task Item only ($F(2, 64) = 749.553, p < .001$). Figure 8.8 illustrates these data.

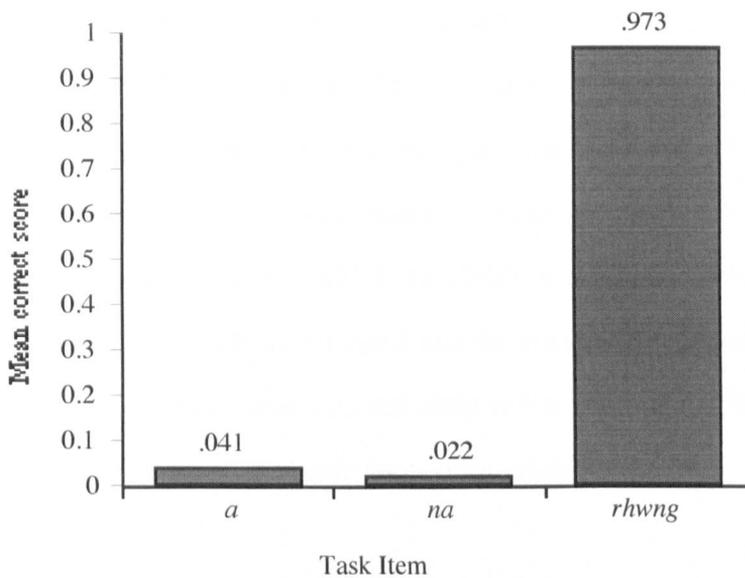


Figure 8.8: Children’s Mean Proportions by Task Item.

Planned pairwise mean comparisons revealed that the main effect of Task Item was due to the children being better at producing the basic form of nouns after *rhwng* “between” than at producing the AM form of nouns after *a* “and” ($F(1, 64) = 1167.428, p < .001$) and *na* “nor” ($F(1, 64) = 1079.509, p < .001$).

The analysis revealed no significant effect of Age or Gender. This suggests that the children did not associate AM with feminine nouns more than with masculine nouns by virtue of their added association with AM after the trigger *ei* “her”.

Qualitative follow-up analysis revealed that there were only a few productions that were different from the expected norm in the children’s productions of nouns after the non-trigger to mutation *rhwng*. These were all SM errors. Two of the children (one of the 4 1/2-year-olds and one of the 6-year-olds) produced *rhwng drol* “between (a) cart” where *trol* (feminine) “cart” had undergone SM into *drol*. Another two of the children (both from the age 9 group) produced *rhwng gwch* “between (a) boat” where *cwch* (masculine) “boat” had undergone SM into *gwch*. Finally, another child produced *rhwng gadair* “between (a) chair” where *cadair* (feminine) “chair” had undergone SM into *gadair*.

Since some of the children produced forms that involved the use of SM for the basic form after *rhwng*, further qualitative analysis was conducted to determine the extent to which the children made the same form “errors” after *a* and *na*. This analysis revealed that the children made four such errors after *a* and seven such errors after *na*. All other errors produced after *a* and *na* consisted of the production of the basic form of the nouns.

Summary: child data.

The analysis suggests that children perform better in contexts that require the basic form of nouns than those that require the AM form. There was a slight overextension of SM after *rhwng* “between” whereas all nouns that were not

produced in their AM form after *a* “and” and *na* “nor” were produced in their basic form.

Adults vs. children.

A repeated measures ANOVA was applied to the children’s and the adults’ data together. Arcsin transformations were also applied to the scores. The analysis indicated a significant main effect of Task Item ($F(2, 92) = 410.062, p < .001$). As this effect is parallel to what we have already seen in previous analyses, it will not be discussed further. The analysis also revealed a main effect of Age ($F(4, 46) = 7.77, p < .001$) and an interaction of Task Item x Age ($F(8, 92) = 6.476, p < .01$). Figure 8.9 illustrates performance by Age.

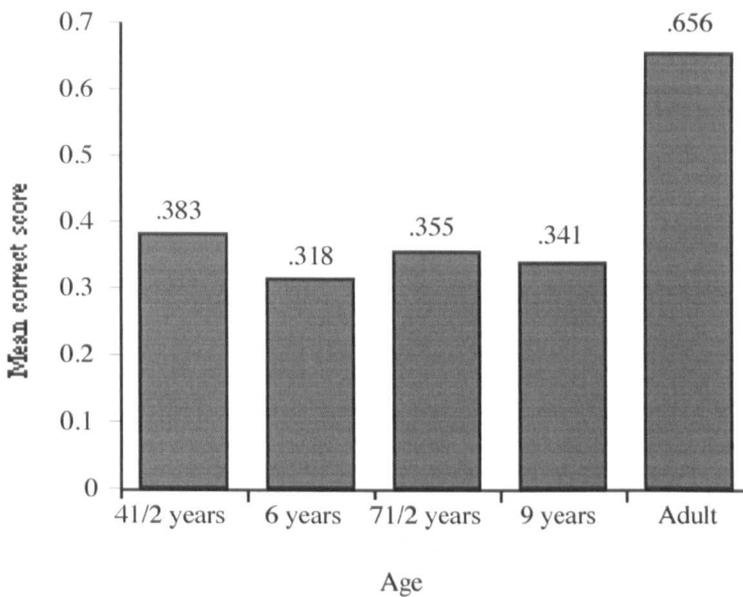


Figure 8.9: Adults’ vs. Children’s Mean Proportions by Age.

Pairwise mean comparisons revealed that adults performed better overall than the children: adults vs. 4 1/2-year-olds ($F(1, 46) = 8.73, p < .01$), adults vs. 6-year-olds ($F(1, 46) = 20.64, p < .001$), adults vs. 7 1/2-year-olds ($F(1, 46) = 14.699, p < .001$), adults vs. 9-year-olds ($F(1, 46) = 19.43, p < .001$). Figure 8.10 shows performance by Task Item and by Age.

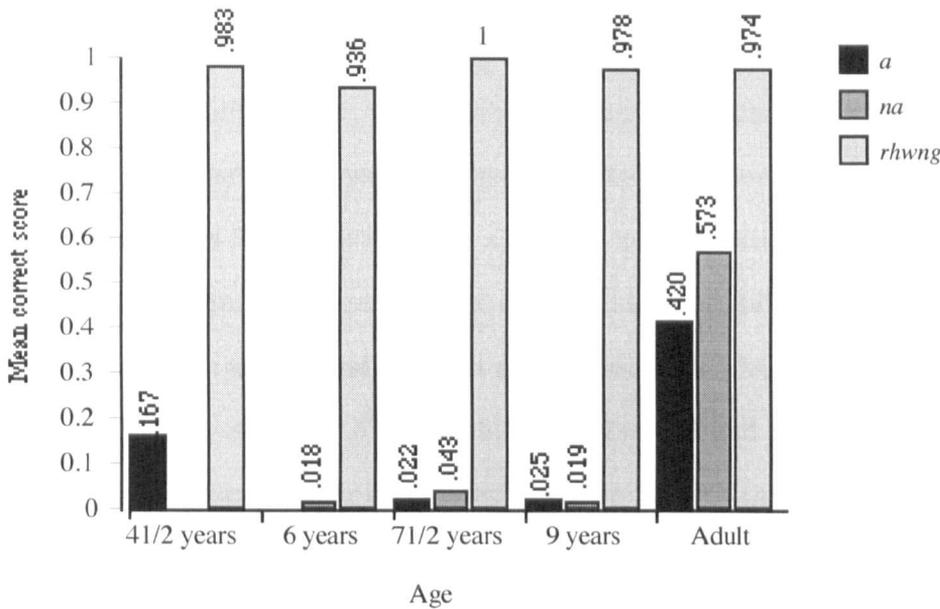


Figure 8.10: Adults' and Children's Mean Proportions per Task Item x Age.

The interaction of Task Item x Age was due to the fact that while there were no significant differences across ages in the production of the basic form of nouns after *rhwng*, adults performed better than all the children on the triggers to mutation (i.e., the adults produced the AM form more often than the children after *a* and *na*): adults vs. 4 1/2-year-olds ($F(1, 92) = 13.175, p < .001$), adults vs. 6-year-olds ($F(1, 92) = 23.172, p < .001$), adults vs. 7 1/2-year-olds ($F(1, 92) = 21.402, p < .001$), adults vs. 9-year-olds ($F(1, 92) = 23.319, p < .001$).

Summary: adults vs. children.

In addition to the effects found when the adults' and the children's data were analysed separately, when both sets of data were analysed together, the adults performed better than all the children on the production of AM after the triggers to mutation.

Discussion of Experiment 2

Experiment 2 aimed to investigate how children (and adults) performed with AM in non-gendered contexts. Recall that the results from Study 3 (distant gender marking) suggested children are not very good at producing AM on /p, t, k/- or vowel-initial nouns. (Recall also that the adults' use of AM was only minimal.) Experiment 2 was designed to explore whether the children's performance on Study 3 was due to a specific lack of ability with distant gender marking of grammatical gender or to a general lack of ability with marking mutation. Both adults' and children's responses with AM in Study 4 were low (for adults $M = .420$ and $.573$, for children, $M = .041$ and $.022$) although the adults' scores were higher in this study than on Study 3 ($M = .365$ with /p, t, k/-initial nouns and $.137$ with vowel-initial nouns) and the children's scores better on Study 3 than on Study 4 ($M = .157$ with /p, t, k/-initial nouns and 0 with vowel-initial nouns).

Results showed that both adults and children produced the basic form of nouns in a non-triggering context (i.e., after *rhwng* "between") more than they produced the AM form in triggering contexts (i.e., after *a* "and" and *na* "nor"). These results were again in accordance with one of the predictions laid out at the beginning of this chapter, namely that adults and children will produce the appropriate form of the nouns in contexts that require the basic form, and that they will do this more consistently than in contexts that require the AM form.

In response to a second prediction -- namely that by virtue of particular genders' association with particular mutation types, children and adults will perform better on feminine nouns than on masculine nouns in triggering contexts, but will perform better on masculine nouns than on feminine nouns in non-triggering contexts -- the data revealed no significant effects of gender. Therefore children are not better on the production of the AM form of feminine nouns than of masculine nouns.

There was no difference between the children's responses on the test: that is, there was no indication of improvement with age among the children. There was, however, a significant effect between the adults' responses and the children's. When the analysis looked at responses per task item, the analysis revealed that the adults produced the AM form of nouns after *a* "and" and *na* "nor" significantly more often than the children; there was no difference between responses after *rhwnng* "between".

Therefore, developmentally, the children are able to produce the basic form of nouns after the non-trigger at the same rate as the adults. However, with regards to AM, the children are not very productive with this mutation after /p, t, k/- and not at all after vowel-initial nouns.

General Discussion of Both Experiments.

The data from both these two experiments agree with the first prediction laid out at the beginning of this chapter, namely that adults and children will produce the appropriate form of the nouns in contexts that require the basic form, and that they will do this more consistently than in contexts that require the SM or the AM form. This may suggest that children start with the basic form of nouns and gradually acquire their mutated variants as they become more proficient language learners.

The data from these two experiments agree with another prediction, namely that children will perform better with the production of SM than with the production of AM. Across experiments, the adults' and the children's mean scores for the triggering items were higher in Experiment 1 than in Experiment 2. That is, both adults and children were better at producing SM after *ar* "on" and *o* "from, out of" than at producing AM after *a* "and" and *na* "nor". The adults' mean score for *ar* "on" was .730 and for *o* "from, out of" was .788. The adults' mean score for *a* "and" was .420 and for *na* "nor" was .573. The children's mean score for *ar* "on" was .332 and for *o* "from, out of" was .380. The children's

mean score for *a* “and” was .041 and for *na* “nor” was .022. This indicates that either (a) children are learning SM before AM (i.e., at separate and distinct times) or (b) children are learning both systems concurrently, only SM will be stronger than AM because of the nature of the input, and the developmental path will reflect this (i.e., children will never reach the same proficiency with marking AM as with marking SM because of the way they are marked in the language). What is certain is that children have not fully acquired either mutation to the adult level. What is also clear is that in the adult language the use of AM is in a very precarious situation. Children are therefore acquiring a mutation type that is irregular in use, a fact that is reflected in the data produced here.

In addition, data from Experiment 1 provide some results to indicate that gender might have a part to play in the application of SM: feminine nouns undergo SM more often than masculine nouns because of the definite article. This suggests that feminineness is associated with SM. If a child knows that a noun is feminine, he or she might be more inclined to produce it in its mutated form. (Recall also that the data from Chapter 4 indicates that, for some feminine nouns, the SM form is used as the “traditional” basic form.) Although frequency effects could also play a part, it is most likely that it does not here since no such effects were found in Experiment 2. In Experiment 2, it could be argued that children would hear feminine nouns in their AM form more often than masculine nouns because of *ei* “her”. However, no such gender effects were found in Experiment 2. Therefore it is more likely that children associate the feminine form with SM rather than base their responses on knowledge of frequencies.

Finally, children’s performance on both experiments was lower than that of the adults. The adults were always better than the children at producing the appropriate mutation after the triggering items. However, there were no differences in performance on the non-triggering items across both experiments. Therefore the children are yet to master the SM and the AM system to the adult level.

CHAPTER 9

General Discussion

The studies reported in this thesis were designed to provide initial data and some initial answers to questions concerning children's productive use and acquisition of grammatical gender in Welsh. Four studies were designed for this purpose. Study 1 provided the participants with a semi-naturalistic study. This required the participants to interpret a series of pictures that depicted a story out loud. To compare results on the semi-naturalistic study with a more experimentally controlled set of stimuli, Study 2 provided participants with six experimentally controlled tests, some of which provided a cue to gender status, some of which did not. Both real and nonsense nouns were used in order to allow investigation of any productivity of gender knowledge. Both Study 1 and Study 2 looked at children's and adults' abilities to mark gender in local gender marked constructs; that is, to mark gender on the noun itself or on its modifier. To expand on the data found in Studies 1 and 2, Study 3 was designed to explore children's and adults' abilities with the distant marking of gender; that is, gender marking after the homonymic possessive adjectives *ei* "his, her, its" which refer back to the gender of the possessor noun. Finally, since Studies 1, 2, and 3 elicited the production of the SM form -- sometimes to mark feminine gender (Studies 1 and 2) and sometimes to mark masculine gender (Study 3) -- and Study 3 elicited the production of the AM form to mark feminine gender, Study 4 investigated children's and adults' abilities to use both types of mutation (and the

basic form that was also elicited in Studies 1, 2, and 3) in non-gendered contexts.

Table 9.1 summarises the main findings in each study.

Table 9.1: Main Percent Scores for Appropriate Mutation in Each Study.

	Adjective After Feminine Noun		Feminine Noun After Definite Article <i>y(r)</i>	
	Study 1	Study 2	Study 1	Study 2
Adults	43%with <i>bach</i> 79%without <i>bach</i>	59%	88%	50%
Children	58%	24%	60%	10%
	SM After <i>ei</i> With Masculine Antecedents	AM After <i>ei</i> With Feminine Antecedents	SM After Prepositions <i>ar/</i> <i>o</i>	AM After Conjunctions <i>a/</i> <i>na</i>
	Study 3	Study 3	Study 4	Study 4
Adults	88%	/p, t, k/ = 37% vowels = 14%	<i>ar</i> = 73% <i>o</i> = 79%	<i>a</i> = 42% <i>na</i> = 57%
Children	71%	/p, t, k/ = 16% vowels = 0%	<i>ar</i> = 33% <i>o</i> = 38%	<i>a</i> = 4% <i>na</i> = 2%

All of the statistical effects have been previously reported in the individual discussions at the end of each experimental chapter, and each question and prediction discussed point by point. In this final chapter, the relevant issues to this thesis will be discussed in general.

Do Welsh-Speaking Children Rely on the Formal Properties of Nouns to Determine Their Gender?

One of the major claims researchers of grammatical gender have put forward is that children attend to the formal properties of the language they are learning to determine the gender of a noun (e.g., MacWhinney, 1978; Karmiloff-Smith, 1978, 1979; Böhme & Levelt, 1979; Levy, 1983a, 1983b; Mills, 1985; Cain, Weber-Olsen,

& Smith, 1987; Martinez & Shatz, 1996); this is especially the case when children are learning more transparent systems that have something closer to one-to-one mappings between form and meaning. The data for Welsh presented in Studies 2 (Chapter 6) and 3 (Chapter 7) are inconsistent with these claims for the following reasons:

First, the children's overall mean scores for feminine nouns was very low in the experimental study (Study 2) ($M = .202$ for the Set 1 analysis, $M = .258$ for the Set 2 analysis). This performance does not suggest that the children found formal information that indicated that a noun is feminine to be useful. (Adult participants' mean scores for feminine nouns was also low in Study 2 compared to Study 1 -- $M = .512$ for the Set 1 analysis, $M = .585$ for the Set 2 analysis of Study 2. Thus the adults did not necessarily or consistently attend to the cues given to determine that a noun was feminine.)

Second, although there were instances when the children performed better on Tests 3, 4, 5, and 6 (these tests provided a cue) than on Tests 1 and 2 (these tests provided no cue) in Study 2, this response pattern was not consistent.

Third, Study 3 (on distant gender-marking) also revealed that, as observed in Study 2, neither children nor adults attended to the cues provided to inform themselves about the gender of the possessor noun.

Fourth, when presented with nonsense feminine nouns in Study 2, neither the children nor the adults performed well on these items; this suggests that neither children nor adults found the cues provided useful for helping them determine the gender of a new noun. However, as reported in Chapter 6, some of the contexts given to the participants in Study 2 were ambiguous with regard to gender. When the

ambiguous contexts were taken out, leaving only the unambiguous contexts, the adults' performance slightly improved. The adults' mean proportion for their performance on nonsense feminine nouns under the Set 1 analysis (some ambiguous cues) was .323, whereas the mean proportion for their performance under the Set 2 analysis (unambiguous cues only) increased to .517. (This compares with a mean of .7 with real nouns with feminine cues in the Set 1 analysis and with a mean of .653 with real nouns with feminine cues in the Set 2 analysis.) This suggests that the adults found the more unambiguous cues better indicators to help determine the gender of the nonsense nouns provided. Performance on nonsense masculine nouns remained more or less the same for the two sets of analyses ($M = .797$ for the Set 1 analysis, and $M = .792$ for the Set 2 analysis). The children's mean proportions, on the other hand, did not seem to improve from the first analysis to the second (with only masculine cues) as much as the adults'. The children's mean proportions for their performance on nonsense feminine nouns under Set 1 analysis was .122 whereas their mean score for their performance under Set 2 analysis increased only slightly to .145. (This compares with a mean proportion of .283 for real feminine nouns under the Set 1 analysis and .371 under the Set 2 analysis.) This suggests that even unambiguous cues did not aid the children's performance on nonsense nouns.

Therefore, contrary to suggestions from previous research, children learning Welsh as a first language do not seem to find intralinguistic cues useful for determining the gender of either real or nonsense nouns. Recall that for real nouns, results from a follow-up set of analyses suggested that familiarity with nouns may influence children's performance: children were better at giving the basic forms of

familiar nouns when they were given gender-marked contexts than they were at giving the basic forms of less familiar nouns. Given that children had difficulty with gender marking of less familiar real nouns in this way, it is not surprising that the children's performance with nonsense nouns was poor. As discussed in Chapter 1, Levy and Tolchinsky (1999) question whether nonsense nouns are suitable stimuli for the study of grammatical gender at all. Children, they say, will perform poorly on nonsense nouns because the lexical status of such nouns is not sufficient enough to trigger the "obligatory automatic procedure of gender agreement" (Levy & Tolchinsky, 1999, p. 26). They base part of their argument on behavioural studies that indicate that children require multiple exposures of a novel noun before they can learn the mapping between the noun and its meaning; a single exposure to a novel noun is not always enough. However, other studies that have looked at Spanish speakers' abilities with the gender marking of nonsense nouns (e.g., Gathercole & Hasson, 1995) have suggested that participants respond to nonsense nouns in ways that are similar to their responses to real nouns. Children have also been shown to be able to respond to nonsense nouns tested within the mass/count frame (e.g., Gathercole, 1985) -- another feature that is arguably an "inherent" property of nouns.

A number of studies have also indicated that a combination of cues can aid children's perception of a noun's gender better than a single cue (e.g., Mulford & Morgan, 1983; Pérez-Peireira, 1991a). Results from Study 2 produced mixed results with regard to this issue. In particular, with feminine nouns, adults and children were better on Test 5, which provided a single cue, than on Test 6, which provided two cues; with masculine nouns, adults were better on Test 6 than on Test 5. This

suggests that performance on masculine nouns is better when two cues are provided (Test 6) and that performance on feminine nouns is better when a single cue is provided (Test 5). Moreover, when the article followed by the noun was given as a single cue, performance was better than when no cue was given. However, when the noun followed by an adjective was given as a cue, performance was worse than when no cue was given, thus indicating that the benefit of a cue seems to operate in specific contexts.

These data ultimately suggest that the Welsh gender system may not be an abstract, rule-based system for children. Children do not seem to be attending to the formal properties of the system: in Studies 2 and 3, local cues did not seem to act as good indicators of gender for them. Therefore it seems that Welsh-speaking children's acquisition process remains at a more superficial, item-by-item level of processing. That children approach the learning of parts of language in a more piecemeal fashion has been underlined in recent years, especially in studies of early verbal morphology (e.g., Gathercole, Sebastián, & Soto, 1999; Braine, 1976; Clark, 1974, 1982; Bloom, Lifter, & Hafitz, 1980; Shirai & Andersen, 1995; Pizzuto & Caselli, 1992, 1993, 1994; Bedore, 1998; Rubino & Pine, 1998; Berman & Armon-Lotem, 1998; Tomasello, 1992, 2000) but also for a range of grammatical constructs (e.g., Lieven, Pine, & Baldwin, 1997; Pine & Lieven, 1993, 1997; Pine, Lieven, & Rowland, 1998). These studies agree that early uses of particular linguistic items are limited. For example, verbs are treated as individual lexical items whose behaviour must be learned one by one; young children lack a more abstract syntactic argument structure (Tomasello, 2000). The data from the studies reported in this thesis suggest

a similar route to the acquisition of grammatical gender in Welsh: children start out by learning the system superficially, learning the different gender marking for each noun individually. They only approach some more abstract knowledge as they become more proficient adult speakers, and only in cases where the system is unambiguous.

Do Welsh-Speaking Children Attend to the Semantic Properties of Nouns to Determine Noun Gender?

A second question that researchers have asked is the extent to which children rely on extralinguistic information (i.e., the biological sex of the referent) to determine the gender of nouns. Recall from Chapter 1 that the answer to this question is, more often than not, that children do not rely on semantic information to determine a noun's gender; this has been interpreted to mean that children do not approach the learning process via a semantic route, contradicting such theories as the “meaning first” hypothesis (see Levy, 1988). However, when the language they are learning has a complex gender system, semantic information may sometimes be useful (e.g., Mulford, 1985). Therefore, since the Welsh gender system is extremely complex, the question is whether Welsh-speaking children may find the sex of the referent useful in determining the gender of nouns.

Study 1 employed both animate and inanimate nouns. However, none of the statistical analyses revealed a significant effect of Animacy. This strongly suggests that extralinguistic information does not aid Welsh-speaking children's knowledge of the gender of a noun, although qualitative analysis did indicate better performance on

the adjective following animate than following inanimate nouns. However, the data for the production of the adjectives in Study 1 were less consistent than in any of the other studies reported in this thesis. This was partly due to the fact that the story was designed to look at noun production and therefore only the nouns were balanced across the task. Moreover, the story was depicted in the colours that are usually associated with the objects in the pictures. This meant that the children concentrated on telling the story without attending to the colours. (Gathercole, Thomas, & Laporte's (2000, in preparation) data will provide adjective data that may provide more definitive results.)

In sum, the data from this study agree with those of a number of other studies of grammatical gender, namely that semantic information does not play a major part in aiding the acquisition of the gender of nouns. Children do not attend to the semantic properties of nouns to determine gender classification.

Local Gender Marking vs. Distant Gender Marking

An issue of concern in the study of grammatical gender is whether children are able to acquire gender marking that is localised around the noun better than they are able to acquire gender marking that is more distant from the noun. Some research suggests that children learn to mark local gender constructs before constructs that involve more distant elements (e.g., Mulford & Morgan, 1983; Mills, 1986a, 1986b; Popova, 1973). The data obtained from Studies 1, 2, and 3 seem to agree, in part, with this view (see Table 9.1 for summary of findings).

In the studies conducted for this thesis, adults were better at marking feminine gender in local constructs (Study 1: $M = .883$ for responses on feminine nouns, and $M = .786$ (excluding *bach*) for adjectives after feminine nouns; Study 2: $M = .512$ for the Set 1 analysis and $M = .585$ for the Set 2 analysis) than in distant constructs (Study 3: $M = .365$ for the AM of /p, t, k/-initial nouns after *ei*; $M = .376$ for the basic form of /b, d, g, ʈ, ʄ, m/-initial nouns after *ei*; and $M = .137$ for the AM of vowel-initial nouns after *ei*). The adult scores for masculine nouns were similar for both experimental Studies 2 and 3 -- possibly due to the overextension of the SM form of adjectives with masculine nouns in Study 2 -- but their performance on the semi-naturalistic study (Study 1) was near ceiling level on local constructs. This suggests that, in input to children, adults are likely to be providing appropriate gender marking in local constructs of both masculine and feminine gender more than in distant constructs. But to what extent do children's responses reflect the pattern heard in the input?

For masculine forms, children were better at marking gender in local than in distant constructs. For masculine responses, performance was relatively low with distant marking ($M = .562$ for /p, t, k/-initial nouns, $M = .571$ for /b, d, g, ʈ, ʄ, m/-initial nouns), whereas performance was almost at ceiling when marking gender in local constructs (Study 1: $M = .956$ for production of nouns and $M = .952$ for the production of adjectives; Study 2: $M = .945$ for the Set 1 analysis and $M = .963$ for the Set 2 analysis). As expected, the children made no errors on the production of vowel-initial nouns after *ei* (masculine possessive) since vowels do not undergo mutation when in reference to a masculine possessor.

For feminine forms, performance in Study 3 (distant gender marking) was particularly poor ($M = .157$ for the AM form of /p, t, k/-initial nouns after *ei* and $M = .410$ for the basic form of /b, d, g, ʒ, r, m/-initial nouns after *ei*). There were no productions of the AM form of vowel-initial nouns after *ei* (feminine possessive). This suggests that vowel-initial nouns are not marked for gender in the distant construct investigated at least when co-referential with an inanimate possessor noun. This is consistent with the fact that adults rarely produced the AM on vowel-initial nouns with *ei* (feminine possessive). The children's best performance was on the marking of feminine gender in local constructs in the semi-naturalistic study, Study 1 ($M = .603$ for the marking of feminine nouns, and $M = .584$ (including *bach*) for adjectives after feminine nouns). In the experimental tests of Study 2, the children's mean score for the production of the SM form of feminine forms after the article was .202 in the Set 1 analysis and .258 in the Set 2 analysis.

Therefore, overall, the children were better at marking feminine and masculine nouns in local constructs than in distant constructs.

Possible reasons for the children's performance in local vs. distant constructs.

The overall poor performance on Study 3 (distant gender marking) is not surprising. When you consider the types of mutation children have to perform in local vs. distant constructs, it appears, in general, that the mutation types required in local contexts are "simpler" than those required in distant contexts. That is, local gender marking requires the production of the basic form for masculine forms, and the SM

form for feminine forms. Distant gender marking, on the other hand, requires the production of the SM form for masculine nouns and the AM form for feminine nouns. As noted in Chapter 2, SM is the most prevalent mutation in the language. Moreover, SM has been shown in many studies to be the one that is used the most consistently in the adult language (e.g., Davies, 1934; Davies, 1955; Davies, 1968; Samuel, 1970; Ball, 1984). AM on the other hand is the mutation that is triggered by the least number of triggers, and studies have shown it to be the least most realised mutation in the language (e.g., Roberts, 1972, 1988; Davies, 1968; Evans, 1930). In fact, keeping these mutation types in mind, it is not surprising that children are able to perform better on masculine than on feminine forms. In local constructs, masculine forms are marked by the basic form and in distant constructs by the SM form. Feminine nouns, on the other hand, are marked by SM in local constructs and by AM in distant constructs. Therefore to mark the masculine a combination of the basic and the SM form is required; to mark the feminine a combination of the SM and AM form is required. The key to the children's performance on local vs. distant gender marking may therefore lie in the greater complexity of the SM and AM combination than in the basic and SM combination of forms required in each construct.

Is One Gender-Marked Context Learned Before Another?

One of the questions raised at the beginning of Chapter 6 was whether Welsh-speaking children are able to attend to, or mark, one gender-marked context better than another. The research to date provides some indication that children learn to mark nouns for gender before they do so with adjectives (see Chapter 1). Again,

results from the semi-naturalistic study are unclear on this point because of the nature of the adjective data obtained throughout Studies 1 and 2.

Because of the paucity of the data for the production of the adjective after nouns, it was not possible to statistically compare children's responses for nouns after the article and adjectives after nouns in Study 1. Qualitative analysis indicated a difference in performance across Animacy. With animate nouns, the children produced more SM forms of nouns after the article than SM forms of adjectives modifying feminine nouns; with inanimate nouns, the children performed more SM of adjectives modifying feminine nouns than of nouns after the definite article. However, since there were no concrete statistical effects to support this tendency, these data are only suggestive.

The data from Study 2 are even more difficult to interpret. Recall that Tests 2 and 3 elicited the production of the adjective form. Both adults and children performed better on Tests 2 and 3 with feminine nouns than on Tests 1 and 4 (these elicited the noun after the article). However, both adults and children performed worse on Tests 2 and 3 than on Tests 1 and 4 with masculine nouns. On the one hand, there was always a large sample of feminine nouns followed by mutated adjectives, which is appropriate for feminine nouns. On the other hand, there was also always a large sample of masculine nouns with mutated adjectives, which is inappropriate for masculine nouns. It might not be that the children are performing better on adjective mutation than on noun mutation, but rather that children are overextending the mutation on the adjective. The adult data revealed a similar trend.

One reason why children may overextend SM on adjectives is that the mutated forms of adjectives might be the most frequent forms in the input. One context in which adjectives undergo mutation besides after feminine nouns is after the predicative particle *yn*, as in Examples 1 and 2.

1. *mae hi yn wlyb < gwlyb*

Aux. be-it-(feminine)-is-wet

“it (feminine) is wet”

2. *mae o yn goch < coch*

Aux. be-it-(masculine)-is-red

“it (masculine) is red”

All adjectives (except those with initials /ʃ/ and /tʃ/) undergo SM here. It is possible that what children hear the most frequently in their linguistic environments is the use of an adjective after *yn*. Note that the overextension of the SM form to the masculine does not occur with nouns. Children scarcely overextend the use of the SM to masculine nouns after the definite article. It may also have been the case that, in the tests, the participants were responding to a sensitisation effect, or were hypercorrecting themselves. Another factor that might contribute to the overextension of SM with adjectives is that the mutated forms of adjectives do not normally produce forms with meanings that are ambiguous or distinct from the basic forms: *coch* and *goch* do not mean anything other than "red". The case is different with nouns. For

example, the mutated forms of both *llaw* "hand" and *glaw* "rain" are *law*¹; the mutated forms of both *glo* "coal", and *llo* "calf" are *lo*. In contrast to the frequency of SM with which children used adjectives, children did not often use SM with feminine nouns after the article in Studies 1 and 2, nor did they often use SM with nouns after the prepositions *ar* "on" and *o* "from, out of" in Study 4 (see Table 9.1). However, they did sometimes, and it is notable that adults and children were selective in their choice of nouns that can undergo mutation after the article: these, almost invariably, were feminine nouns. It cannot therefore be the case that *y(r)* has lost its gender-marking status, otherwise masculine nouns would also undergo SM here.

The above discussion makes it clear that it is impossible to say that children are better at gender marking in one context than another.

Lexical variability.

Children were better at producing the SM form of *bach* after feminine nouns than the adults. However, it seems, in the adult language, that *bach* might be becoming a diminutive marker. Children's apparent better performance on *bach* could be due to their differential use of the term: children have not yet reached the adult level of using *bach* as a diminutive marker and are responding to it as an adjective, and are applying what knowledge they have about how adjectives are able to behave after feminine nouns (see discussion in Chapter 4).

¹ An example of the ambiguity of noun form due to mutation is clearly stated in this example taken from one of the adults who participated in the picture-story task (Study 1): . . . *mae 'na goeden neis a glöyn byw arni hi a maneg neu law*. 'Dw 'i 'myn meddwl glaw "rain", 'dw i'n meddwl manag i rhoid

Are Children Responding to Frequency Effects?

A possible reason for the children's performance is that children could be building their knowledge of gender marking based on frequencies; that is, somehow their knowledge is strengthened the more frequently they hear a form. If frequency does play a role, the question is whether children are attending to the frequency of a form in general, or to the frequency of a form in particular contexts. For the local gender marking of nouns, if children were attending to form in general, they should have performed best on feminine nouns: feminine nouns undergo SM in all contexts for SM. In contrast, the children should have performed the worst with masculine nouns: masculine nouns undergo SM in all contexts for SM other than after the definite article. This was not the case. (However, it should be noted that in Study 4 there was a suggestion that children and adults produced more SM on feminine nouns than on masculine nouns after the triggers to mutation *ar* "on" and *o* "from, out of". This, along with additional analysis that suggested children (and adults) may have the prescriptive SM form as the basic form for some feminine nouns, indicates that SM might be associated with feminine forms for some speakers.) If frequency plays a role at all it must involve the frequency in given contexts. For the marking of nouns, children will hear variable usage of feminine nouns after the article and will hear basic forms of masculine nouns after the article. If frequency effects are context-sensitive, then performance on feminine nouns will be low and performance on masculine nouns high in this context. This is what was found.

am law "there's a nice tree with a butterfly on it and a glove or a hand [SM: *law* < *llaw*]. I don't mean [*law* < *glaw*] "rain", I mean a glove to put on (a) [SM: *law* < *llaw*] hand."

For the distant marking of nouns, since there are twice as many masculine nouns than feminine nouns in Welsh (see next section below), children will hear /p, t, k/-initial nouns after *ei* in their SM form more often than any other form; performance on the marking of masculine nouns will be good and performance on the marking of feminine nouns here is expected to be poor. This is what was found. (It could also be argued that children hear the greatest use of AM after *ei* since research suggest that AM is prevalent after *ei*; however, when in reference to an inanimate possessor at least, results from Study 3 suggest this is not the case, and it is still expected that children will be best on masculine forms after *ei* since SM is possibly the “simpler” mutation in terms of frequency and general use.) Children also hear /b, d, g, t, r, m/-initial nouns after *ei* mostly in their SM form; again, performance on the marking of masculine gender will therefore be good and performance on the marking of feminine gender (i.e., the basic form) is expected to be poor. Again, this is what was found. Finally, children hear vowel-initial nouns after *ei* in reference to masculine possessors almost always in their basic form; vowel-initial nouns are not marked as feminine after *ei* when in reference to inanimate possessor nouns. Again, this was reflected in the children’s data.

Does Welsh Exhibit a Gender Bias?

Like many other grammatical gender languages (e.g., French; see Surridge, 1995, and Tucker, Lambert, & Rigault, 1970, 1977) Welsh is biased towards the masculine: approximately 2/3 of nouns in Welsh are masculine; only 1/3 are feminine. There is documented tendency to assign the masculine form to new nouns

(see Williams, 1973) in the literary standard; the results of this thesis suggest that this also seems to be the case in that nonsense forms were treated like masculines.

Children begin by marking masculine forms more correctly than feminine forms in both local and distant gender-marked contexts. However, unlike other languages, it cannot be said that children are overextending masculine gender to feminine forms (where feminine nouns and their modifiers do not undergo SM) since their performance might have a lot to do with their knowledge and ability with the mutation processes. As already stated, children might find it easier to mark masculine nouns; this involves the knowledge and production of the basic form of masculine nouns in local constructs and the SM form of masculine nouns in distant constructs. Conversely, children might find it more difficult to mark feminine nouns; this involves the knowledge and production of the SM form in local constructs and the AM form in distant constructs. Therefore it seems that the type of mutation that is required to compute gender agreement in particular contexts may influence the child's ability with the marking of feminine forms, and may dictate the course of development.

Rapid and/or Early Acquisition?

A repeated finding throughout the literature on children's acquisition of grammatical gender is that children learn to mark the gender of real or "natural" nouns by around the age of 3 years (e.g., Clark, 1985; Mulford, 1985; Levy, 1983a, 1983b). The data from this thesis do not support this view, however. The results from the studies reported in this thesis suggests that, overall, the adults performed better than

the children. The 9 year-olds were often worse than the other children (but similar to the adults) and often better than the other children (and similar to adults). For example, the 9-year-olds and the adults performed well on the production of the SM form of adjectives after feminine nouns (Test 3), but performed worse on the production of the basic form of adjectives after masculine nouns (i.e., they produced the SM form). This suggests that both the 9-year-olds and the adults overextended the SM of adjectives more than the other children. Another context where the 9-year-olds seemed to perform worse than all other participants was in the production of the basic form of nouns after the non-trigger to mutation -- *mewn* "in". This was again due to the 9-year-olds' overextension of SM. The adults and the 9-year-olds were also better than the 6- and the 7 1/2-year-olds on the distant marking of nouns. Moreover, the adults were better than the children on the production of SM or no mutation in Experiment 1 of Study 4, and the 9-year-olds were better than the 7 1/2-year-olds. Therefore the 9-year-olds are performing the most like the adults, indicating some progressive development of knowledge (although the adults were still performing better overall than all of the children). However, the extent to which the adults' and the 9-year-olds' performance was similar seems to rely on the mutation type involved: the adults were always better than all of the children in the production of the AM form of nouns after *ei*.

Overall, the data do not indicate a U-shaped curve, although it was often suggested that the youngest children (the 4 1/2-year-olds) performed better than the 6- and the 7 1/2-year-olds in places. However, the amount and type of data obtained by the 4 1/2-year-olds was limited. What these data tell us is that with real nouns at least,

performance gradually improves by the age of 9-years, although the adults are still performing better overall than the 9-year-olds. Performance on nonsense nouns on the other hand did not improve by age, even in the adult data. Therefore it seems that performance is generally low at 6 and 7 1/2 years of age, and gradually improves by the age of 9 years, although the 9-year-olds are yet to master the system. Therefore it seems that, in Welsh, the acquisition of the grammatical gender system is a long drawn-out process and the system is not in place until well after 9 years of age.

Language Specific Constraints on the Early Acquisition of Grammatical Gender

One aspect of the grammatical gender system unique in Welsh (and other Celtic languages) is the integral involvement of the mutation system. As noted, this system in itself is very complex, and children have been shown to acquire it late (e.g., Hatton, 1988; see Chapter 3). Because of this, Welsh-speaking children's apparent lack of ability with the marking of gender might have something to do with their concurrent acquisition of the complex mutation system. In fact, children's performance on Study 4, Experiment 1, provided a mean proportion of .332 for the production of SM after *ar* "on" and .380 for the production of SM after *o* "from, out of". Although these proportional scores are low, they are higher than the children's mean scores for the production of the SM form of feminine nouns in Study 2; these scores were .202 for the Set 1 analysis and .258 for the Set 2 analysis in Study 2. The mean proportions for the production of SM in the picture-story (Study 1: $M = .603$ for the production of SM on feminine nouns after the article and $M = .584$ for the production of SM on adjectives after feminine nouns) and on distant marking (Study

3: masculine: $M = .562$ for the SM of /p, t, k/-initial nouns after *ei*) were higher.

Since no statistical test was conducted on the data across the studies, it is not possible to say whether children were better at producing SM in gendered or in non-gendered context. What is certain, however, is that the children are yet to reach the adult level of performing in these two types of contexts.

With regard to results from Study 4, children's ability to produce AM after *a* and *na* was worse than their ability to produce AM after *ei*, a result found elsewhere in the literature (see Chapter 2). However, the children's ability to produce AM after *ei* when the referent was an inanimate noun was only at .157. What this might indicate is that gender distinctions as marked in distant constructs are dying when in reference to inanimate nouns and slowly moving towards a more semantic-based system. This suggestion coincides with Dorian's (1973) findings for Scottish Gaelic showing that the distant marking of gender is not applicable to inanimate reference. With inanimates, speakers tend to use one form for "it" -- the masculine form -- as the default. (See also Jones, 1998, for information about the lack of appropriate use of gender pronouns in Welsh.)

Moreover, the Welsh gender system lacks consistency: for example, there is no one-to-one form-function mapping between SM and feminine gender since masculine possessives trigger SM in distant relations, and there is always considerable variation in the system (see Chapter 2). This means that it is always very difficult to determine whether a noun is masculine or feminine. In addition to this, local gender-marked constructs, as marked by mutation, are often ambiguous. However, the analysis here indicates that when the ambiguous forms are taken away, performance is

only slightly better overall. Moreover, a follow-up study identified that some of the children may have basic forms that differ from the expected forms, a phenomenon that was observed in some of the adults' speech during their story telling (Study 1). Adults produced some sort of "double mutation" whereby the form produced in a given context was two sound alternations away from the traditional basic form, sound alternations that are permissible under SM. Hearing and producing this type of phenomenon could affect children's knowledge about the forms nouns can take in particular contexts and how they can be used to show gender agreement.

Since the mutation system is variable and complex, it is not surprising that gender distinctions that are marked by mutation take a very long time to learn.

Language Obsolescence: An Alternative View?

As discussed in Chapter 1, one possible additional factor that might hinder the acquisition process of the Welsh grammatical gender system is that of language obsolescence. Jones (1998) argued that this was indeed the case for two of the Welsh dialects she studied. Accordingly, a comparison of the results of the studies of this thesis with those of Jones would be informative to explore the extent to which the data presented in this thesis may also expose evidence of language obsolescence as an impediment to the acquisition process. That a language utilises a complex system that is neither easy nor quickly learned need not imply language death of any kind. Similarly, evidence of a low level of productivity need not imply language death. It may be that children eventually gain mature competence (whether or not it involves

productive knowledge), but the process may be more prolonged than it would be for a less complex system.

Table 9.2 compares, across ages, the results obtained by Jones for the northern dialect she studied and those obtained from the studies reported in this thesis. The results are shown there by construction type.

Recall that the results obtained from the Gwynedd adults were initially analysed across three age groups: 16- to 30-year-olds; 31- to 50-year-olds; and 51+ year-olds. However, there were no significant effects across ages in any of the analyses conducted on the adult data, so these are collapsed in Table 9.2. A comparison of responses per gender-marked context and across both sets of data is discussed below.

Definite article followed by a feminine noun (A in Table 9.2). For the adults, the accuracy of responses across the “naturalistic” studies (Study 1 of the Gwynedd data and all of Jones’ data) was similar. Note, however, that in Jones’ study only, the 20- to 39-year-olds produced a lower response rate. In the language of adults in the Gwynedd area, there was no strong evidence of such language loss in the young adults.

Table 9.2: Comparison of Mutation and Gender Mutation Data of Two Northern Dialects, That of Gwynedd (Thomas, this thesis), and That of Rhosllannerchrugog (Jones, 1998). (Data in brackets show scores obtained from a southern dialect by Jones, 1998.)

Ages (in years)	Thomas: Study 1 (Story)		Thomas: Study 2 (Elicitation Tests 1-6)		Mari C. Jones (1998)				
	Children 4 1/2 - 9 1/2	Adults 18 - 60+	Children 4 1/2 - 9 1/2	Adults 18 - 60+	Children (7 - 19)	Adults 20 - 39	Adults 40 - 59	Adults 60 - 74	Adults 75+
A: Feminine Noun After Definite Article y(r)	60%	88%	10%	50%	44% (38%)	62% (29%)	91% (84%)	90% (86%)	96% (92%)
B: Adjective After Feminine Noun	58%	42.9% (with bach) 78.6% (without bach)	24%	59%	32% (35%)	67% (69%)	93% (85%)	92% (90%)	96% (91%)
C: Adjective After Masculine Noun	95%	100%	86%	68%	83%	84%	100%	100%	100%
D: SM After ei With Masculine Antecedents			/p, t, k/ = 56% /b, d, g, f, m/ = 57% vowel = 100%	/p, t, k/ = 84% /b, d, g, f, m/ = 87% vowel = 100%	41% (23%)	78% (100%)	100% (100%)	100% (100%)	100% (100%)
E: AM After ei With Feminine Antecedents			/p, t, k/ = 16% vowels = 0%	/p, t, k/ = 37% vowels = 14%	42%	100%	100%	100%	100%
F: SM After Prepositions			ar = 33% o = 38%	ar = 73% o = 79%	51% (54%)	72% (60%)	82% (60%)	86% (76%)	87% (79%)

The children's responses were higher in Study 1 (Gwynedd data) than in Jones' study. Moreover, the Gwynedd data from Study 1 indicated that the children were slowly approaching the adult norm, and more quickly than the children (and even the younger adults) did so in Jones' study: the Gwynedd children's data showed that the children's performance was near that of adults by 9 years, whereas the data obtained by Jones showed that even at 39 years of age speakers of the two dialects she studied were still performing much lower than the older adults.

Finally, both Gwynedd adults and children performed much worse on the more experimentally controlled study of this thesis, Study 2, than on the more naturalistic studies, and worse than the participants in Jones. The more formal situation of Study 2 may have yielded less accurate responses, given the more metalinguistic nature of the test and the lack of freedom of usage and choice of words.

Adjective after feminine noun (B in Table 9.2). Comparisons of the results from the two "naturalistic" studies (Study 1 of this thesis and all of Jones' data) again show different profiles across ages. Jones' data showed a clear difference between, on the one hand, the children and the younger adults' responses, and, on the other hand, those provided by the older adults. Such an age difference was not evident in the Gwynedd data. Furthermore, the children's responses in Study 2 of this thesis seemed to be approaching the adult response rates.

Adjective after masculine noun (C in Table 9.2). Generally, participants from Jones' studies and from Studies 2 and 3 of this thesis responded accurately in this context, providing no mutation of adjectives after masculine nouns. However, in Study 2, the

adults were much more likely to produce the SM form of adjectives after masculine nouns. This response may have been linked to specific peculiarities about the test: the adults may have been responding to a sensitisation effect, or it may be that the more formal context of Study 2 elicited more hypercorrections of this type.

ei followed by SM (D in Table 9.2). When both the adults' and the children's data from Study 2 on /p, t, k, b, d, g, ʒ, ʒ, m/-initial nouns were compared to Jones' data, the use of SM in this context was similar for both.

ei followed by AM (E in Table 9.2). None of the adults in Jones' study produced errors on the application of AM following *ei* with a feminine antecedent. This was in stark contrast to the Gwynedd adults in Study 3, who produced AM on /p, t, k/-initial nouns after *ei* only 37% of the time and after vowel-initial nouns only 14% of the time. The explanation for the difference in the two studies may lie in the antecedent nouns studied. Although not explicitly stated in Jones' work, it seems that her data involve uses of *ei* in reference to animate possessors. She says:

In this case study, enough tokens were yielded for a comparison to be made between the use by informants of *ei* + soft mutation to denote a male possessor and *ei* + aspirate mutation to denote a female possessor. (p.166)

The use of the terms "male" and "female" (not "masculine" and "feminine") suggests animate, or even human, antecedents. Animates (and especially humans) have clear

sex characteristics that correspond to male and female gender, so it is not surprising to find better responses here. In fact, Gathercole, Thomas, and Laporte (2000, in preparation) report that children's comprehension of *ei* with either SM or AM is high when antecedents are human, and low when antecedents are animals or inanimate objects. Study 3 here reported solely on the data for the use of the possessive in response to an inanimate possessor.

Preposition followed by SM (F in Table 9.2). The children performed slightly better in Jones' study than in Study 4 of this thesis on the use of SM after relevant prepositions. The adults in Study 4 were also slightly less accurate than those in Jones' study although probably not significantly different. It should be noted that in Study 4, only data on the use of two prepositions were available, whereas Jones' study involved a larger set of prepositions. Moreover, Study 4 was more stringent than Jones' study, possibly evoking less naturalistic usage.

Having compared the two sets of data, the evidence for and against language obsolescence as an encumberment to the acquisition of grammatical gender in Welsh (as discussed in this thesis) can now be assessed:

1. The above data suggests that language obsolescence may be more operative in some dialects than in others. This may be dependent upon the prevalence of Welsh in the community, and therefore to the frequency of exposure one has to the different linguistic systems in that language. Gwynedd has the highest percentage

of the population speaking Welsh (72%). Unlike the younger adults in Jones' study, the younger adult speakers in the Gwynedd studies did not show any inferior knowledge or adherence to patterns than the older adult speakers did.

Moreover, the data for the southern dialect studied by Jones, for whom only 6% of the community spoke Welsh, showed consistent poorer performance than the data for the northern dialect she studied, whose linguistic community involved a higher percentage of Welsh (38%).

2. If language obsolescence is in place, there should be a difference in language competency with a linguistic system between the older and younger speakers (Jones, 1998). Jones' data showed a difference between the performance of the 39-year-olds and the older adults; the data gathered for this thesis showed no difference between the adult groups. Furthermore, the difference in percentage scores between the adult age groups in Jones was greater than the difference between the 9-year-olds and the adults in the Gwynedd data. This suggests that the Gwynedd children were progressing towards the adult norm.

Future Research

Further studies on the acquisition of the Welsh grammatical gender system are underway. The studies conducted by Gathercole, Thomas, and Laporte (2000, in preparation) will provide additional adjective data in a semi-naturalistic situation; these results can be compared to the results reported in this thesis. Gathercole et al. are also exploring additional contexts of usage. First, they are exploring children's knowledge of distant marking and local marking more extensively. Second, they are

examining whether the form or origin of a noun might affect children's knowledge of gender for that noun. These data will help provide a fuller picture of Welsh-speaking children's ability to attend to morphological cues and whether semantic information helps in children's knowledge of the gender of nouns.

One problem with the studies presented in this thesis is that they did not use distant marking as cues. Some data regarding children's and adults' production of local and distant cues within the same noun phrase are also being gathered by Gathercole et al. (2000, in preparation). Gathercole et al. are also providing children and adults with a combination of local and distant gender markers. These data, along with the data presented in this thesis, will help provide a fuller account of children's ability to attend to the potential cues to gender status available in the language they are learning.

One aspect that was not closely studied in this thesis was gender marking in the immediate linguistic environment of the children. Although adults were tested so that the children's data could be compared to the adult norm, an even more useful approach would involve information about the actual input that the children are receiving. For this, data could be collected from children and their parents, and naturalistic observation of the language input received at the schools that the children attend could be collected.

The results of the studies also suggest the need to test children older than 9 years of age. If the 9-year-olds were only starting to show responses that are similar to the adult norm it would be useful to see whether and when older children will respond more in line with the adults; this would be useful in determining language

obsolescence as has already been discussed. On the other hand, the youngest children in these studies were approximately 4 1/2 years of age. It could have been that these children had difficulty in dealing with the metalinguistic nature of some of the studies reported in this thesis and that this was reflected in their lack of responses. A naturalistic study, combined with a shorter experimentally controlled study, would provide information to indicate when Welsh-speaking children start to mark gender in their language.

Finally, since both adults and children could allow themselves to be inconsistent with regard to feminine gender marking, it would be useful to conduct an error repetition or an error recognition type of test. This would provide additional information about the extent to which both children and adults can accept, or point out, irregularities in gender marking among the agreeing elements.

A Changing System: Rewriting the Rules

What the data from this thesis and the above discussion tell us is that the marking of gender in Welsh is not as robust as prescriptive grammars would have us believe. Based on the adult data from Study 1 of this thesis (the semi-naturalistic study) the “rules” for local gender marking in spoken Welsh may be rewritten as follows: masculine nouns that appear after the article are never mutated; feminine nouns that appear after the article are optionally mutated; adjectives that appear after masculine nouns are never mutated; adjectives that appear after feminine nouns are optionally mutated. (If we consider the data from Study 2 to reflect a change in the system, adjectives after masculine nouns are also optionally produced in their basic or

SM forms.) Based on the adult data from Study 3 of this thesis (distant gender marking), the “rules” for distant gender marking in spoken Welsh may be rewritten as follows: /p, t, k/-initial nouns after *ei* when in reference to masculine inanimate nouns usually undergo SM; /p, t, k/-initial nouns after *ei* when in reference to feminine inanimate nouns will only sometimes undergo AM (they will more often undergo SM); /b, d, g, ʔ, r, m/-initial nouns when in reference to masculine inanimate nouns usually undergo SM; /b, d, g, ʔ, r, m/-initial nouns when in reference to feminine inanimate nouns will only sometimes retain their basic form (they will more often undergo SM); and vowel-initial nouns after *ei* will almost invariably retain their basic form when in reference to either masculine or feminine inanimate nouns.

Conclusion

The studies designed for this thesis indicate that children’s ability with the Welsh grammatical gender system is not as strong as that of children learning other grammatical gender languages. Welsh-speaking children have not mastered the system even by 9 years of age. Semantic information was not useful for determining gender status. In addition, it was not possible to say from the data obtained in the studies whether or not one type of contextual information was better as a cue than another, or learned before another, due to the overextension of SM on adjectives. However, neither adults nor children could show that they attended to the cues to gender status to determine the gender of a noun. This suggests that children are not learning the system by constructing abstract representations of the language. However, children become more proficient in marking feminine nouns modified by

the definite article and adjectives modifying feminine nouns (local gender constructs) before they do so on nouns modified by feminine *ei* (distant gender constructs) to a certain degree. Results suggested that the particular type of mutation required (e.g., SM vs. no mutation for Studies 1 and 2; SM, AM, or no mutation for Study 3) influenced the course of acquisition, and this may possibly be due to frequency of usage, or of occurrence. Finally, the results identified one type of lexical variability: *bach* “little” often resisted mutation after feminine nouns.

When a language has a complex gender system that is marked by opaque morpho-phonological processes such as mutations, the course of development is protracted and variable, and appears to reflect piecemeal, item-by-item learning.

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QuestionnaireGeneral

1. Name
(optional).....
2. Date of birth.....
3. Marital status.....
4. Your occupation/trade.....
5. Your partner's occupation/trade.....
6. Please indicate which of the following describes your annual family income:
 - (a) below £5000
 - (b) £5000 - £10,000
 - (c) £10,000 - £20,000
 - (d) £20,000 - £30,000
 - (e) £30,000 +
7. How many children do you have (if applicable).....
8. What is his/her/ their age(s).....
9. How many brothers and sisters do you have?(if applicable)..... Were you the first, second, third etc. child?.....

Language history

- A1. How old were you when you started to speak Welsh?.....
2. How old were you when you started to speak English?.....
3. Can you speak any other language(s)? yes/no
4. If you answered 'yes' to the previous question, what language(s) can you speak and how old were you when you started to speak the language?
Language(s).....
Age.....

B1. Is Welsh your first language? yes/no

2. Of the following, which ones best describe you (tick the appropriate ones):
 - (a) My spoken Welsh is better than my spoken English
 - (b) My spoken English is better than my spoken Welsh
 - (c) My spoken Welsh and English are as good as each other
 - (d) My written Welsh is better than my written English
 - (e) My written English is better than my written Welsh
 - (f) My written English and Welsh are as good as each other
 - (g) I prefer to speak Welsh than English in informal situations
 - (h) I prefer to speak English than Welsh in informal situations

- (i) I'm comfortable speaking both languages in informal situations
- (j) I prefer to speak Welsh than English in formal situations
- (k) I prefer to speak English than Welsh in formal situations
- (l) I'm comfortable speaking both language in formal situations

3. Please indicate the percentage time you speak Welsh generally:% of the time.
Please also indicate under what circumstances, where and when you speak Welsh:

.....

4. Please indicate the percentage time you speak English generally:.....% of the time.

Please also indicate under what circumstances, where and when you speak English:

.....

5. If you speak any other languages, please indicate how often generally:.....% of the time.

Please indicate under what circumstances, where and when you speak these other languages:

.....

6. Did your father/ guardian speak Welsh as his first language? Yes/No-he she spoke..... Did your partner's father/guardian speak Welsh as his first language? Yes/No- he spoke

7. Did you mother/guardian speak Welsh as her first language? yes/no- she spoke..... Did your partner's mother/guardian speak Welsh as her fist language? Yes/No- she spoke.....

Please provide the following information about yourself and your partner. Please indicate which one of you is described where:

8. When I was growing up (age 0-5 years) the home language was Welsh about.....% of the time. The school language was Welsh about.....% of the time.

9. From ages 5-13 years, the home language was Welsh about.....% of the time.
The school language was Welsh about% of the time.

10. From ages 13-18 years, the home language was Welsh about.....% of the time.
the school language was Welsh about% of the time.

11. From age 18 years +, the home language was Welsh about% of the time.
The work/college language was Welsh about.....% of the time.

12. When I was growing up (ages 0-5 years), the home language was English
about.....% of the time. The school language was English about% of the
time.

13. From ages 5-13 years, the home language was English about.....% of the time.
The school language was English about% of the time.

14. From the ages 13-18 years, the home language was English about.....% of the
time. The school language was English about% of the time.

15. From the Age 18 years +, the home language was English about.....% of the
time. The work/college language was English about% of the time.

16. The home language was.....(give details if applicable)about.....% of the
time.

26. My husband/wife/partner's first language is.....

27. I speak Welsh with my husband/wife/partner about.....% of the time

28. I speak English with my husband/wife/partner about.....% of the time

29. I speak Welsh about.....% of the time with my children

30. I speak English about.....% of the time with my children

31. I speak Welsh about.....% of the time with my friends.

32. I speak English about% of the time with my friends.

I originally come from North/South Wales

D I have always lived in North/South Wales

E I have lived in North Wales for.....years/ months etc. since 19..... and
have lived in(please specify main area if necessary
for.....years/months.

F Have you ever followed a Higher Education course through the medium of Welsh
and have had to learn 'correct' Welsh grammar ? Give examples e.g. A-level in

Welsh, B.A. Degree in Welsh, B.A. degree in History through the medium of Welsh
etc.

.....
.....
.....
.....

Thank you for your participation in this study.

HoliadurCyffredinol

1. Enw(heb fod yn orfodol).....
2. Dyddiad geni.....
3. Priod/Sengl (diddymir fel sy'n addas)
4. Eich gwaith/crefft.....
5. Gwaith/crefft eich partner.....
6. Dangoswch pa un o'r canlynnol sy'n disgrifio'ch incwm teuluol blynyddol:
 - (a) o dan £5000
 - (b) £5000 - £10,000
 - (c) £10,000 - £20,000
 - (ch) £20,000 - £30,000
 - (d) £30,000+
7. Sawl plentyn sydd gennych? (os yn berthnasol).....
8. Beth yw ei hoedran/ei oedran/ eu hoedrannau?.....

Cefndir iaith

- A1. Beth oedd eich oedran pan ddechreuoch siarad Cymraeg?.....
2. Beth oedd eich oedran pan ddechreuoch siarad Saesneg?.....
3. Â ydych yn gallu siarad unrhyw iaith/ieithoedd eraill? ydw/nacydw
4. Os atebwyd 'ydw' i'r cwestiwn blaenorol, pa iaith/ ieithoedd a allwch siarad a beth oedd eich oedran pan ddechreuoch siarad yr iaith?
Iaith/ Ieithoedd.....
Oedran.....

B1. Ai Cymraeg yw eich iaith gyntaf? Ia/ Na

2. O'r canlynnol, pa rai sydd yn gweddu i chi fwyaf (rhowch dic wrth ymyl y rhai perthnasol):
 - (a) Mae fy Nghymraeg llafar yn well na fy Saesneg llafar
 - (b) Mae fy Saesneg llafar yn well na fy Nghymraeg llafar
 - (c) Mae fy Nghymraeg llafar a fy Saesneg llafar yr un mor dda a'u gilydd
 - (ch) Mae fy Nghymraeg ysgrifenedig yn well na fy Saesneg ysgrifenedig
 - (d) Mae fy Saesneg ysgrifenedig yn well na fy Nghymraeg ysgrifenedig
 - (dd) Mae fy Saesneg a'ng Nghymraeg ysgrifenedig yr un mor dda a'u gilydd
 - (e) Mae'n well gennyf siarad Cymraeg na Saesneg mewn sefyllfaoedd ffurfiol
 - (f) Mae'n well gennyf siarad Saesneg na Chymraeg mewn sefyllfaoedd ffurfiol
 - (ff) Rwy'n gyffyrddus wrth siarad y ddwy iaith mewn sefyllfaoedd ffurfiol

- (g) Mae'n well gennyf siarad Cymraeg na Saesneg mewn sefyllfaoedd anffurfiol
 (ng) Mae'n well gennyf siarad Saesneg na Chymraeg mewn sefyllfaoedd anffurfiol
 (h) Rwy'n gyffyrddus wrth siarad y ddwy iaith mewn sefyllfaoedd anffurfiol

3. Rwy'n siarad Cymraeg tua.....% o'r amser yn gyffredinol
4. Rwy'n siarad Saesneg tua.....% o'r amser yn gyffredinol
5. Rwy'n siarad iaith/ ieithoedd eraill tua.....% o'r amser
6. Oedd eich tad/gwarcheidwr yn siarad Cymraeg? Oedd/nacoedd, roedd yn siarad.....
7. Oedd eich mam/ gwarcheidwraig yn siarad Cymraeg? Oedd/ Nacoedd, roedd yn siarad.....
8. Yn ystod fy mhentyndod (0-5 mlwydd oed), roedd iaith y cartref yn Gymraeg tua.....% o'r amser
9. Yn 5-13 mlwydd oed, roedd iaith y cartref yn Gymraeg tua.....% o'r amser
10. Yn 13-18 mlwydd oed, roedd iaith y cartref yn Gymraeg tua.....% o'r amser
11. Yn 18 mlwydd oed +, roedd iaith y cartref yn Gymraeg tua% o'r amser
12. Yn ystod fy mhentyndod(0-5 mlwydd oed), roedd iaith y cartref yn Saesneg tua.....% o'r amser
13. Yn 5-13 mlwydd oed, roedd iaith y cartref yn Saesneg tua.....% o'r amser
14. Yn 13-18 mlwydd oed, roedd iaith y cartref yn Saesneg tua.....% o'r amser
15. Yn 18 mlwydd oed +, roedd iaith y cartref yn Saesneg tua.....% o'r amser
16. Roed iaith y cartref yn.....(rhowch fanylion os yn berthnasol) tua.....% o'r amser
17. Iaith gyntaf fy ngwr/ngwraig/ partner yw.....
18. Rwy'n siarad Cymraeg efo'ng ngwr/ngwraig/partner tua.....% o'r amser
19. Rwy'n siarad Saesneg efo'ng ngwr/ngwraig/ partner tua% o'r amser
20. Rwy'n siarad Cymraeg tua% o'r amser efo'm mhlant
21. Rwy'n siarad Saesneg tua.....% o'r amser efo'm mhlant
- C Rwy'n dod yn wreiddiol o Ogledd/Dde Cymru

D Rwyf wastad wedi byw yng Ngogledd /Ne Cymru

E Rwyf wedi byw yng Ngogledd Cymru ammlynedd/mis a.y.y.b. ers 19..... ac wedi byw yn(rhowch wybodaeth ynglyn â'r ardal pennafos yn bethnasol) ammlynedd/mis a.y.y.b.

Ychwanegwch wybodaeth os yn berthnasol:

.....
.....
.....

F A ydych erioed wedi dilyn cwrs Addysg Bellach drwy gyfrwng y Gymraeg ac wedi gorfod dysgu gramadeg y Gymraeg yn gywir? Rhowch fanylion e.e. lefel A yn y Gymraeg, gradd B.A. yn y Gymraeg, gradd B.A. mewn Hanes drwy gyfrwng y Gymraeg a.y.y.b.

.....
.....
.....
.....

Diolch am eich amser.

Please provide the following information:

Child's name: _____

Child's birth date: _____

Please specify if your child is your first child, second child, third child etc.

Child speaks (please tick all that apply):

___ **English**

He/She began speaking English at age: ___

He/She speaks English approximately ___% of the time

___ **Welsh**

He/She began speaking Welsh at age: ___

He/She speaks Welsh approximately ___% of the time

___ **Other language(s)** (please specify: _____)

He/She began speaking this language at age: ___

He/She speaks this language approximately ___% of the time

Language(s) spoken in the home (please tick one):

- ___ 100% English
 ___ about 80% English, 20% Welsh
 ___ about 60% English, 40% Welsh
 ___ about 50% English, 50% Welsh
 ___ about 60% Welsh, 40% English
 ___ about 80% Welsh, 20% English
 ___ 100% Welsh
 ___ Other combinations. Please specify: _____

Language(s) spoken in the school (please tick one):

- ___ 100% English
 ___ about 80% English, 20% Welsh
 ___ about 60% English, 40% Welsh
 ___ about 50% English, 50% Welsh
 ___ about 60% Welsh, 40% English
 ___ about 80% Welsh, 20% English
 ___ 100% Welsh

___ Other combinations. Please specify: _____

Languages spoken by parents/guardians (please tick all that apply):

Mother/guardian:

- ___ English (approximately ___% of the time)
 ___ Welsh (approximately ___% of the time)
 ___ Other (please specify: _____ (approximately ___% of the time)

Father/guardian:

- ___ English (approximately ___% of the time)
 ___ Welsh (approximately ___% of the time)
 ___ Other (please specify: _____ (approximately ___% of the time)

Language(s) spoken by siblings:

Older siblings:

- ___ English (approximately ___% of the time)
 ___ Welsh (approximately ___% of the time)
 ___ Other (please specify: _____ (approximately ___% of the time)

Younger siblings:

- ___ English (approximately ___% of the time)
 ___ Welsh (approximately ___% of the time)
 ___ Other (please specify: _____ (approximately ___% of the time)

Which language(s) does your child speak with his/her older brothers and/or sisters? (please include percentages) _____

Which language(s) does your child speak with his/her younger brothers and/or sisters? (please include percentages) _____

Which parent does the child spend the most of his/her time with on a daily basis?(please tick):

Father/ guardian _____
(approximately _____% of the time daily)

Mother/ guardian _____(approximately _____% of the time daily)

Language(s) spoken by grandparents (if applicable):

Grandmother (mother's/guardian's side):
 _____ English (approximately _____% of the time)
 _____ Welsh (approximately _____% of the time)
 _____ Other (please specify: _____)
 (approximately _____% of the time)

Grandfather (mother's/guardian's side):
 _____ English (approximately _____% of the time)
 _____ Welsh (approximately _____% of the time)
 _____ Other (please specify: _____)
 (approximately _____% of the time)

Grandmother (father's/guardian's side):
 _____ English (approximately _____% of the time)
 _____ Welsh (approximately _____% of the time)
 _____ Other (please specify: _____)
 (approximately _____% of the time)

Grandfather (father's/guardian's side):
 _____ English (approximately _____% of the time)
 _____ Welsh (approximately _____% of the time)
 _____ Other (please specify: _____)
 (approximately _____% of the time)

How much time does your child spend with his/her grandparents on a daily basis?

Grandmother (mother's/guardian's side)
 _____% of the time daily

Grandfather (mother's/ guardian's side) _____% of the time daily

Grandmother (father's/guardian's side) _____% of the time daily

Grandfather (father's/ guardian's side) _____% of the time daily

Language(s) spoken by the child's aunts or uncles (if applicable):

Mother's/guardian's brothers and/or sisters (Indicate if the language they use with the child is anything other than Welsh e.g. brother's wife and children speak English etc.): _____

Father's/guardian's brothers and/or sisters (Indicate if the language they use with the child is anything other than Welsh e.g. brother's wife and children speak English etc.) _____

How much time does your child spend with his/her aunts and uncles:

Mother's/guardian's brothers and/or sisters _____

Father's/guardian's brothers and/or sisters _____

Does your child attend any after school clubs or clubs attended on the weekend?(e.g. Sunday school, Welsh League of Youth (The Urdd), Brownies, Scouts, swimming club etc.)
 please specify:

Of these clubs, please specify if they are conducted through the medium of Welsh or English.

What language do most of your child's friends speak? (Please indicate an approximate number of Welsh speaking and English speaking friends, including those who are of the same age as his/her brothers and/or sisters but the child considers as friends)

Does your child come in contact, on a regular basis, with a learner of Welsh who addresses your child in Welsh? (e.g. a Welsh-learning relative, a Welsh -learning friend of the family or neighbour, a Welsh-learning school-friend etc. Please specify below:)

Thank you for taking part in this study.

Rhoddwch y wybodaeth a ganlyn as gwelwch yn dda:

Enw eich plentyn: _____

Dyddaid geni eich plentyn: _____

Nodwch os mai'r plentyn cyntaf, ail, trydydd a.y.y.b. yw eich plentyn _____

Mae fy mhlentyn yn siarad (ticiwch bob un sy'n berthnasol os gwelwch yn dda):

___ **Saesneg**

Dechreuodd siarad Saesneg yn ___ oed.

Mae'n siarad Saesneg tua ___% o'r amser.

___ **Cymraeg**

Dechreuodd siarad Cymraeg yn ___ oed.

Mae'n siarad Cymraeg tua ___% o'r amser.

___ **Iaith/Ieithoedd eraill**
(nodwch: _____)

Dechreuodd siarad yr iaith hon yn ___ oed.

Mae'n siarad yr iaith hon tua ___% o'r amser.

Iaith/ieithoedd a siaredir yn y cartref
(ticiwch un):

- ___ 100% Saesneg
- ___ tua 80% Saesneg, 20% Cymraeg
- ___ tua 60% Saesneg, 40% Cymraeg
- ___ tua 50% Saesneg, 50% Cymraeg
- ___ tua 60% Cymraeg, 40% Saesneg
- ___ tua 80% Cymraeg, 20% Saesneg
- ___ tua 100% Cymraeg
- ___ cyfuniad arall. Nodwch os gwelwch yn dda: _____

Iaith/ieithoedd a siaredir yn yr ysgol
(ticiwch un):

- ___ 100% Saesneg
- ___ tua 80% Saesneg, 20% Cymraeg
- ___ tua 60% Saesneg, 40% Cymraeg
- ___ tua 50% Saesneg, 50% Cymraeg
- ___ tua 60% Cymraeg, 40% Saesneg
- ___ tua 80% Cymraeg, 20% Saesneg
- ___ tua 100% Cymraeg
- ___ cyfuniad arall. Nodwch os gwelwch yn dda: _____

Iaith/ieithoedd a siaredir gan rieni/gwarcheidwaid (ticiwch bob un sy'n berthnasol):

Mam/gwarcheidwad:

___ Saesneg (tua ___% o'r amser)

___ Cymraeg (tua ___% o'r amser)

___ Arall (nodwch: _____
tua ___% o'r amser)

Tad/gwarcheidwad:

___ Saesneg (tua ___% o'r amser)

___ Cymraeg (tua ___% o'r amser)

___ Arall (nodwch: _____
tua ___% o'r amser)

Iaith/ieithoedd a siaredir gan frodyr/chwirydd eich plentyn:

Brodyr/chwirydd hyn:

___ Saesneg (tua ___% o'r amser)

___ Cymraeg (tua ___% o'r amser)

___ Arall (nodwch: _____
(tua ___% o'r amser)

Brodyr/chwirydd iau:

___ Saesneg (tua ___% o'r amser)

___ Cymraeg (tua ___% o'r amser)

___ Arall (nodwch: _____
tua ___% o'r amser)

Pa iaith mae eich plentyn yn siarad efo'i frodyr/brodyr neu chwirydd hyn?

(ychwanegwch ganrannau os gwelwch yn dda): _____

Pa iaith mae eich plentyn yn siarad efo'i frodyr/brodyr neu chwirydd ieuangach?

(ychwanegwch ganrannau os gwelwch yn dda): _____

Gyda pha riant mae eich plentyn yn gwario'r rhan fwyaf o'i amser yn ddyddiol? (ticiwch un os gwelwch yn dda):

Mam/ gwarcheidwad _____ (tua ___
___% o'r amser yn ddyddiol)

Tad/gwarcheidwad _____ (tua _____ % o'r amser yn ddyddiol)

Iaith/ieithoedd siariedir gan neiniau a teidiau eich plentyn (os yn berthnasol):

Nain (ochr y fam/gwarcheidwad):

_____ Saesneg (tua _____ % o'r amser)

_____ Cymraeg (tua _____ % o'r amser)

_____ Arall(nodwch: _____, tua _____ % o'r amser)

Taid (ochr y fam/gwarcheidwad):

_____ Saesneg (tua _____ % o'r amser)

_____ Cymraeg (tua _____ % o'r amser)

_____ Arall (nodwch: _____, tua _____ % o'r amser)

Nain (ochr y tad/gwarcheidwad):

_____ Saesneg (tua _____ % o'r amser)

_____ Cymraeg (tua _____ % o'r amser)

_____ Arall (nodwch: _____, tua _____ % o'r amser)

Taid (ochr y tad/gwarcheidwad):

_____ Saesneg (tua _____ % o'r amser)

_____ Cymraeg (tua _____ % o'r amser)

_____ Arall (nodwch: _____, tua _____ % o'r amser)

Faint o amser mae eich plentyn yn treulio gyda ei nain a'i daid/thaid yn ddyddiol?

Nain (ochr y fam/ gwarcheidwad)

_____ % o'r amser yn ddyddiol

Taid (ochr y fam/ gwarcheidwad)

_____ % o'r amser yn ddyddiol

Nain (ochr y tad/ gwarcheidwad)

_____ % o'r amser

Taid (ochr y tad/ gwarcheidwad)

_____ % o'r amser

Ieithoedd a siariedir gan frodyr a chwirydd rhieni'r plentyn (os yn berthnasol):

Brodyr a chwirydd ochr y

fam/gwarchwidwad (nodwch os yw'r iaith a ddefnyddir gyda'ch plentyn yn unrhywbeth heblaw am y Gymraeg e.e. gwraig y brawd yn siarad Saesneg, felly siariedir Saesneg o'i blaen hi a.y.y.b.): _____

Brodyr a chwirydd ochr y

tad/gwarchwidwad (nodwch os yw'r iaith a ddefnyddir gyda'ch plentyn yn unrhywbeth heblaw am y Gymraeg e.e. gwraig y brawd yn siarad Saesneg, felly siariedir Saesneg o flaen eich plentyn a.y.y.b.): _____

Faint o amser mae'ch plentyn yn ei wario efo'i ewyrth(edd)/modryb(edd):

Brodyr neu chwirydd ochr y fam/gwarcheidwad: _____

Brodyr a chwirydd ochr y tad/gwarcheidwad: _____

A yw eich plentyn yn mynychu clybiau ar ôl ysgol neu glybiau ar y penwythnos?(e.e. Ysgol Sul, Yr Urdd, Brownies, Scouts, clwb nofio a.y.y.b.)

Nodwch os gwelwch yn dda:

O'r clybiau hyn, nodwch os gwelwch yn dda os ydynt yn cael eu cynnal drwy gyfrwng y Saesneg neu'r Gymraeg:

Pa iaith mae rhan fwyaf o ffrindiau eich plentyn yn siarad? (nodwch os gwelwch yn dda y nifer, yn frasgywir, o ffrindiau sy'n siarad Cymraeg a Saesneg, gan gynnwys y rhai hynny sydd o'r un oedran a brodyr neu chwirydd eich plentyn ond sy'n cael eu ystyried fel ffrindiau i'ch plentyn):

A yw eich plentyn yn dod i gysylltiad cyson efo dysgwr/yr Cymraeg sydd yn cyfarch eich plentyn yn y Gymraeg? (e.e. perthynas sy'n dysgu Cymraeg, ffrind i'r teulu neu cymydog sy'n dysgu Cymraeg, neu ffrind o'r ysgol sy'n dysgu Cymraeg a.y.y.b. Nodwch isod os gwelwch yn dda):

Diolch yn fawr am eich amser.

Questionnaire

If there are any questions you would rather not answer, then please leave them blank. Thank you.

1. Name
(optional).....
.....

2. Age: 16- 30 years
31 - 50 years
51 + years

3. Your occupation/ trade
.....

4. Please indicate which of the following describes your annual family income:

- (a) £5000 - £10,000
- (b) £10,000 - £30,000
- (c) £30,000 +

5. How many children do you have?
.....

6. What is his/her/ their age(s).....
.....

7. How old were you when you started to speak Welsh?

8. How old were you when you started to speak English?.....

9. Is Welsh your first language?
Yes/No

10. Of the following, which ones best describe you (tick the appropriate one for each set):

- (a) My spoken Welsh is better than my spoken English __
- (b) My spoken English is better than my spoken Welsh __
- (c) My spoken Welsh and English are as good as each other __

(d) My written Welsh is better than my written English __

(e) My written English is better than my written Welsh __

(f) My written English and Welsh are as good as each other __

(g) I prefer to speak Welsh than English in informal situations __

(h) I prefer to speak English than Welsh in informal situations __

(i) I'm comfortable speaking both languages in informal situations __

(j) I prefer to speak Welsh than English in formal situations __

(k) I prefer to speak English than Welsh in formal situations __

(l) I'm comfortable speaking both languages in formal situations __

11. Please indicate the percentage time you speak Welsh generally:
.....% of the time.

Please also indicate under what circumstances, for example where and when you speak Welsh:

.....
.....
.....
.....
.....
.....

12. Please indicate the percentage time you speak English generally:.....% of the time.

Please also indicate under what circumstances, for example where and when you speak English:

.....
.....
.....
.....
.....

13. I speak Welsh with my husband/wife/partner about.....% of the time

Degree in Welsh, B.A. degree in History through the medium of Welsh etc.

14. I speak English with my husband/wife/partner about.....% of the time

.....
.....
.....
.....
.....
.....

15. I speak Welsh about.....% of the time with my children

16. I speak English about.....% of the time with my children

17. I speak Welsh about.....% of the time with my friends.

Thank you for your participation in this study.

18. I speak English about% of the time with my friends.

19. I originally come from North/South Wales

If you answered South Wales for question 19, then please go to question 20. If you answered North Wales, then please go to question 21.

20. I have lived in North Wales for.....years/ months etc. since 19..... and have lived in(please specify main area) for.....years/months.

Add information if applicable:
.....
.....
.....
.....
.....
.....
.....
.....
.....

21. Have you ever followed a Higher Education course through the medium of Welsh and have had to learn 'correct' Welsh grammar? Give examples e.g. A-level in Welsh, B.A.

Holiadur

Os oes unrhyw gwestiynnau a fyddai'n well gennych beidio eu ateb, yna gadewch nhw'n wag. Diolch.

1. Enw(heb fod yn orfodol)
.....
2. Oedran: 16 - 29 mlwydd
30 - 49 mlwydd
50 + mlwydd
3. Eich gwaith/ crefft
.....
4. Dangoswch pa un o'r canlynol sy'n disgrifio eich incwm teuluol blyneddol os gwelwch yn dda:
(a) £5000 - £10,000
(b) £10,000 - £30,000
(c) £ 30,000 +
5. Sawl plentyn sydd gennych?
.....
6. Beth yw ei hoedran/ei oedran/ eu oedran?
.....
7. Beth oedd eich oedran pan ddechreuoch siarad Cymraeg?
.....
8. Beth oedd eich oedran pan ddechreuoch siarad Saesneg?
.....
9. Ai Cymraeg yw eich iaith gyntaf?
Ia/ Na
10. O'r canlynol, pa rai sydd yn gweddu i chi fwyaf (rhowch dic wrth ymyl yr un perthnasol ymhob set):
(a) Mae fy Nghymraeg llafar yn well na fy Saesneg llafar. __
(b) Mae fy Saesneg llafar yn well na fy Nghymraeg llafar. __

- (c) Mae fy Nghymraeg llafar a fy Saesneg llafar yr un mor dda a'u gilydd. __
- (ch) Mae fy Nghymraeg ysgrifenedig yn well na fy Saesneg ysgrifenedig.
__
- (d) Mae fy Saesneg ysgrifenedig yn well na fy Nghymraeg ysgrifenedig. __
- (dd) Mae fy Saesneg a fy Nghymraeg ysgrifenedig yr un mor dda a'u gilydd.
__
- (e) Mae'n well gennyf siarad Cymraeg na Saesneg mewn sefyllfaoedd ffurfiol.
__
- (f) Mae'n well gennyf siarad Saesneg na Chymraeg mewn sefyllfaoedd ffurfiol. __
- (ff) Rwy'n gyffyrddus wrth siarad y ddwy iaith mewn sefyllfaoedd ffurfiol.
__
- (g) Mae'n well gennyf siarad Cymraeg na Saesneg mewn sefyllfaoedd anffurfiol. __
- (ng) Mae'n well gennyf siarad Saesneg na Chymraeg mewn sefyllfaoedd anffurfiol. __
- (h) Rwy'n gyffyrddus wrth siarad y ddwy iaith mewn sefyllfaoedd anffurfiol. __
11. Nodwch gyfartaledd o'r amser yr ydych yn siarad Cymraeg yn gyffredinol:
.....% o'r amser.
- Nodwch hefyd o dan ba amgylchiadau, er enghraifft ym mha le a pha bryd yr ydych yn siarad Cymraeg:
.....
.....
.....
12. Nodwch gyfartaledd o'r amser yr ydych yn siarad Saesneg yn gyffredinol:
.....% o'r amser.

Nodwch hefyd o dan ba amgylchiadau, er enghraifft ym mha le a pha bryd yr ydych yn siarad Saesneg:

.....

13. Rwy'n siarad Cymraeg efo fy ngwr/ ngwraig/ partner tua% o'r amser

14. Rwy'n siarad Saesneg efo fy ngwr/ ngwraig/partner tua% o'r amser

15. Rwy'n siarad Cymraeg tua% o'r amser efo fy mhlant.

16. Rwy'n siarad Saesneg tua% o'r amser efo fy mhlant.

17. Rwy'n siarad Cymraeg tua% o'r amser efo fy ffrindiau.

18. Rwy'n siarad Saesneg tua% o'r amser efo fy ffrindiau

19. Rwy'n dod yn wreiddiol o
 A1:Ogledd/Dde Cymru
 A2:Ogledd/Dde Cymru

Os atebwyd De Cymru i gwestiwn 19, yna ewch ynlaen i gwestiwn 20 os gwelwch yn dda. Os atebwyd Gogledd Cymru i gwestiwn 19, yna ewch ymlaen i gwestiwn 21 os gwelwch yn dda.

20. Rwyf wedi byw yng Ngogledd Cymru ammlynedd/mis a.y.y.b. ers 19..... ac wedi byw yn(nodwch unrhyw ardal arall os yn berthnasol) ammlynedd / mis.

Ychwanegwch wybodaeth os yn berthnasol:

.....

.....

21. A ydych erioed wedi dilyn cwrs Addysg Bellach drwy gyfrwng y Gymraeg ac wedi gorfod dysgu gramadeg y Gymraeg yn gywir? Rhowch fanylion e.e. lefel A yn y Gymraeg, gradd B.A. yn y Gymraeg, gradd B.A. mewn Hanes drwy gyfrwng y Gymraeg a.y.y.b.

A1.....

 A2.....

Diolch am gymryd rhan yn yr astudiaeth hon.

Llun 1: Un diwrnod roedd mam yn rhoi dillad ar y lein ddillad. Roedd hi'n ddiwrnod gwyntog iawn, a'r dillad yn chwythu yn y gwynt. Roedd yr hogan fach yno hefyd, a dwy gath fach yn yr ardd a gwiwer goch yn dringo i fyny'r polyn.

Picture 1: "Once upon a time mother was putting clothes on the clothesline. It was a very windy day, and the clothes were blowing in the wind. The little girl was there also, and two cats in the garden and a red squirrel climbing up the pole."

Llun 2: Ar ôl i bawb fynd yn ôl i'r tŷ, gwelodd yr hogan fach a'r hogyn bach, a'r gath, y dillad yn hedfan i ffwrdd o'r lein ddillad. Roedd y ddau wedi dychryn.

Picture 2: "After everyone went back into the house, the little girl, the little boy, and the cat, saw the clothes flying away from the clothesline. They were both shocked."

Llun 3: Felly, rhedodd yr hogan fach a'r hogyn bach a'r gath wen allan o'r tŷ efo basged felen mam ar ôl y dillad.

Picture 3: "So, the little boy and the little girl and the white cat ran out of the house with mother's yellow basket after the clothes."

Llun 4: Roedd y dillad i gyd yn hedfan heibio'r parc -- y ffrog binc a'r flows wen -- a'r hogyn a'r hogan yn rhedeg ar eu holau. Roedd dwy hogan yn y parc yn trio dal gafael ar eu hetiau. Roedd het felen un ohonyn nhw yn dechrau hedfan i ffwrdd!

Picture 4: "All the clothes flew past the park -- the pink dress and the white blouse -- and the boy and the girl ran after them. Two girls in the park were trying to keep hold of their hats. The yellow hat of one of them started to fly away!"

Llun 5: Roedd y dillad wedi glanio. Roedd y trowsus glas ar y wal, a'r ffrog binc ar ben y gath! Aeth yr hogan fach i nol y ffrog oddi ar y gath a'i rhoi yn y fasedg.

Picture 5: "The clothes had landed. The blue trousers were on the wall, and the pink dress was on top of the cat! The little girl went to get the dress from the cat and put it in the basket."

Llun 6: Aeth yr hogyn i nol y trowsus oddi ar y wal, tra bo'r hogan yn trio dal y gôt goch a'r hosan felen.

Picture 6: "The boy went to get the trousers from the wall, while the girl tried to catch the red coat and the yellow sock."

Llun 7: Roedd y dillad dal i hedfan tuag at y ffarm. Roedd yr hogan fach yn rhedeg ar eu hôl.

Picture 7: "The clothes were still flying towards the farm. The little girl was running after them."

Llun 8: Gwelodd yr hogan fam a'i babi. Roedd blws wen mam wedi mynd yn sownd ar y goets! Rhoddodd y fam y flows yn ôl i'r hogan fach.

Picture 8: "The girl saw a mother and her baby. Mother's white blouse had got stuck on the pram! The mother gave the blouse back to the little girl."

Llun 9: Aeth yr hogan i nol hosan felen oedd wedi glanio ar y fainc werdd. Ond yn sydyn, gwelodd gi mawr du a gwyn yn barod i frathu sgert felen mam. "Brysia, brysia" meddai wrth yr hogyn, "mae'r ci am gnoi sgert mam!"

Picture 9: The girl went to get a yellow sock than had landed on the green bench. But suddenly, she saw a bog black and white dog ready to bite mother's yellow skirt. "Quick, quick" she said to the boy, "the dog's going to chew mother's skirt!"

Llun 10: Rheddodd yr hogyn at y ci a gafaelodd yn un pen i'r sgert, a gafaelodd y ci yn y pen arall!

Picture 10: The boy ran towards the dog and held one end of the skirt, and the dog held the other end!

Llun 11: Ym mhen arall y ffarm, roedd un o'r sana wedi hedfan tuag at un o'r caeau. Roedd y giat ar agor, ac roedd y ddafad yn denig allan, ac yn rhedeg tuag at babell fach gerllaw. Roedd rhywun yn campio yno oherwydd roedd yno gwpan a phadell ffriô y tu allan i'r dent.

Picture 11: "At the other end of the farm, one of the socks had flown towards one of the fields. The gate was open, and the sheep was escaping, and running towards a little tent nearby. Someone was camping there because there was a cup and a frying pan outside the tent."

Llun 12: Ond nath y ddafad ddisgyn ar ben y babell a malu'r babell. Roedd y badell ffriô a'r gwpan yn hedfan wrth i'r ddafad neidio ar y babell. Roedd yr hogyn a'r hogan yn chwerthin wrth weld hyn yn digwydd.

Picture 12: “But the sheep fell on top of the tent and broke the tent. The frying pan and the cup flew as the sheep jumped on the tent. The boy and the girl laughed as they saw this.”

Llun 13: Gwelodd yr hogan a'r gath yr hosan wedi glanio ar glust y fuwch!

Picture 13: “The girl and the cat saw that the sock had landed on the cow’s ear!”

Llun 14: Yn uchel, uchel mewn coeden, roedd y faneg biws wedi mynd yn sownd mewn dielen. Roedd y glöyn byw a'r falwen yn edrych yn syn.

Picture 14: In a tree, high, high above, the purple glove had got stuck in a leaf. The butterfly and the snail looked amazed.”

Llun 15: Ond, tynnodd yr hogan fach y faneg biws oddi ar y ddeilen a'i rhoi yn y fasedd, a thynnodd yr hogyn bach y falwen oddi ar y goeden. Hedfanodd y glöyn byw i ffwrdd!

Picture 15: “But, the little girl pulled the purple glove off the leaf and put it in the basket, and the little boy pulled the snail off the tree. The butterfly flew away!”

Llun 16: Roedd y gôt goch wedi glanio yng nghanol y goeden afalau. Roedd yr hogan fach ofn mynd i nol y gôt oherwydd fod y dylluan wedi deffro.

Picture 16: “The red coat had landed in the middle of an apple tree. The little girl was scared to go and get the coat because the owl had woken up.”

Llun 17: Ond, tynodd yr hogan y lli oddi ar y boncyff, a safodd ar y boncyff, a chyraedd at y gôt a'i thynnu i lawr o'r goeden. Tra roedd y hogan yn nol y gôt, roedd yr hogyn wedi gweld y bais las yn sownd ar droed cwningen fach.

Picture 17: “But, the little girl took the saw from the tree trunk, and stood on the tree trunk, and reached for the coat and pulled it down from the tree. While the girl was getting the coat, the boy saw the blue petticoat stuck to the little rabbit’s foot.”

Llun 18: Cododd yr hogyn y gwningen, a thynnu'r bais las i ffwrdd o'i throed.

Picture 18: “The boy lifted the rabbit, and pulled the petticoat off its foot.”

Llun 19: Gwelodd yr hogyn bâr o drowsus cwta yn hedfan i fwrdd, a gollyngodd y gwningen er mwyn mynd ar ôl y trowsus cwta.

Picture 19: “The boy saw a pair of shorts flying away, and he let go of the rabbit to go after the shorts.”

Llun 20: Roedd y trowsus cwta wedi glanio ar y drol. Aeth yr hogyn bach i'w nol. Roedd y faneg biws arall o dan droedd y ceffyl. Neidiodd y gath dros y masiarŵm i helpu'r hogan gael y faneg.

Picture 20: “The shorts had landed on the cart. The little boy went to get them. The other purple glove was under the horse's foot. The cat jumped over the mushroom to help the girl get the glove.”

Llun 21: Aeth yr hogan i nôl y faneg oddi wrth y ceffyl. Roedd y faneg wedi mynd yn sownd ar y bedol felyn ar ei droed. Aeth yr hogyn a'r gath am dro tuag at y felin wynt i weld os oedd dillad wedi hefan tuag yno.

Picture 21: “The girl went to get the glove from the horse. The glove had got stuck on the yellow horseshoe on his foot. The boy and the cat went for a walk towards the windmill to see if any clothes had flown that way.”

Llun 22: Yn wir, roedd yr hogyn wedi gweld brat mam yn sownd ar y felin, ac roedd y gath wedi gweld llydoen! Roedd y ffarmwr yn rhedeg ar ôl llwynog hefyd!

Picture 22: In fact, the boy had seen mother's apron stuck on the mill, and the cat had seen a mouse! The farmer was running after a fox also!”

Llun 23: Symodd yr hogyn y rhaw er mwyn i'r melinydd gael i ben yr ysgol i nôl y brat. Roedd y gath yn rhedeg ar ôl y llygoden, ac roedd y llwynog yn rhedeg ar ôl y ffarmwr!

Picture 23: The boy moved the shovel so that the millman could get to the top of the ladder to get the apron. The cat was running after the mouse, and the fox was running after the farmer!”

Llun 24: Yn ôl yn y tŷ, aeth y fam allan i'r ardd a gweld bod y dillad i gyd wedi diflannu. Dim ond y wiwer fach oedd ar ôl.

Picture 24: “Back in the house, the mother went out to the garden and saw that all the clothes had vanished. Only the squirrel was left.”

Llun 25: Ond gwelodd yr hogyn, yr hogan, a'r gath yn dod yn ôl efo basged a'i llond hi o ddillad.

Picture 25: “But she saw the boy, the girl, and the cat returning with the basket full of clothes.”

Llun 26: Roedd y fam yn hapus iawn fod y dillad i gyd yn eu hôl, a'r plant yn saff.

“Diolch yn fawr” meddai wrth y plant. Rhoddodd yr hogyn y farged iddi, a rhoddodd yr hogan y rhosyn iddi.

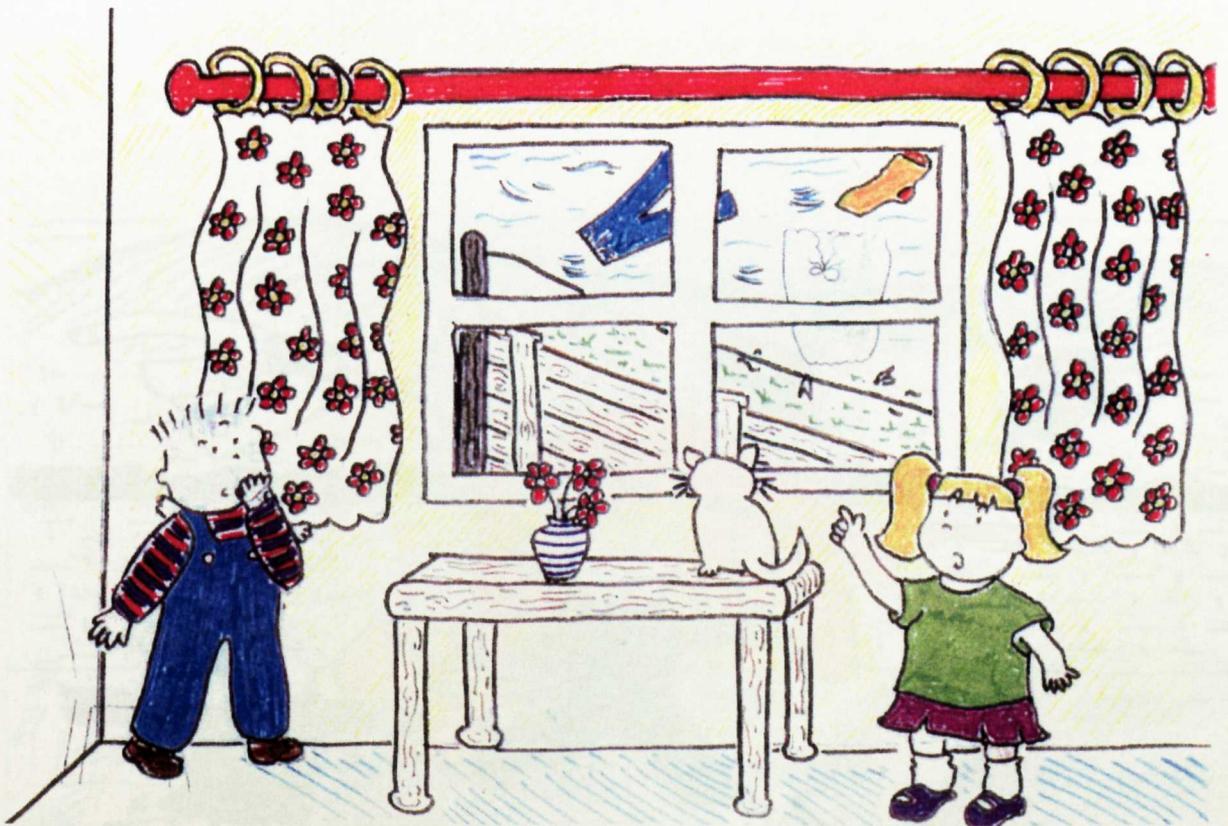
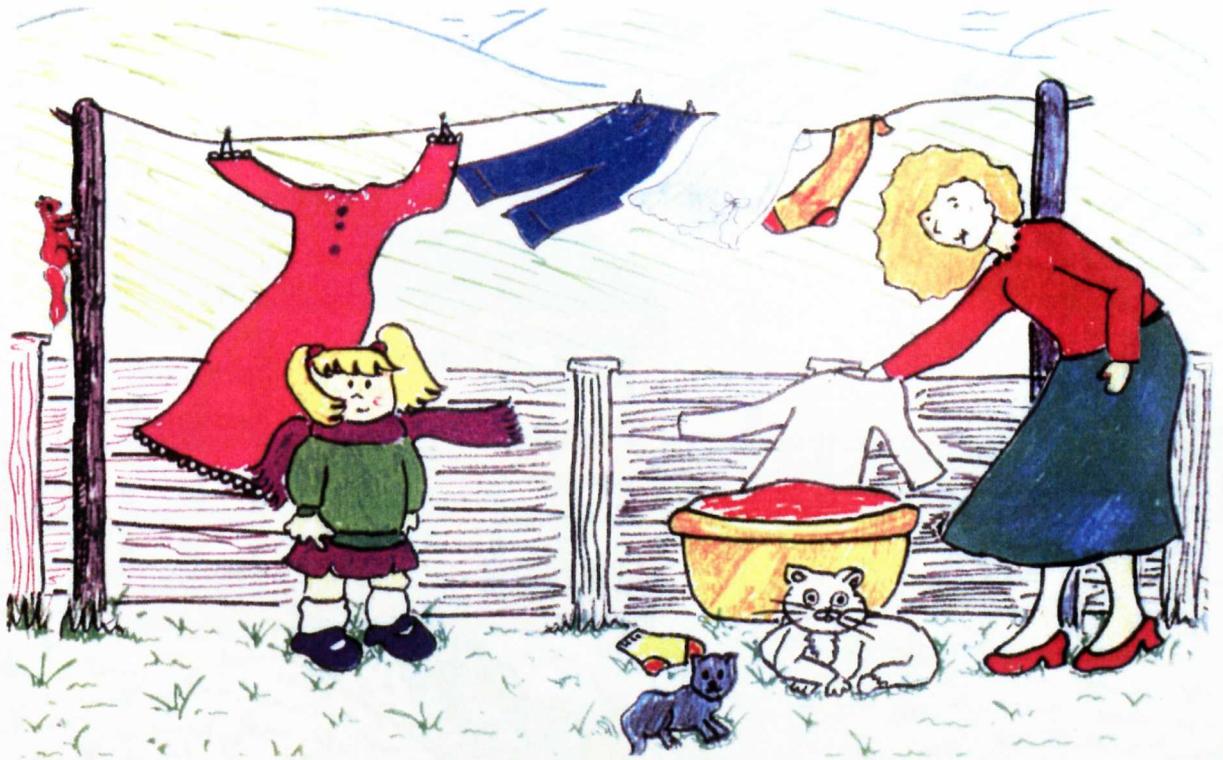
Picture 26: The mother was very happy that the clothes were all back, and the children safe. “Thank you very much” she told the children. The boy gave her the basket, and the girl gave her the rose.

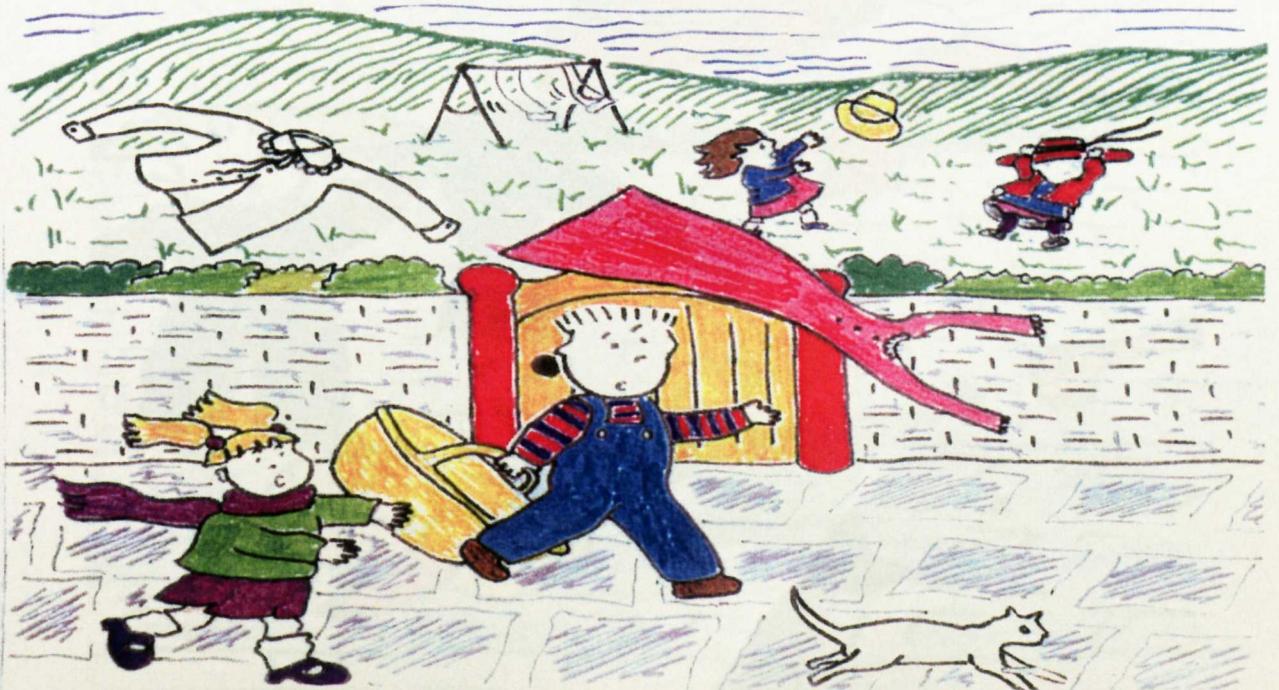
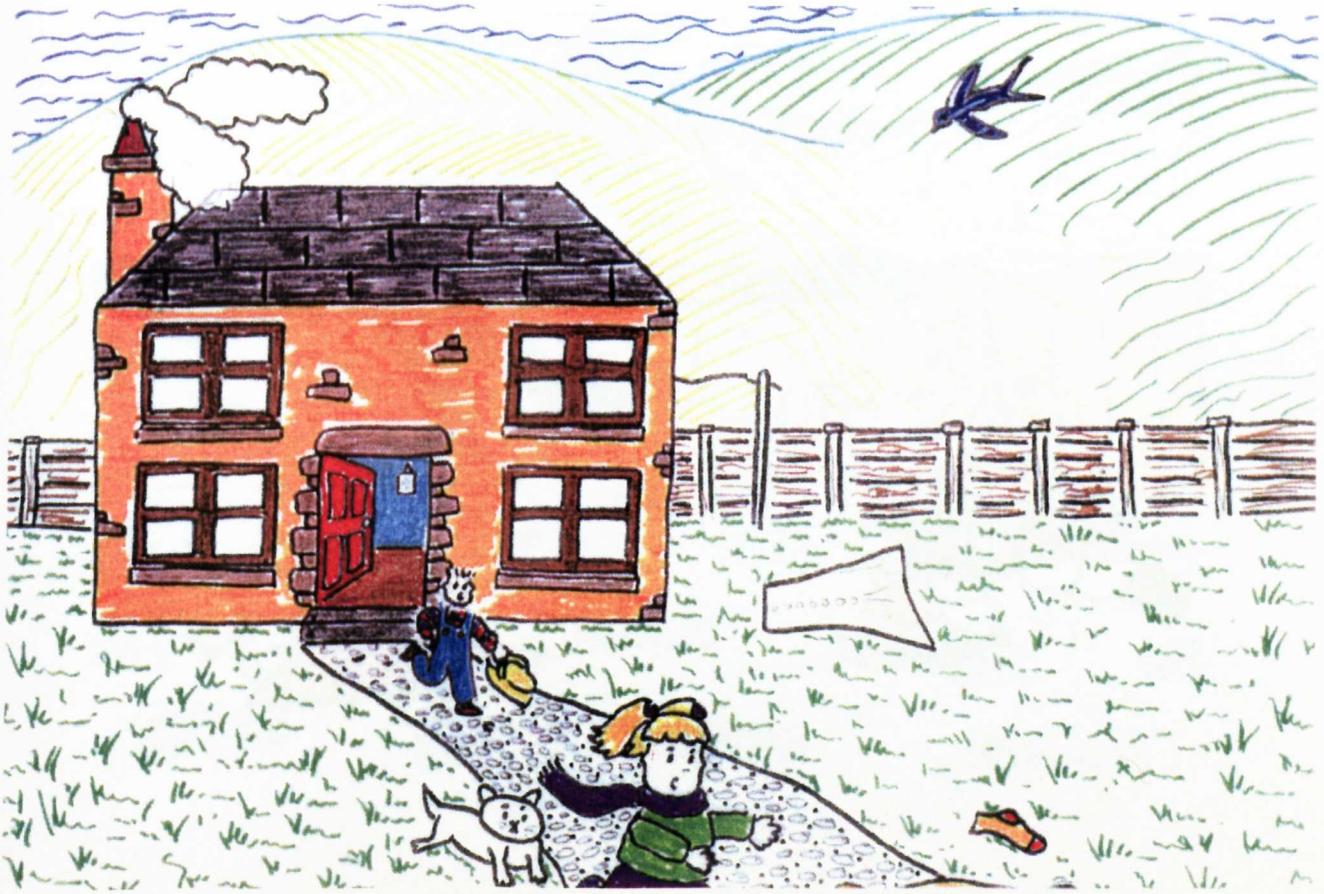
Llun 27: Yn ôl yn y tŷ, rhoddodd y fam yr holl dillad i sychu'n iawn o flaen y tân, a chafodd yr hogyn a'r hogan hufen iâ am eu trafferth. Roed y gath yn cael dysgl o lefrith ar y mat o flaen y tân.

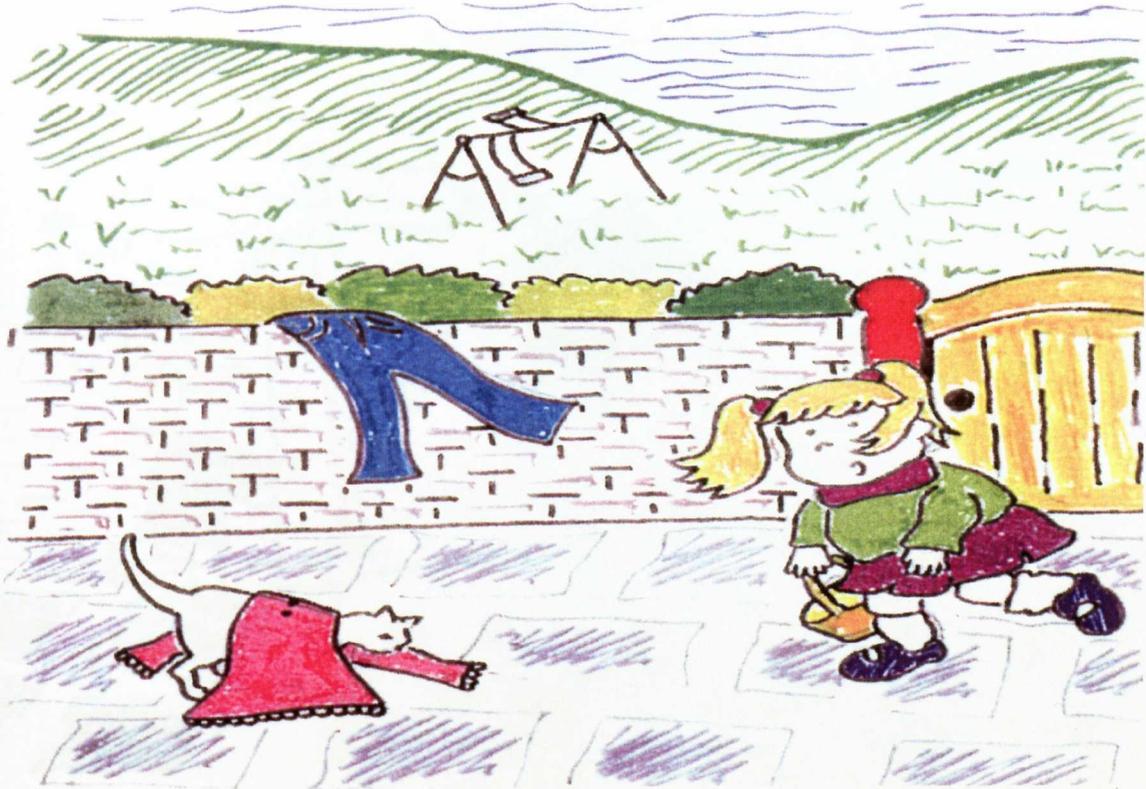
Picture 27: “Back in the house, the mother put all of the clothes to dry by the fire, and the boy and the girl had an ice cream for their trouble. The cat was having a bowl of milk on the mat by the fire.”

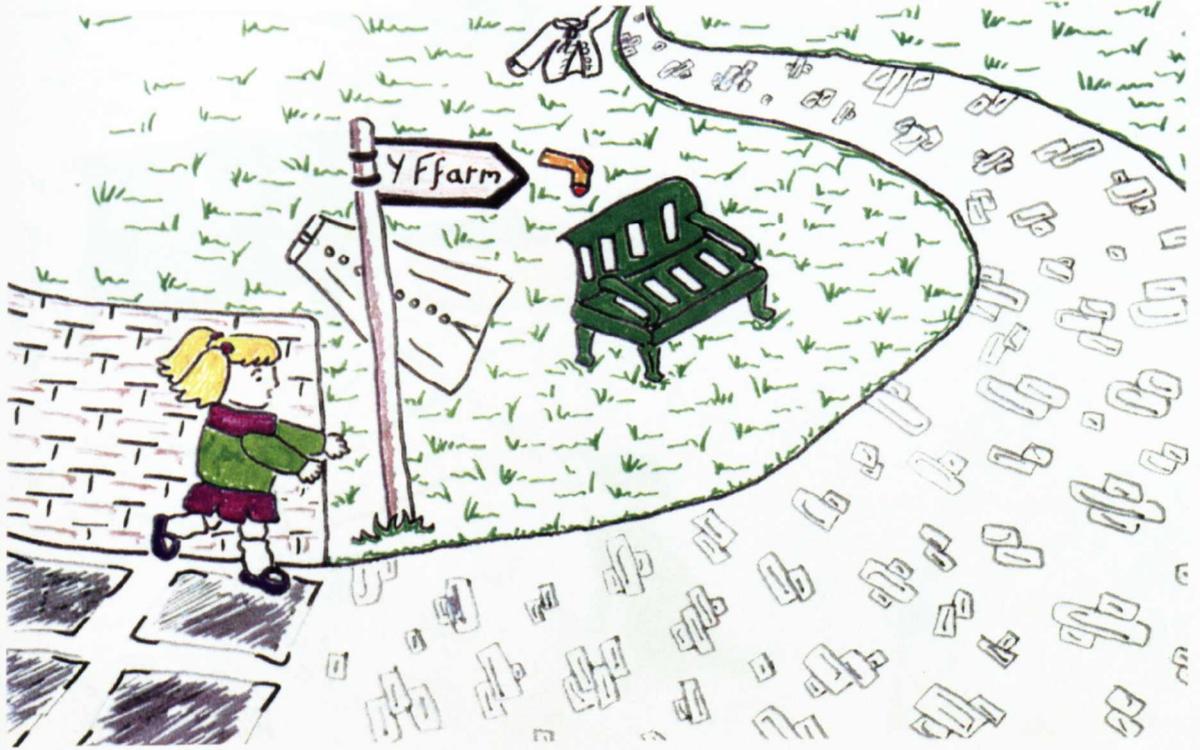
Llun 28: Aeth y ddau i eistedd wrth y bwrdd bwyd a chael darn mawr o'r deisen a diod o oren am fod yn blant da.

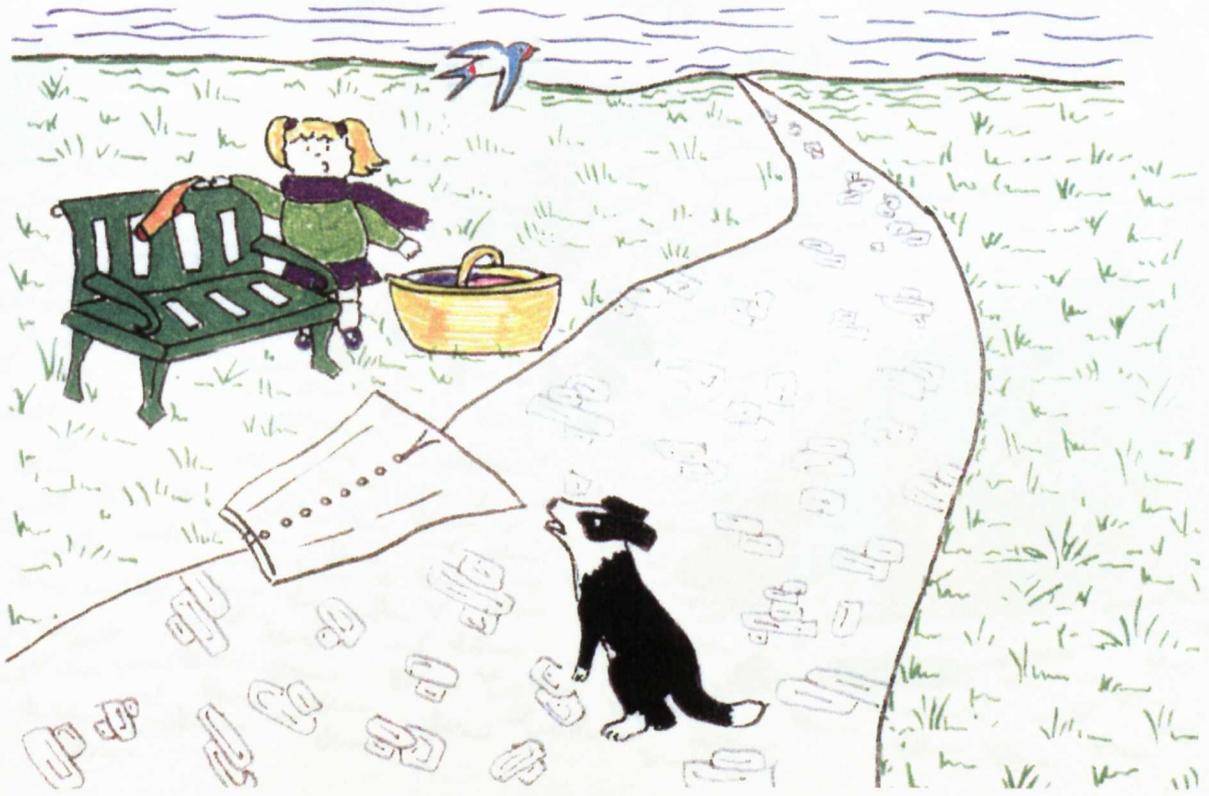
Picture 28: They both went to sit by the table and had a big piece of the cake and a drink of orange for being good children.”

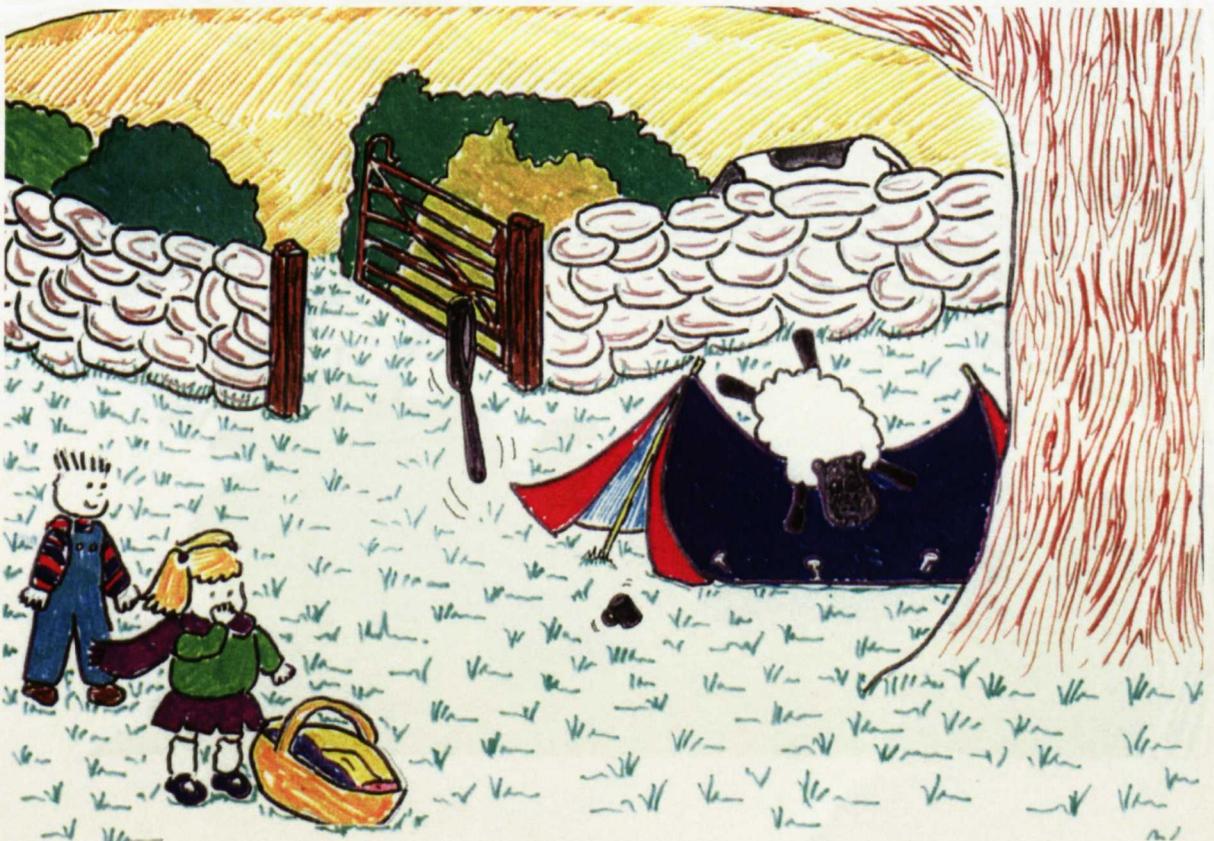
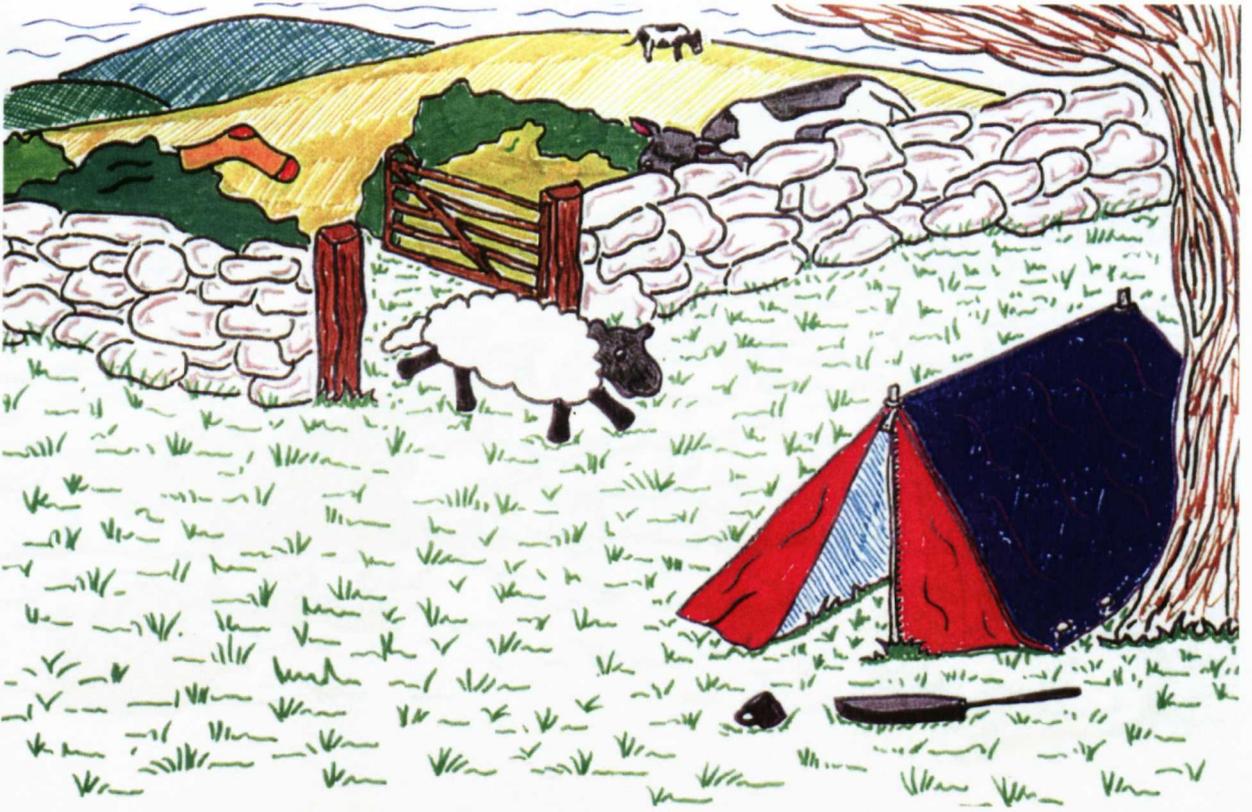


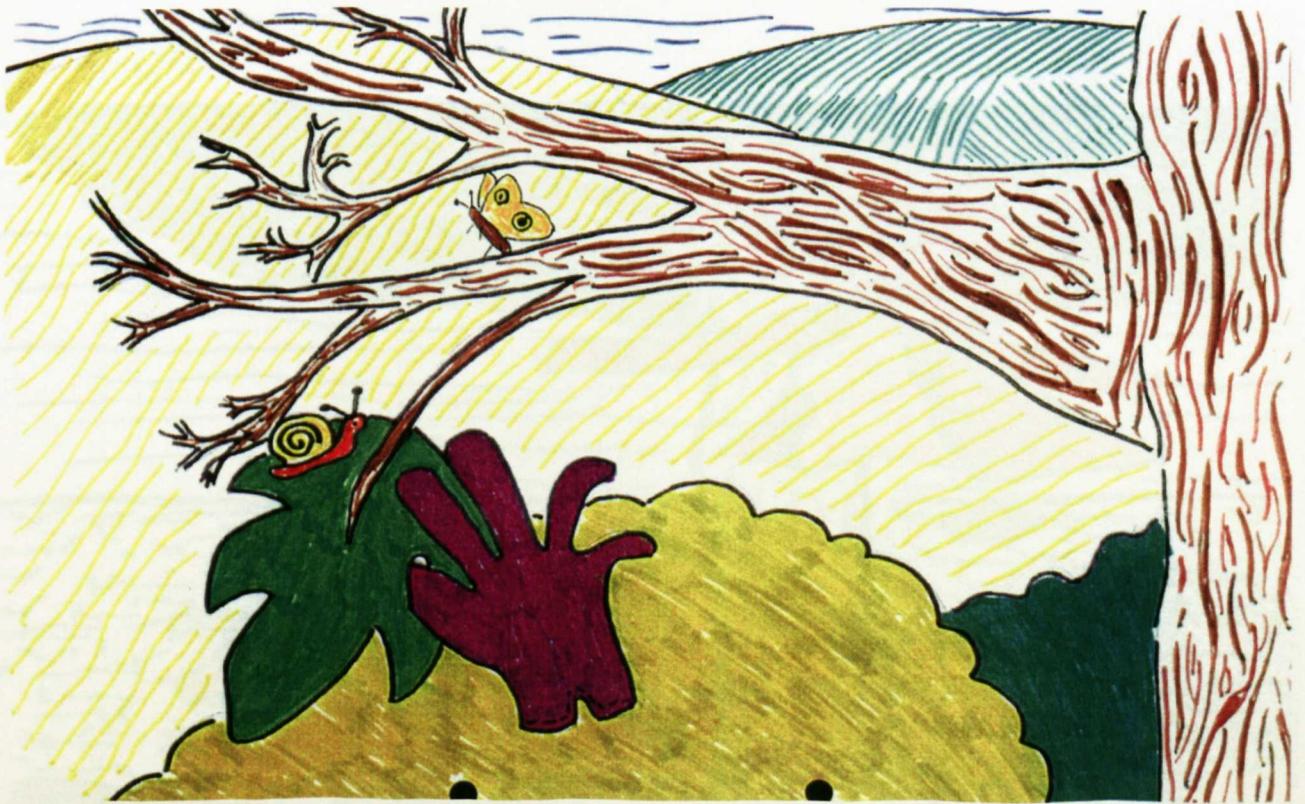




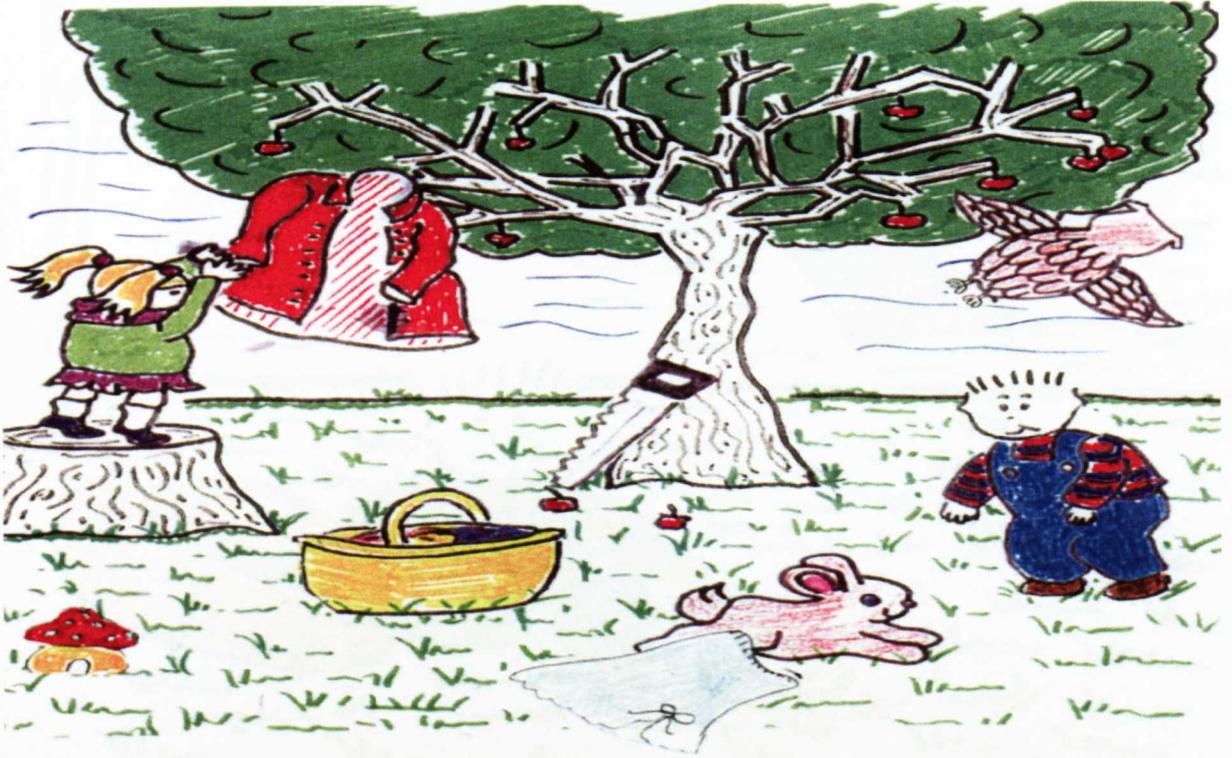


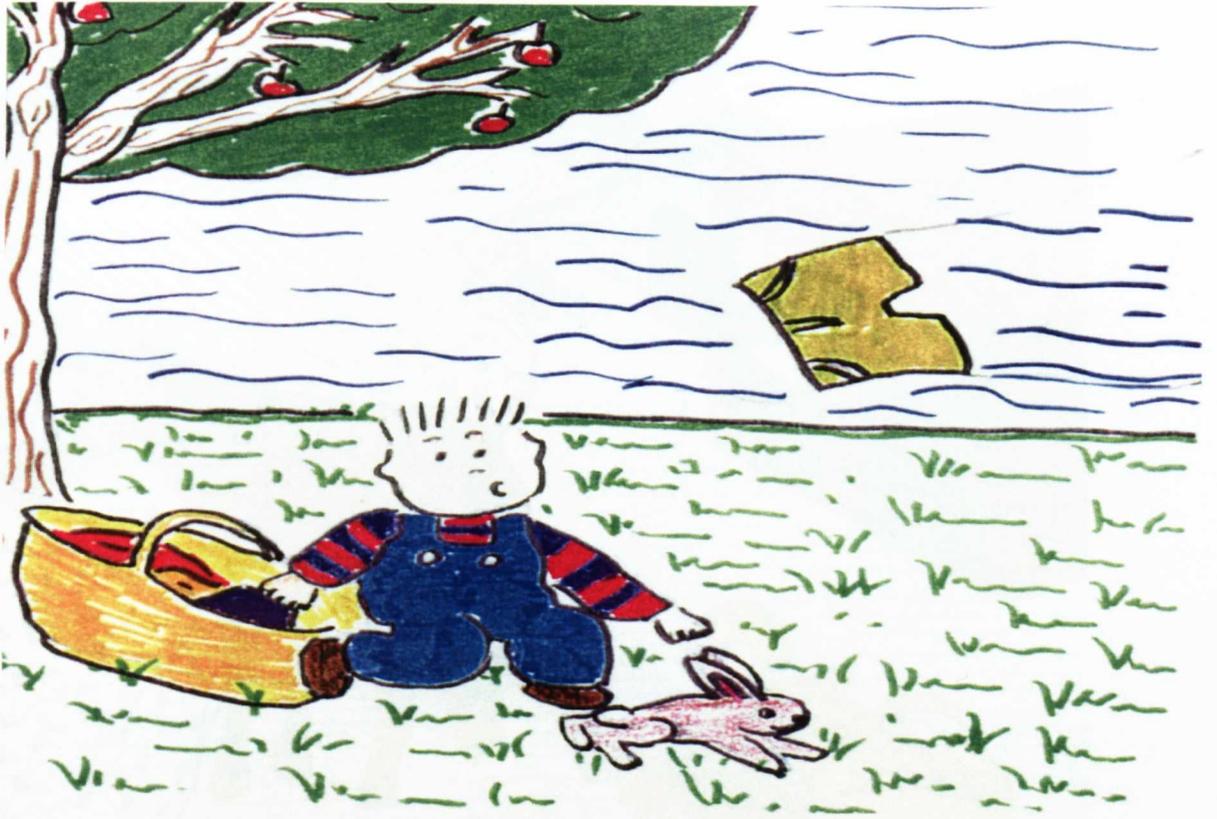


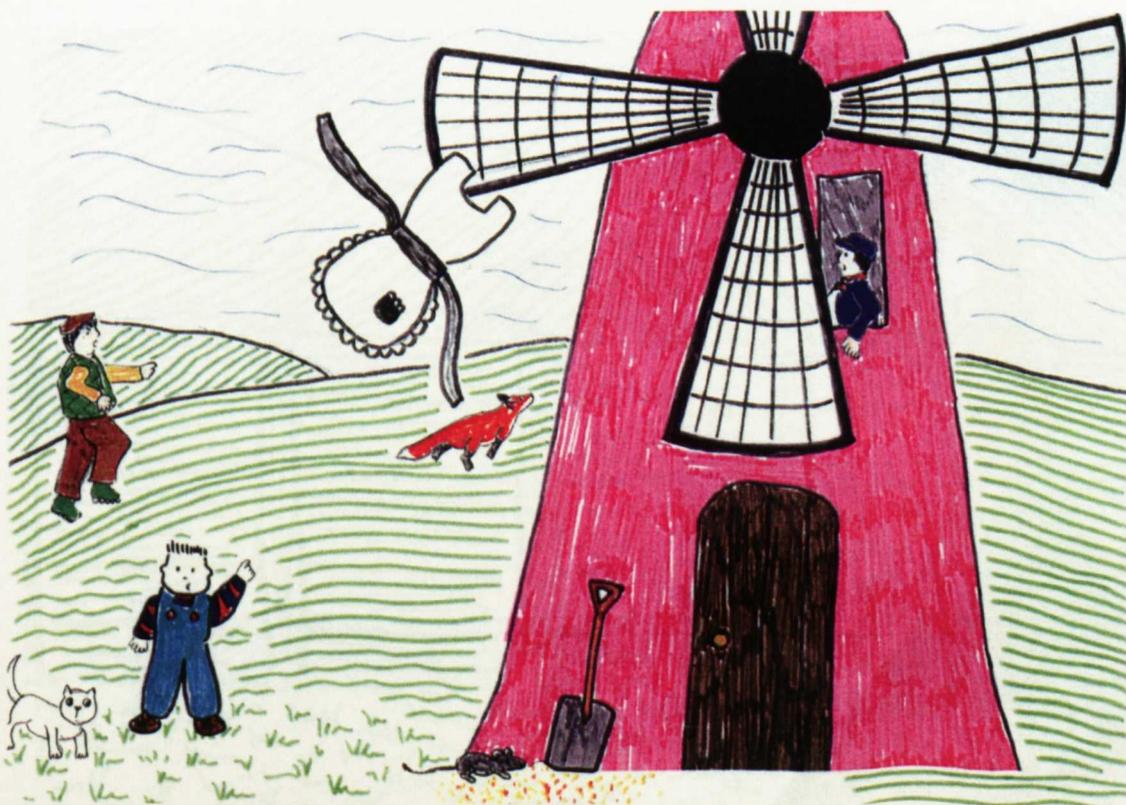
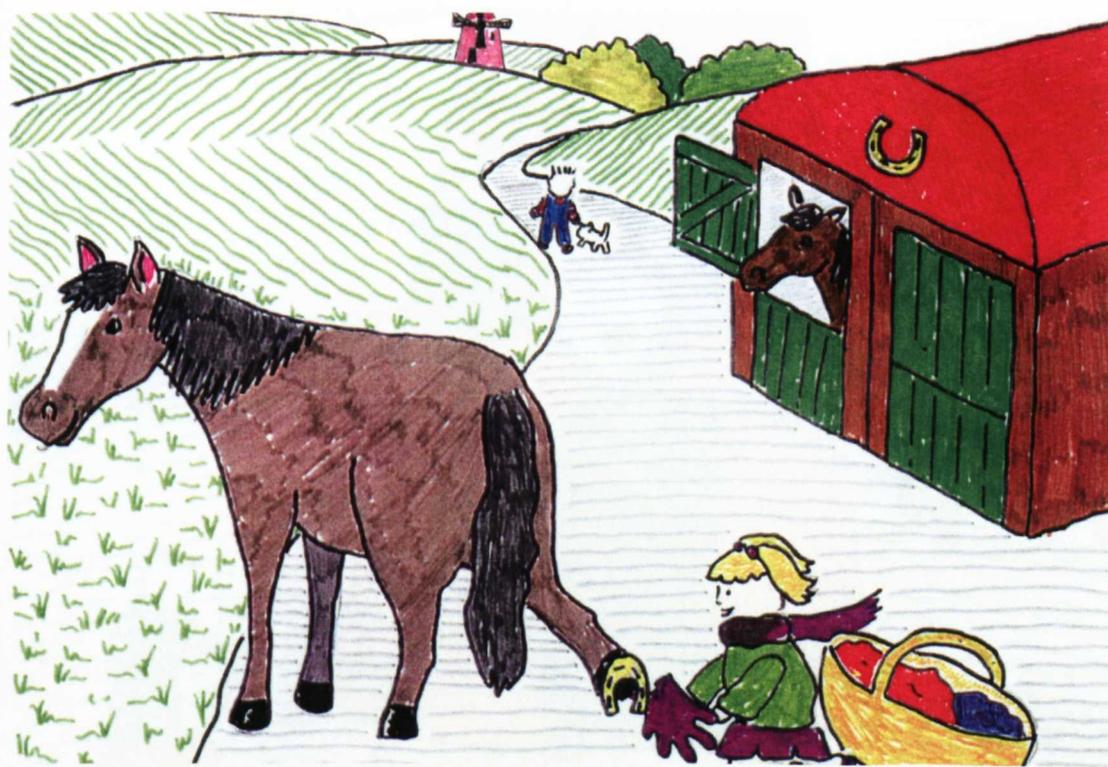


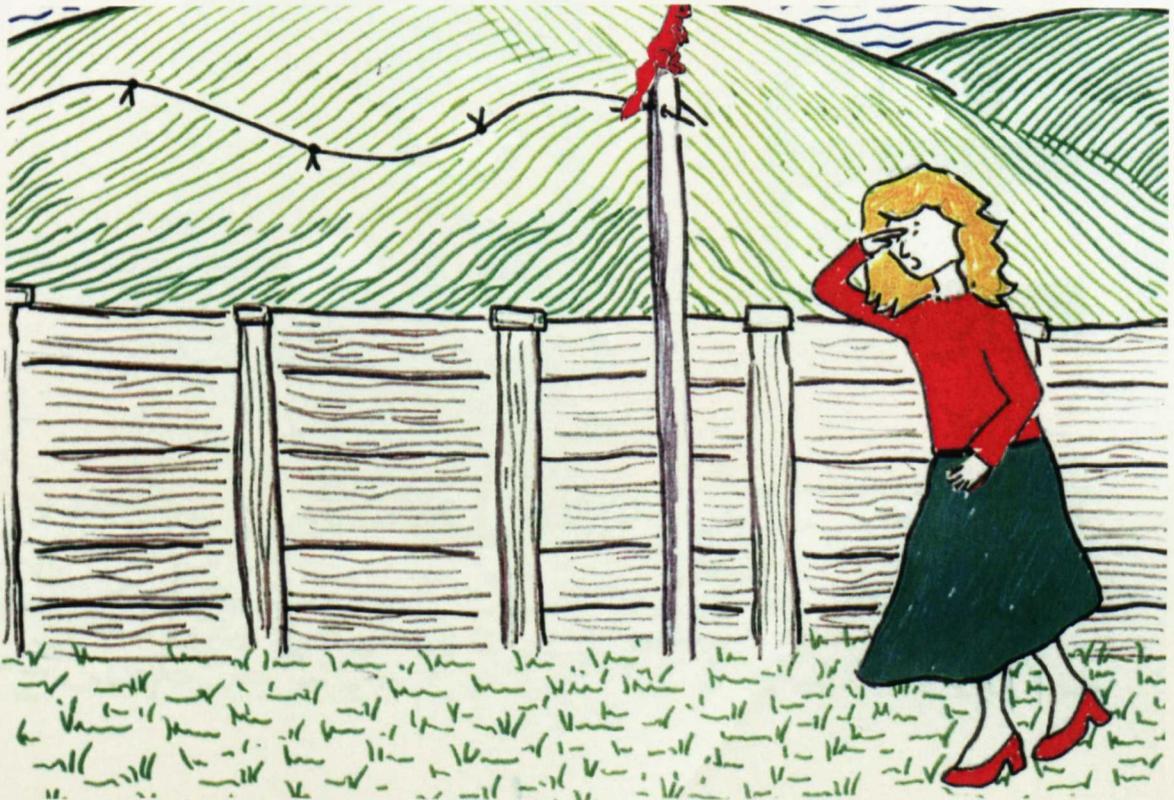


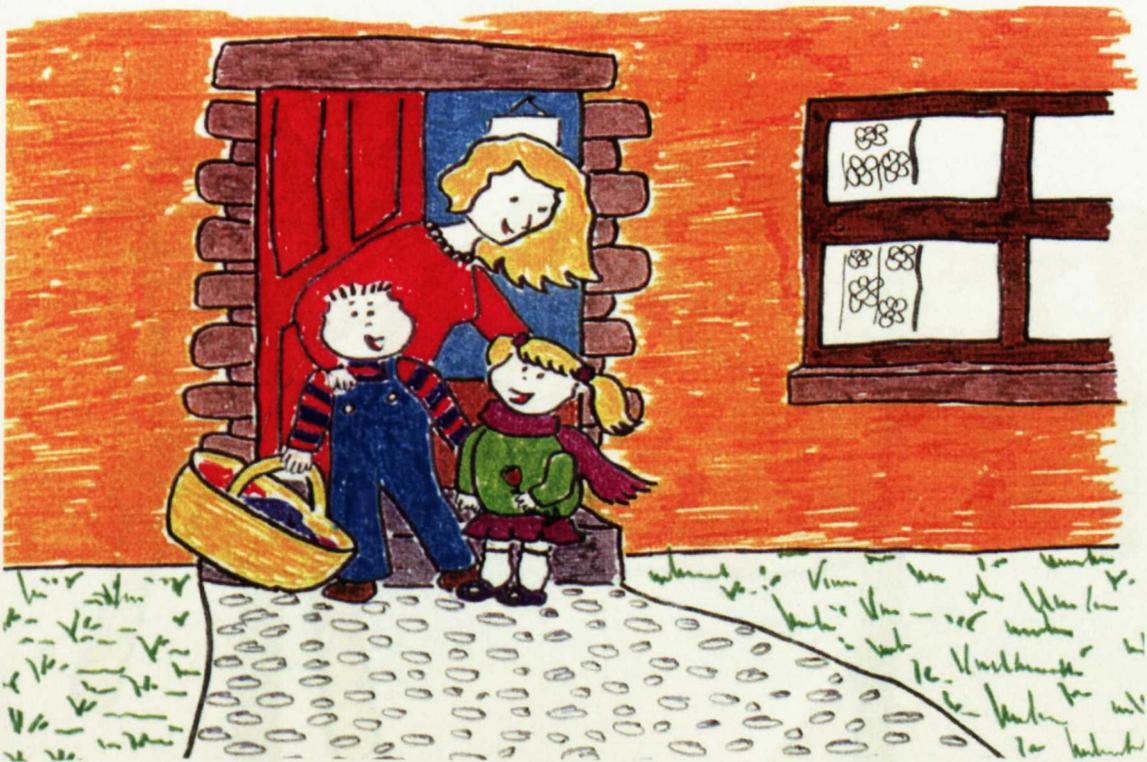
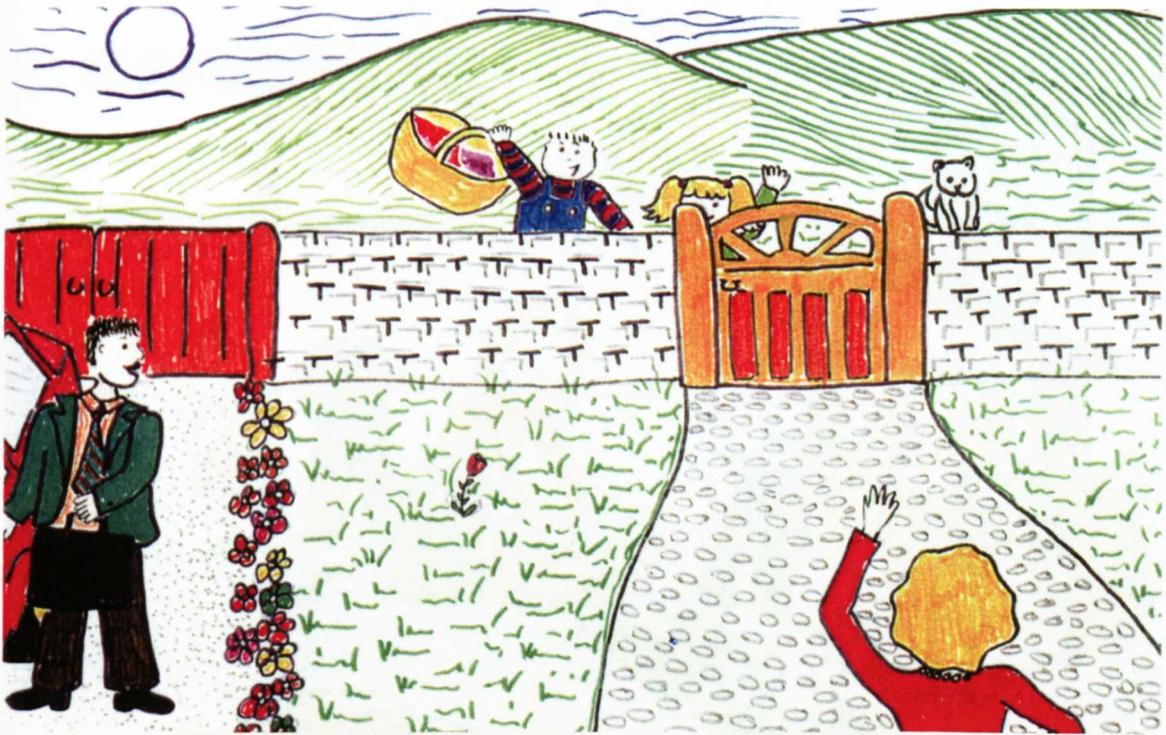


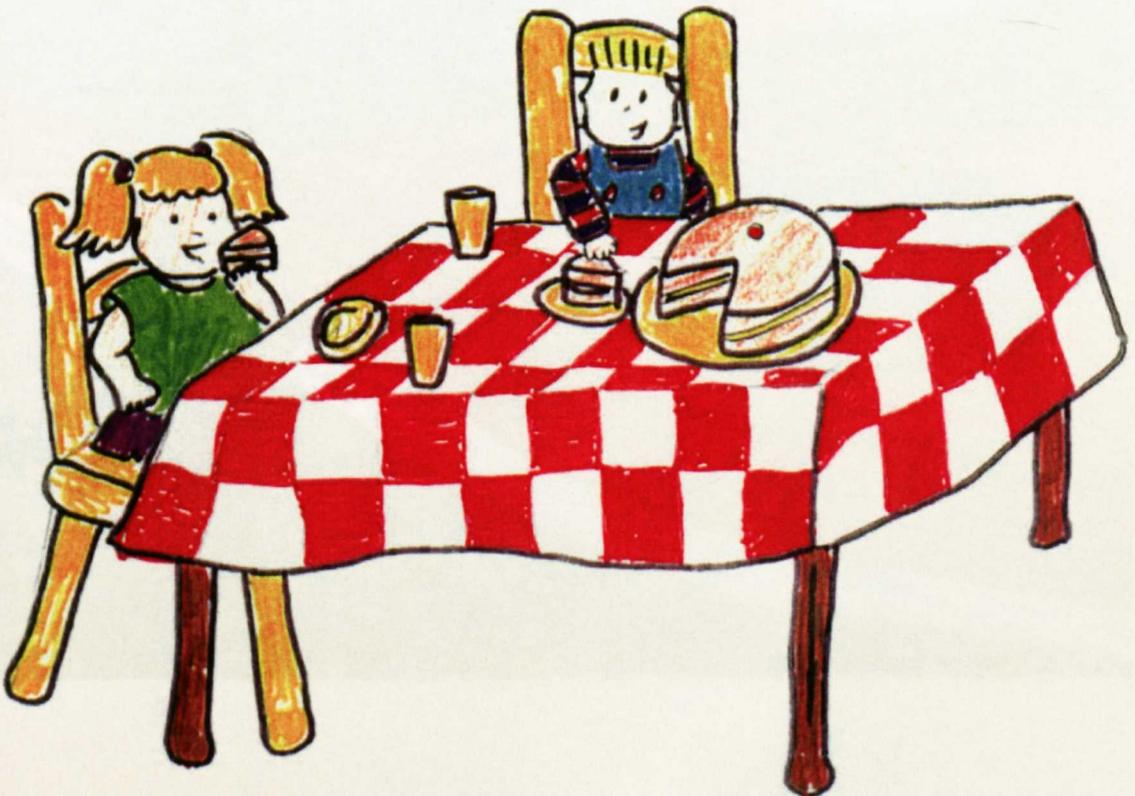














Nouns: Adults

* Dependent Variable = Arcsin proportion correct scores

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age Group	2	.208	.104	.932	.4060
Subject(Group)	27	3.007	.111		
Animacy	1	.019	.019	.391	.5368
Animacy * Age Group	2	.094	.047	.981	.3880
Animacy * Subject(Group)	27	1.290	.048		
Gender Arcsin	1	3.261	3.261	29.278	.0001
Gender Arcsin * Age Group	2	.208	.104	.932	.4060
Gender Arcsin * Subject(Group)	27	3.007	.111		
Animacy * Gender Arcsin	1	.019	.019	.391	.5368
Animacy * Gender Arcsin * Age Group	2	.094	.047	.981	.3880
Animacy * Gender Arcsin * Subject(Group)	27	1.290	.048		

Dependent: Arcsin

Nouns: Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age group	3	.566	.189	.885	.4629
Order	1	1.235	1.235	5.793	.0241
Subject(Group)	24	5.117	.213		
Animacy arcsin	1	.051	.051	.792	.3825
Animacy arcsin * Age group	3	.189	.063	.980	.4187
Animacy arcsin * Order	1	.107	.107	1.659	.2100
Animacy arcsin * Subject(Group)	24	1.541	.064		
Gender arcsin	1	12.315	12.315	51.815	.0001
Gender arcsin * Age group	3	.503	.168	.706	.5578
Gender arcsin * Order	1	.102	.102	.428	.5191
Gender arcsin * Subject(Group)	24	5.704	.238		
Animacy arcsin * Gender arcsin	1	.025	.025	.150	.7017
Animacy arcsin * Gender arcsin * Age group	3	.397	.132	.791	.5108
Animacy arcsin * Gender arcsin * Order	1	.012	.012	.071	.7920
Animacy arcsin * Gender arcsin * Subject(Group)	24	4.013	.167		

Dependent: Arc

Nouns: Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	4	5.834	1.459	8.232	.0001
Subject(Group)	54	9.567	.177		
Animacy arcsin	1	.023	.023	.409	.5253
Animacy arcsin * Age	4	.221	.055	.985	.4236
Animacy arcsin * Subject(Group)	54	3.032	.056		
Gender arcsin	1	14.403	14.403	86.222	.0001
Gender arcsin * Age	4	2.700	.675	4.041	.0061
Gender arcsin * Subject(Group)	54	9.020	.167		
Animacy arcsin * Gender arcsin	1	.020	.020	.202	.6546
Animacy arcsin * Gender arcsin * Age	4	.450	.113	1.124	.3550
Animacy arcsin * Gender arcsin * Subject(Group)	54	5.408	.100		

Dependent: Arc

Adjective: Adults

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age group	2	.527	.263	5.822	.2812
Subject(Group)	1	.045	.045		
Arc Onset	1	.023	.023	.872	.5217
Arc Onset * Age group	2	.119	.060	2.274	.4245
Arc Onset * Subject(Group)	1	.026	.026		
Arc Animacy	1	1.311	1.311	7.980	.2166
Arc Animacy * Age group	2	.289	.145	.881	.6017
Arc Animacy * Subject(Group)	1	.164	.164		
Arc Gender	1	8.147	8.147	180.024	.0474
Arc Gender * Age group	2	.527	.263	5.822	.2812
Arc Gender * Subject(Group)	1	.045	.045		
Arc Onset * Arc Animacy	1	.004	.004	4.470	.2813
Arc Onset * Arc Animacy * Age group	2	.095	.048	51.219	.0983
Arc Onset * Arc Animacy * Subject(Group)	1	.001	.001		
Arc Onset * Arc Gender	1	.023	.023	.872	.5217
Arc Onset * Arc Gender * Age group	2	.119	.060	2.274	.4245
Arc Onset * Arc Gender * Subject(Group)	1	.026	.026		
Arc Animacy * Arc Gender	1	1.311	1.311	7.980	.2166
Arc Animacy * Arc Gender * Age group	2	.289	.145	.881	.6017
Arc Animacy * Arc Gender * Subject(Group)	1	.164	.164		
Arc Onset * Arc Animacy * Arc Gender	1	.004	.004	4.470	.2813
Arc Onset * Arc Animacy * Arc Gender * Age group	2	.095	.048	51.219	.0983
Arc Onset * Arc Animacy * Arc Gender * Subject(Group)	1	.001	.001		

Dependent: Compact Variable 2

Adjective: Adult responses without *bach*

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	1	1.496	1.496	48.152	.0010
Subject(Group)	5	.155	.031		
Arc Animacy	1	.054	.054	1.723	.2463
Arc Animacy * Age	1	.054	.054	1.723	.2463
Arc Animacy * Subject(Group)	5	.155	.031		
Arc Gender	1	2.841	2.841	91.477	.0002
Arc Gender * Age	1	1.496	1.496	48.152	.0010
Arc Gender * Subject(Group)	5	.155	.031		
Arc Animacy * Arc Gender	1	.054	.054	1.723	.2463
Arc Animacy * Arc Gender * Age	1	.054	.054	1.723	.2463
Arc Animacy * Arc Gender * Subject(Group)	5	.155	.031		

Dependent: Compact Variable 2

Adjective: Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value	G-G	H-F
Age group	3	1.568	.523	2.624	.0840		
Subject(Group)	17	3.386	.199				
Arc Gender	1	3.595	3.595	10.573	.0047	.0047	.0047
Arc Gender * Age group	3	.365	.122	.357	.7845	.7845	.7845
Arc Gender * Subject(Group)	17	5.780	.340				

Dependent: Compact Variable 2

Adjective: Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age group	4	2.137	.534	3.518	.0150
Subject(Group)	40	6.076	.152		
Arc Gender	1	4.919	4.919	25.276	.0001
Arc Gender * Age group	4	.467	.117	.599	.6652
Arc Gender * Subject(Group)	40	7.785	.195		

Dependent: Compact Variable 2

	Animate		Inanimate	
	Feminine	Masculine	Feminine	Masculine
4 1/2 years	No Change	100% (14/14)	No Change	No Change
6 years	48.44% (31/64)	100% (35/35)	58.54% (24/41)	No Change
7 1/2 years	69.42% (84/121)	89.58% (43/48)	51.95% (40/77)	100% (55/55)
9 years	57.14% (40/70)	97.14% (34/35)	67.16% (45/67)	No Change
Total	68.89% (155/225)	95.45% (126/132)	58.92% (109/185)	100% (55/55)

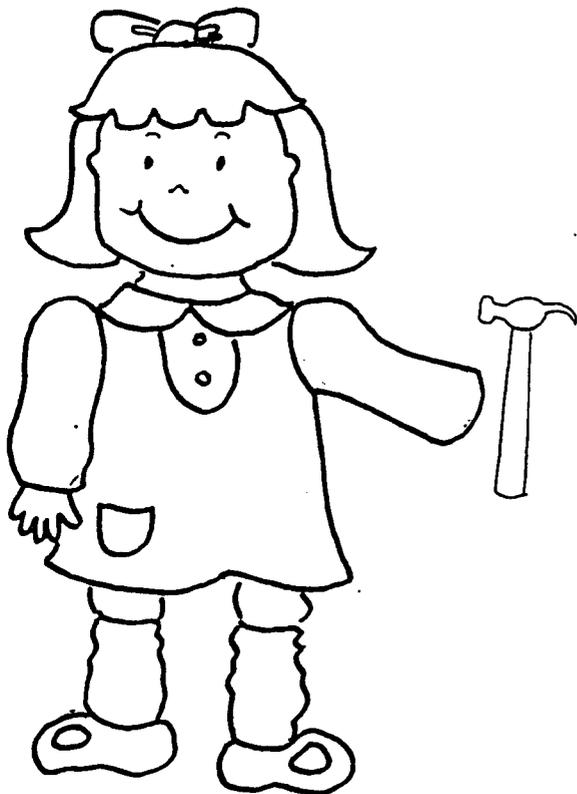
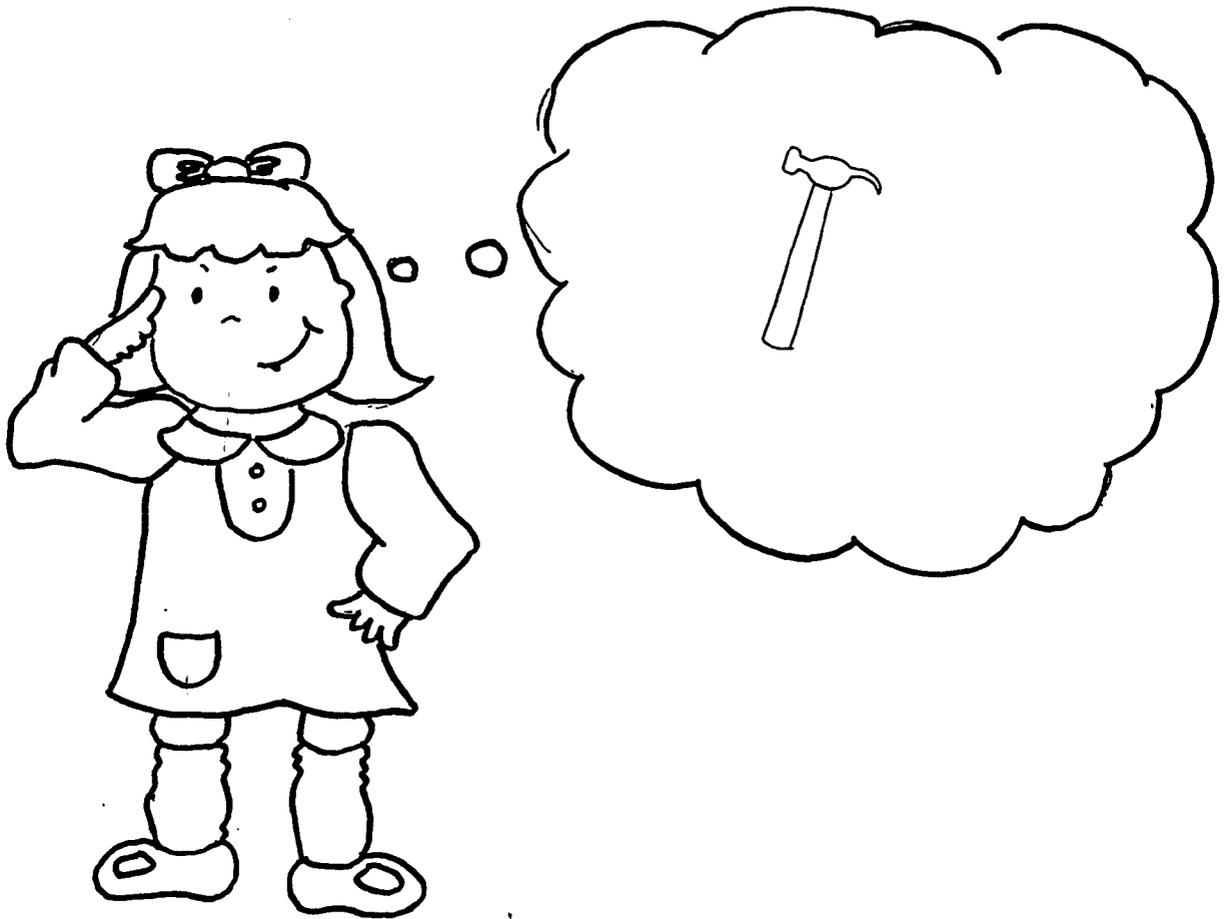
The following presents phonological transcriptions of words in northern pronunciation. Although, in some cases, one would expect the prescriptive phonological transcript (e.g., /kɑdɑɪr/ for “cadair”), these nouns will be presented here as they would be pronounced (i.e., /kɑdɑr/).

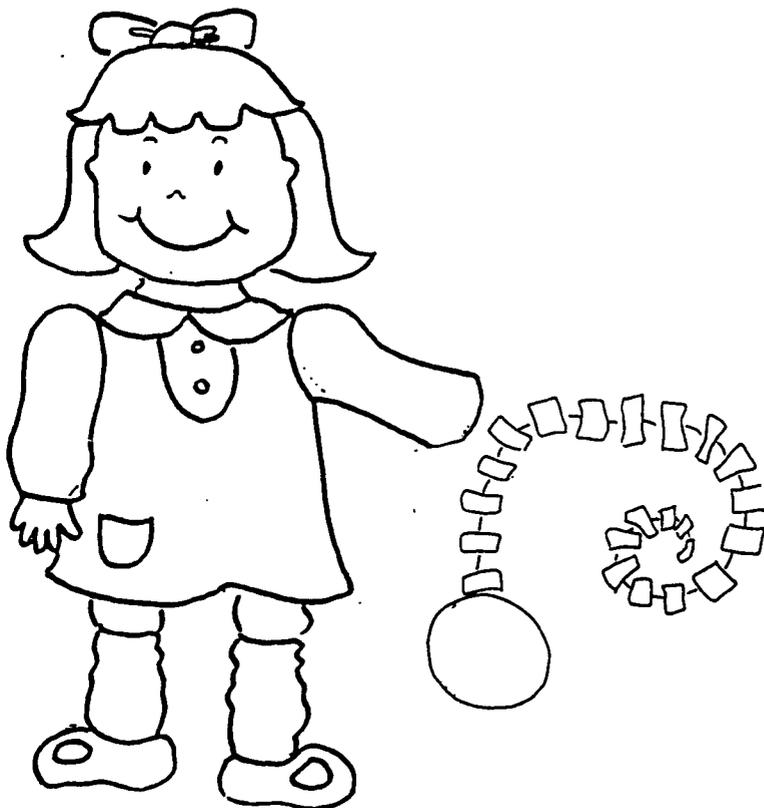
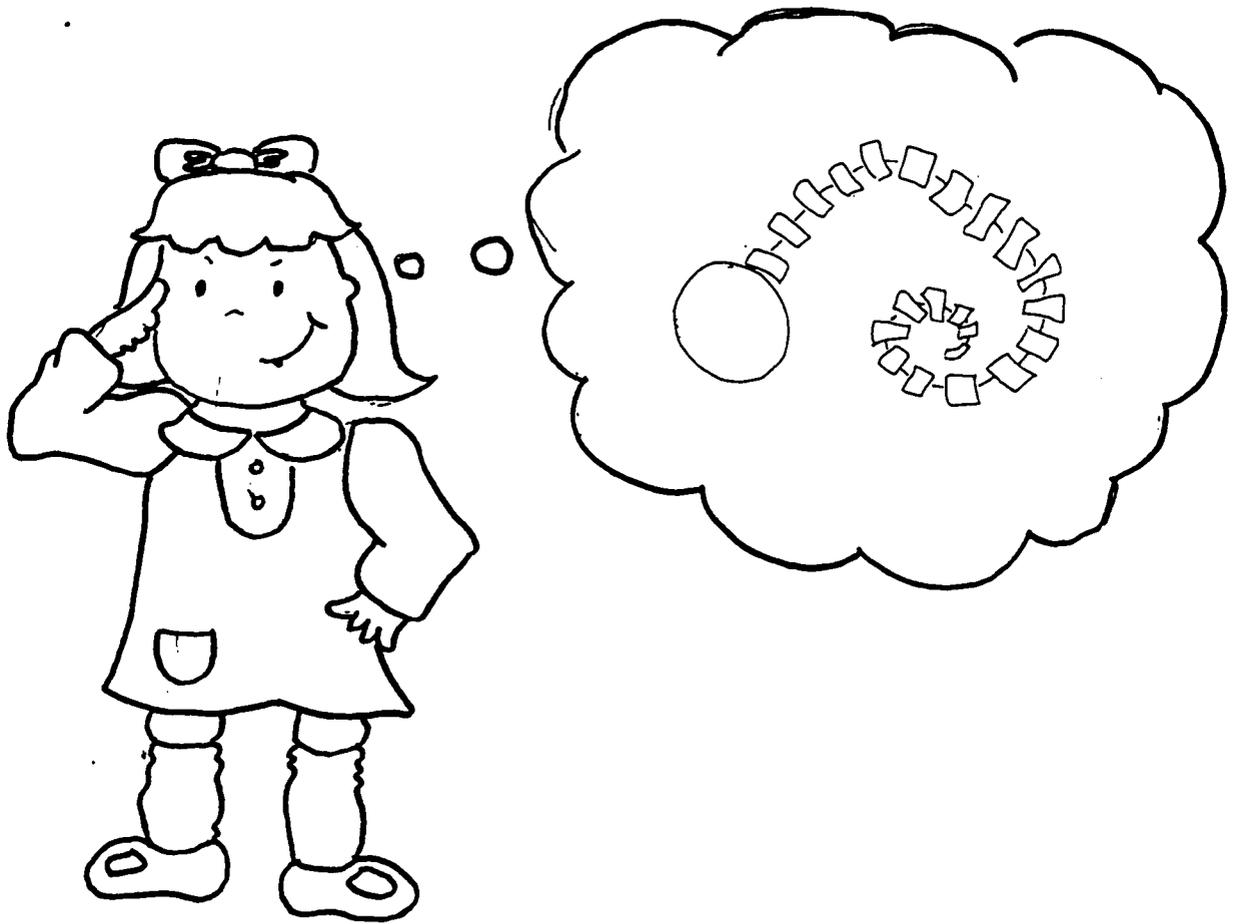
	Real Masculine	Real Feminine
/p/	<i>pastwn</i> /pɑsdun/ "truncheon" <i>papur</i> /pɑpɪr/ "paper" <i>plât</i> /plɑ:t/ "plate" <i>popty</i> /pɔpdi/ "oven" <i>pen- glin</i> /pɛn glɪ:n/ "knee" <i>pwrs</i> /purs/ "purse"	<i>pêl</i> /pɛ:l/ "ball" <i>pabell</i> /pabɛɫ/ "tent" <i>pedol</i> /pɛdɔl/ "horseshoe" <i>pais</i> /pɑis/ "petticoat" <i>planed</i> /plɑnɛd/ "planet" <i>poced</i> /pɔkɑd/ "poket"
/t/	<i>tŷ</i> /tɪ:/ "house" <i>tegan</i> /tɛɡɑn/ "toy" <i>to</i> /tɔ:/ "roof" <i>tecell</i> /tɛɡɑɫ/ "kettle" <i>tap</i> /tɑp/ "tap" <i>tân</i> /tɑ:n/ "fire"	<i>ton</i> /tɔn/ "wave" <i>teisen</i> /tɛisɑn/ "cake" <i>taten</i> /tɑtɑn/ "potato" <i>telyn</i> /tɛlɪn/ "harp" <i>trol</i> /trɔl/ "cart" <i>torth</i> /tɔrθ/ "loaf"
/k/	<i>clo</i> /klɔ:/ "lock" <i>cleddyf</i> /klɛðɪv/ "sword" <i>cetyn</i> /kɛtɪn/ "pipe" <i>crys</i> /krɪ:s/ "shirt" <i>cwch</i> /ku:x/ "boat" <i>caws</i> /kaʊs/ "cheese"	<i>coeden</i> /kɔɪdɑn/ "tree" <i>cadair</i> /kɑdɑr/ "chair" <i>cyllell</i> /kɛɫɑɫ/ "knife" <i>calon</i> /kɑlɔn/ "heart" <i>cadwyn</i> /kɑdɪn/ "necklace" <i>cloch</i> /klɔ:x/ "bell"
/b/	<i>blodyn</i> /blɔdɪn/ "flower" <i>bocs</i> /bɔks/ "box" <i>brwsh</i> /brʊʃ/ "brush" <i>barcut</i> /bɑrkɪd/ "kite" <i>bwrdd</i> /burð/ "table" <i>bath</i> /bɑθ/ "bath"	<i>bricsen</i> /brɪksɑn/ "brick" <i>bwyell</i> /buɪɑɫ/ "axe" <i>basged</i> /basɡɪɑd/ "basket" <i>blanced</i> /blɑnkɑd/ "blanket" <i>brechdan</i> /brɛχdɑn/ "sandwich" <i>breichled</i> /brɛɪχlɛd/ "bracelet"
/d/	<i>dis</i> /dɛɪs/ "die" <i>drwm</i> /drʊm/ "drum" <i>dant</i> /dɑnt/ "tooth" <i>drych</i> /drɪ:x/ "mirror" <i>deimwnt</i> /dɛɪ:mʊnd/ "diamond" <i>drws</i> /dru:s/ "door"	<i>daear</i> /dɛɪɑr/ "earth" <i>diod</i> /dɪ:ɔd/ "drink" <i>dysgl</i> /dɛsgɪl/ "dish" <i>dol</i> /dɔl/ "doll" <i>deilen</i> /dɛɪlɑn/ "leaf" <i>desg</i> /dɛsg/ "desk"
/g/	<i>gwely</i> /ɡwɛlɪ:/ "bed" <i>gun</i> /ɡʊn/ "gun" <i>goriad</i> /ɡɔrɪɑd/ "key" <i>goleudy</i> /ɡɔlɛɪdɪ/ "lightgouse" <i>gliw</i> /ɡlɪu/ "glue" <i>glaw</i> /ɡlɑ:ɪ/ "rain"	<i>gwasgod</i> /ɡwasɡɔd/ "waistcoat" <i>gwe</i> /ɡwɛ:/ "web" <i>gwialen</i> /ɡwɪɑlɛn/ "rod" <i>gwobr</i> /ɡwɔbr/ "prize" <i>gwisg</i> /ɡwɪ:sg/ "dress" <i>gardd</i> /ɡɑrð/ "garden"

/ʃ/	<i>llwyn</i> /ʎu:ɪn/ "bush" <i>llun</i> /ʎi:n/ "picture" <i>llythyr</i> /ʎəθɪr/ "letter" <i>lliaïn</i> /ʎi:an/ "cloth" <i>llyfr</i> /ʎivr/ "book" <i>llyn</i> /ʎi:n/ "lake"	<i>llong</i> /ʎɔŋ/ "ship" <i>llwy</i> /ʎu:i/ "spoon" <i>lleuad</i> /ʎe:ɪad/ "moon" <i>llaw</i> /ʎa:u/ "hand" <i>llif</i> /ʎi:/ "saw" <i>llawes</i> /ʎauas/ "sleeve"
/r/	<i>rheiddiadur</i> /rɛiðɪadur/ "radiator" <i>rhwbïwr</i> /rɔbɪur/ "eraser" <i>rhif</i> /rɪ:v/ "number" <i>rhosyn</i> /rɔsɪn/ "rose" <i>rhuban</i> /rɪban/ "ribbon" <i>rhew</i> /rɛ:u/ "ice"	<i>rhaw</i> /rɑ:u/ "shovel" <i>rhaff</i> /rɑ:f/ "rope" <i>rhestr</i> /rɛsdər/ "list" <i>rhwyf</i> /rɔi:v/ "oar" <i>rhwyd</i> /rɔi:d/ "net" <i>rhewgell</i> /rɛuɣɛɪ/ "freezer"
/m/	<i>mynydd</i> /mənið/ "mountain" <i>mat</i> /mat/ "mat" <i>map</i> /mɑp/ "map" <i>melon</i> /mɛlɔn/ "melon" <i>morthwyl</i> /murθul/ "hammer" <i>masïarw̄m</i> /məfrum/ "mushroom"	<i>matsïen</i> /matʃan/ "match" <i>maneg</i> /manag/ "glove" <i>moronen</i> /mɔrɔnan/ "carrot" <i>mellten</i> /mɛɪdan/ "bolt of lightning" <i>modrwy</i> /mɔdru:i/ "ring" <i>melin</i> /mɛlɪn/ "mill"
/n/	<i>nïonyn</i> /niɔnin/ "onion" <i>nenfwd</i> /nɛnvud/ "ceiling" <i>nodyn</i> /nɔðɪn/ "musical note" <i>Nadolig</i> /nadɔlɪg/ "Christmas" <i>napcyn</i> /napkin/ "napkin" <i>niwl</i> /niul/ "fog"	<i>neges</i> /negas/ "shopping" <i>nant</i> /nant/ "brook" <i>neuadd</i> /nɛi:að/ "hall" <i>nyten</i> /nɛtan/ "nut (& bolt)" <i>nofel</i> /nɔval/ "novel" <i>nodwydd</i> /nɔduið/ "needle"
/f/	<i>ffrwyth</i> /fru:θ/ "fruit" <i>ffril</i> /fri:l/ "frill" <i>ffôn</i> /fɔ:n/ "phone" <i>fflat</i> /flat/ "flat" <i>ffotograff</i> /fɔtɔgraf/ "photograph" <i>ffisig</i> /fisɪg/ "medicine"	<i>ffidil</i> /fidil/ "ffiddle" <i>ffliwt</i> /fliut/ "flute" <i>ffrog</i> /frɔg/ "frock" <i>fffenest</i> /fenasd/ "window" <i>fflag</i> /flag/ "flag" <i>fforc</i> /fɔrk/ "fork"
vowel-initial	<i>enw</i> /enu/ "name" <i>ysbyty</i> /əsbəti/ "hospital" <i>asgwrn</i> /asgurn/ "bone" <i>adeilad</i> /adeilad/ "building" <i>w̄y</i> /u:i/ "egg" <i>inc</i> /ɪnk/ "ink"	<i>olwyn</i> /ɔluin/ "wheel" <i>ysgol</i> /əsdɔl/ "ladder" <i>awyren</i> /auəren/ "aeroplane" <i>esgid</i> /ɛsgid/ "shoe" <i>weïren</i> /uɛiran/ "wire" <i>wats</i> /uatʃ/ "watch"

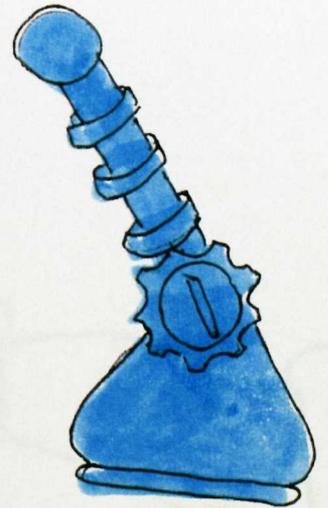
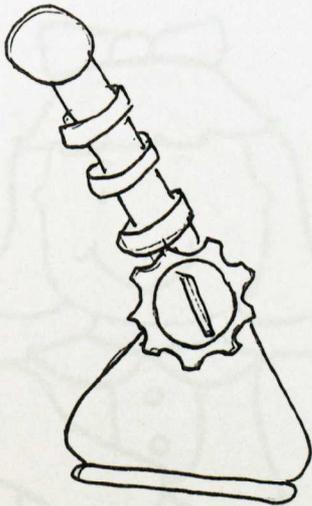
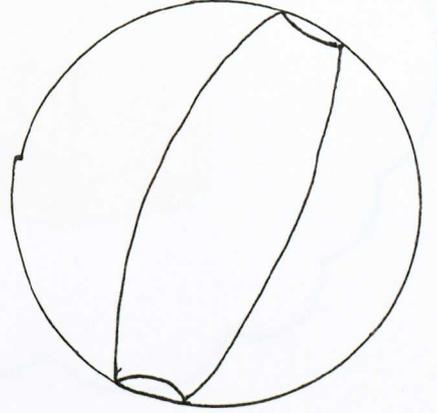
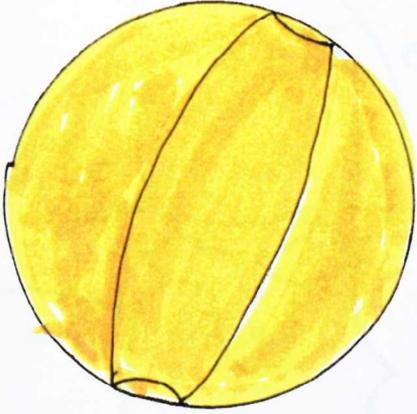
Word-Initial Phoneme	Nonsense Masculine	Nonsense Feminine
/p/	<i>pibot</i> /pibɔt/ <i>palan</i> /palan/ <i>peglan</i> /peglan/ <i>polet</i> /pɔlet/ <i>pwfr</i> /puvər/ <i>pesel</i> /pesel/	<i>pefryn</i> /pefrin/ <i>pair</i> /pair/ <i>piban</i> /piban/ <i>pigell</i> /piget/ <i>pogair</i> /pɔgair/ <i>pall</i> /paʔ/
/t/	<i>tesol</i> /tesɔl/ <i>tarin</i> /tarin/ <i>torel</i> /tɔrel/ <i>taber</i> /taber/ <i>twnsydd</i> /tunsið/ <i>twrin</i> /turin/	<i>tolfa</i> /tɔlva/ <i>torn</i> /tɔrn/ <i>twnin</i> /tunin/ <i>twrdd</i> /turð/ <i>tigail</i> /tigail/ <i>tabar</i> /tabar/
/k/	<i>cwgel</i> /kugel/ <i>celeg</i> /keleg/ <i>calur</i> /kalir/ <i>cellig</i> /ketig/ <i>cabir</i> /kabir/ <i>cadan</i> /kadan/	<i>cerin</i> /kerin/ <i>coglan</i> /kɔglan/ <i>caig</i> /kaig/ <i>cwrlith</i> /kurliθ/ <i>canad</i> /kanad/ <i>cinw</i> /kinu/
/b/	<i>batail</i> /batail/ <i>bâl</i> /ba:l/ <i>banw</i> /banu/ <i>baran</i> /baran/ <i>belon</i> /belɔn/ <i>barth</i> /barθ/	<i>boled</i> /bɔled/ <i>bilwr</i> /bilur/ <i>bligior</i> /bligior/ <i>belem</i> /belem/ <i>bwll</i> /buʔ/ <i>baniar</i> /baniar/
/d/	<i>delan</i> /delan/ <i>dimyn</i> /dimin/ <i>digw</i> /digu/ <i>donyn</i> /dɔnin/ <i>daig</i> /daig/ <i>dwlydd</i> /dulið/	<i>darrig</i> /darig/ <i>digan</i> /digan/ <i>dogan</i> /dɔgan/ <i>dabir</i> /dabir/ <i>didan</i> /didan/ <i>daer</i> /dair/
/g/	<i>gefalch</i> /gevalx/ <i>gollt</i> /gɔ:ʔd/ <i>gelor</i> /gelɔr/ <i>gisarn</i> /gisarn/ <i>gele</i> /gele/ <i>garan</i> /garan/	<i>graidd</i> /graið/ <i>galas</i> /galas/ <i>gared</i> /gared/ <i>gwibell</i> /guibeʔ/ <i>gelan</i> /gelan/ <i>gabil</i> /gabil/
/ʎ/	<i>llesarn</i> /ʎesarn/ <i>llaer</i> /ʎaer/ <i>lleban</i> /ʎeban/ <i>llaib</i> /ʎaib/ <i>llabi</i> /ʎabi/ <i>llerin</i> /ʎerin/	<i>lliber</i> /ʎiber/ <i>llwr</i> /ʎur/ <i>llesem</i> /ʎesam/ <i>llaber</i> /ʎaber/ <i>llîn</i> /ʎin/ <i>llain</i> /ʎain/

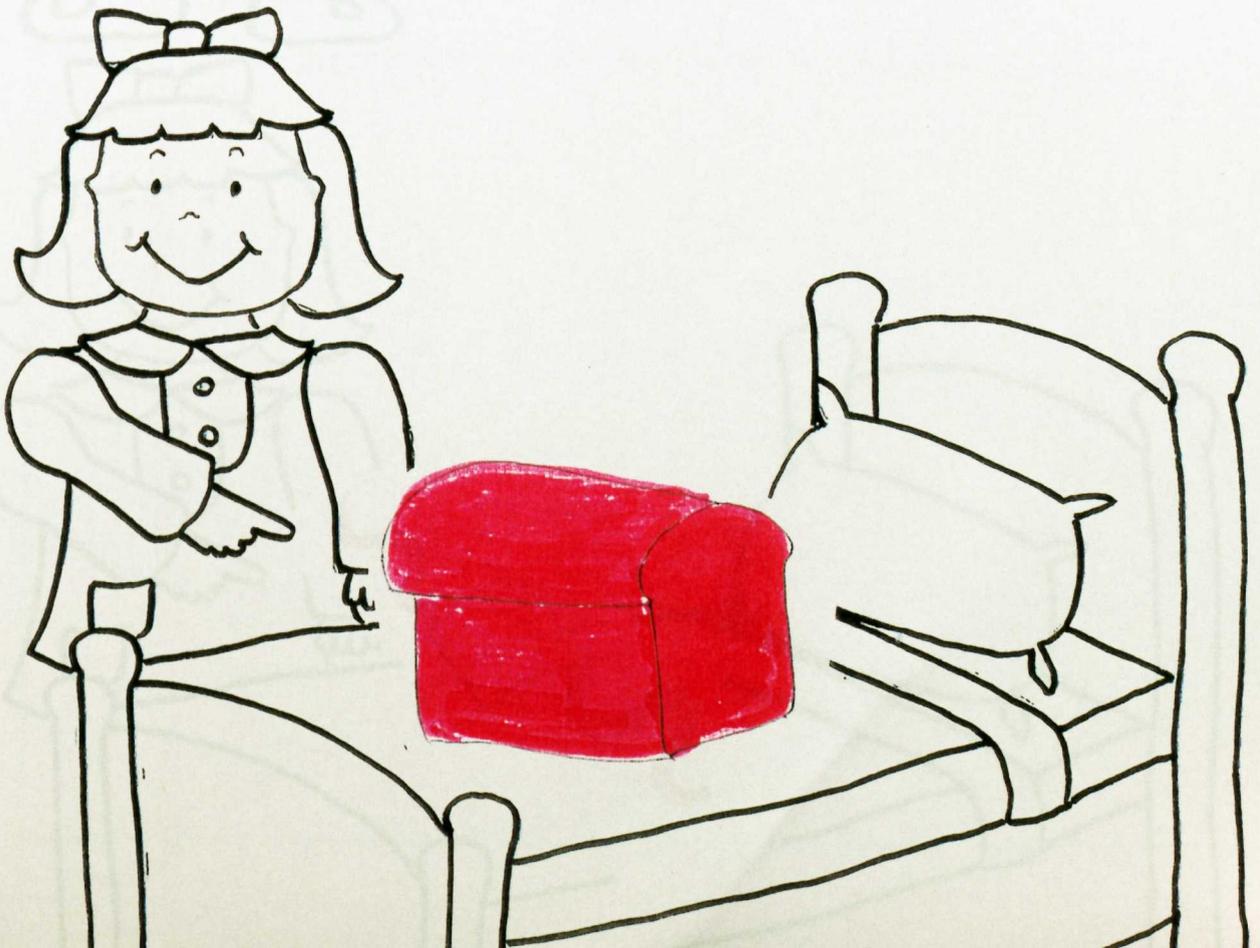
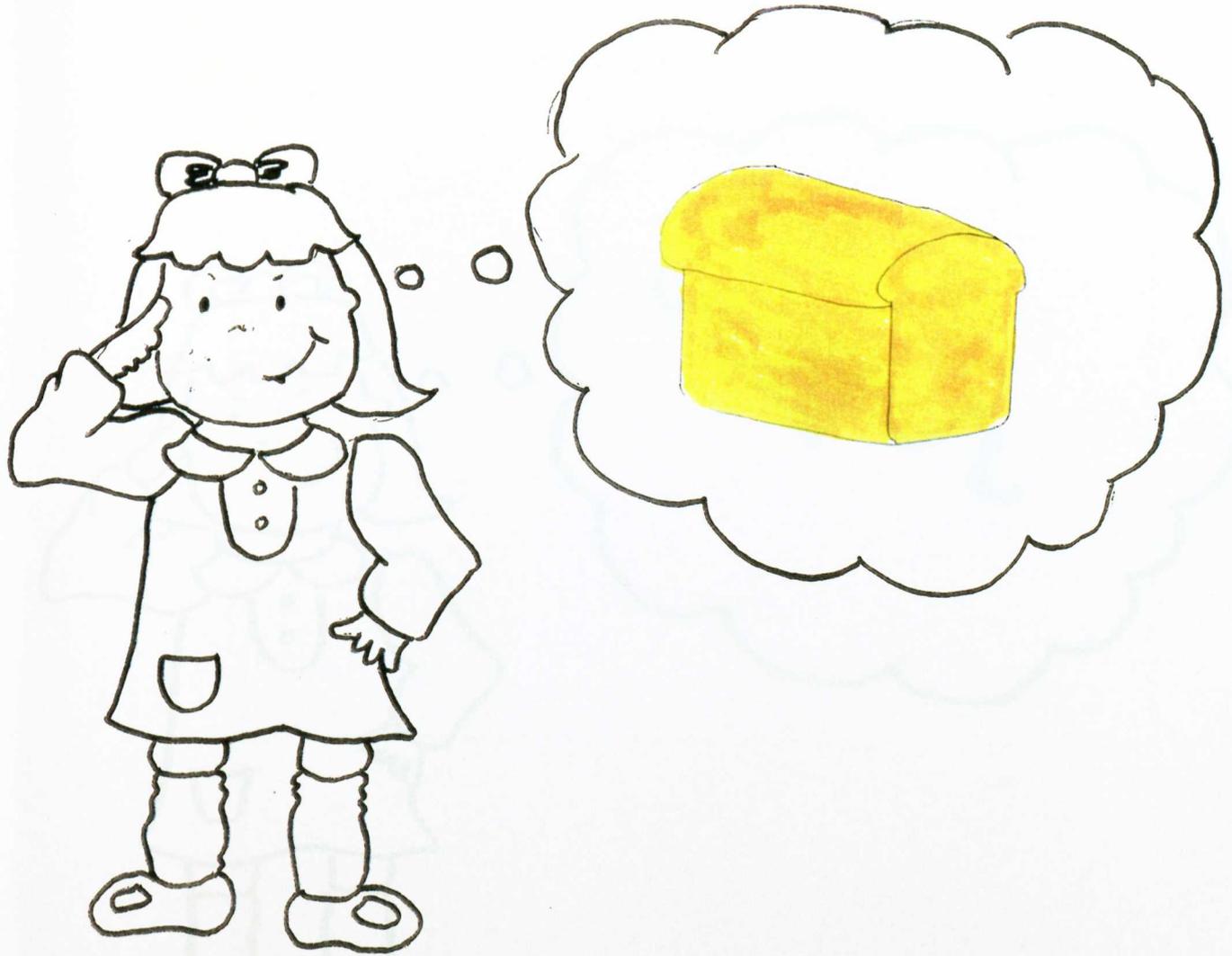
/r/	<i>rheng</i> /rɛŋ/ <i>rhibin</i> /rɪbɪn/ <i>rhawd</i> /rɔud/ <i>rhaidd</i> /rɔɪθ/ <i>rhath</i> /rɔ:θ/ <i>rheinws</i> /rɛɪnus/	<i>rhîb</i> /rɪ:b/ <i>rhwgnel</i> /rɔgnɛl/ <i>rhodl</i> /rɔdɔl/ <i>rhaig</i> /rɔɪg/ <i>rhigan</i> /rɪgan/ <i>rhaith</i> /rɔɪθ/
/m/	<i>melan</i> /mɛlan/ <i>merin</i> /mɛrɪn/ <i>mafur</i> /mavɪr/ <i>mursan</i> /mɪrsan/ <i>magl</i> /magəl/ <i>mant</i> /mant/	<i>medan</i> /mɛdan/ <i>meigwn</i> /mɛɪgun/ <i>maben</i> /mabɛn/ <i>mallt</i> /ma:tɪd/ <i>meran</i> /mɛran/ <i>meigel</i> /mɛɪgɛl/
/n/	<i>nwl</i> /nul/ <i>nalwr</i> /nalur/ <i>nochel</i> /nɔxɛl/ <i>nigol</i> /nɪgɔl/ <i>nilan</i> /nɪlan/ <i>nelfa</i> /nɛlva/	<i>noler</i> /nɔlɛr/ <i>nibot</i> /nɪbɔt/ <i>neddin</i> /nɛðɪn/ <i>nipyn</i> /nɪpɪn/ <i>nagur</i> /nagur/ <i>naer</i> /na:ɪr/
/f/	<i>ffagol</i> /fagɔl/ <i>ffwlgan</i> /fulgan/ <i>ffenydd</i> /fɛnið/ <i>ffalor</i> /falɔr/ <i>ffola</i> /fɔla/ <i>ffâl</i> /fɔ:l/	<i>ffagor</i> /fagɔr/ <i>ffolyn</i> /fɔlɪn/ <i>ffaer</i> /fa:ɪr/ <i>ffolydd</i> /fɔlɪð/ <i>ffrithin</i> /frɪθɪn/ <i>ffïell</i> /fɪ:ɛɪ/
Vowel- initial	<i>ysgwn</i> /əsgun/ <i>walar</i> /ualar/ <i>afan</i> /avan/ <i>ianti</i> /iantɪ/ <i>oblwr</i> /ɔblur/ <i>erwy</i> /ɛruɪ/	<i>olydd</i> /ɔlɪð/ <i>adair</i> /adaɪr/ <i>erydd</i> /ɛrɪð/ <i>waner</i> /uanar/ <i>ysgell</i> /əsgɛɪ/ <i>ilwr</i> /ɪlur/

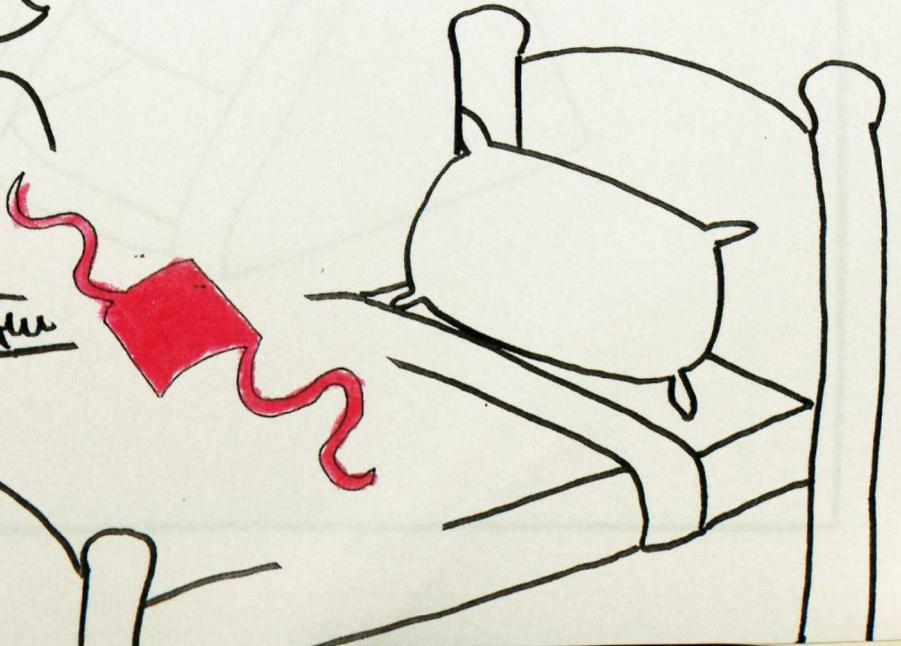
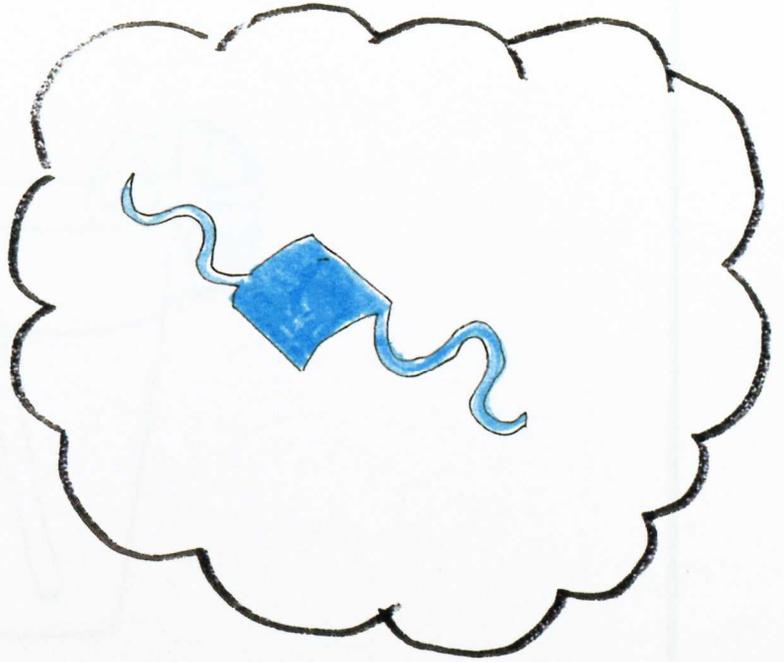


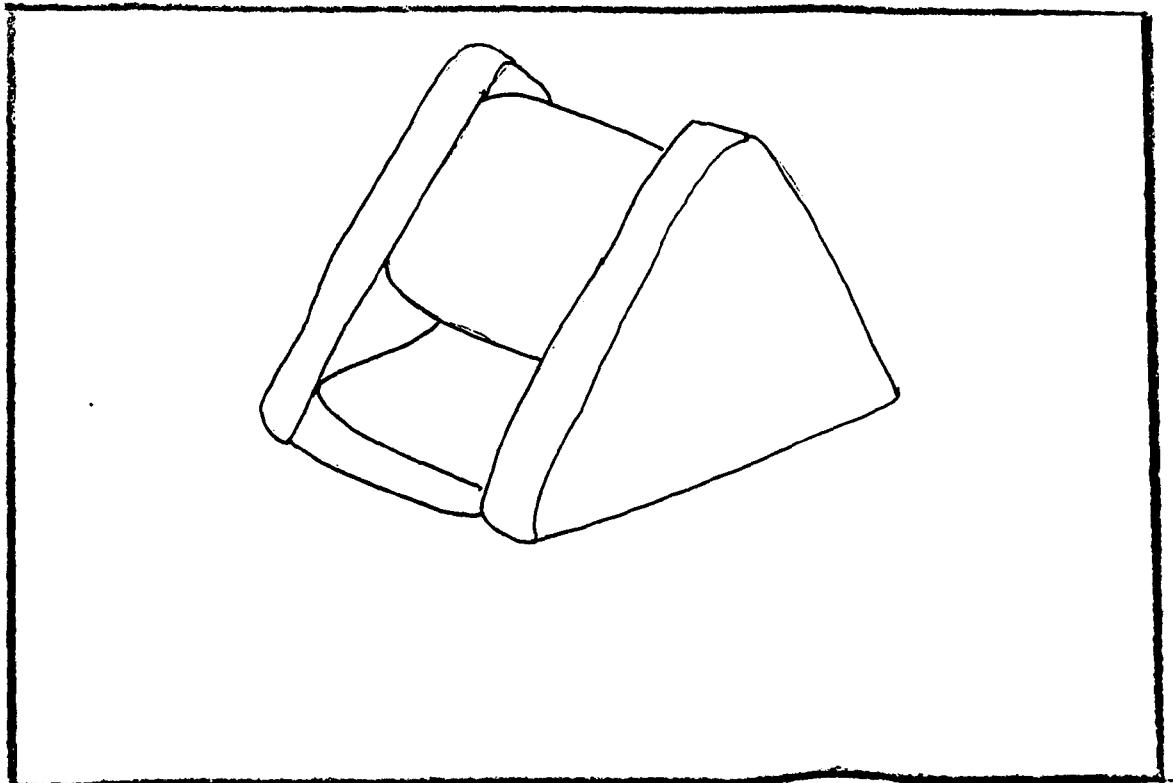
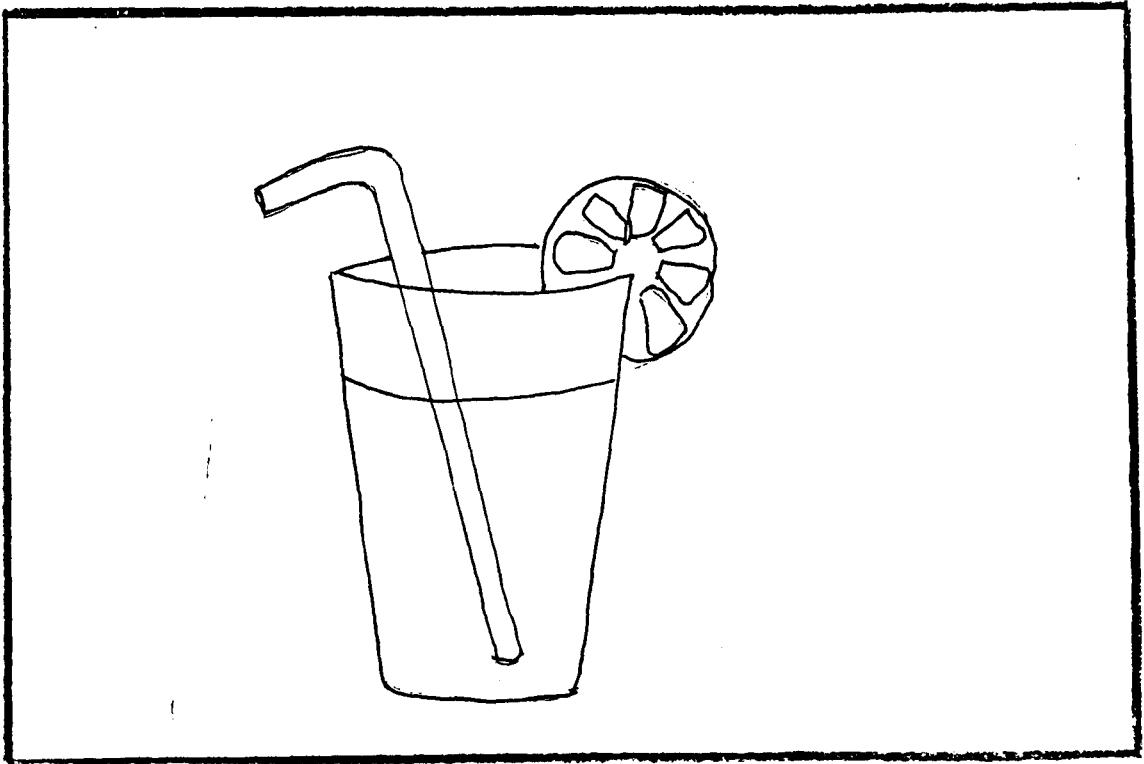


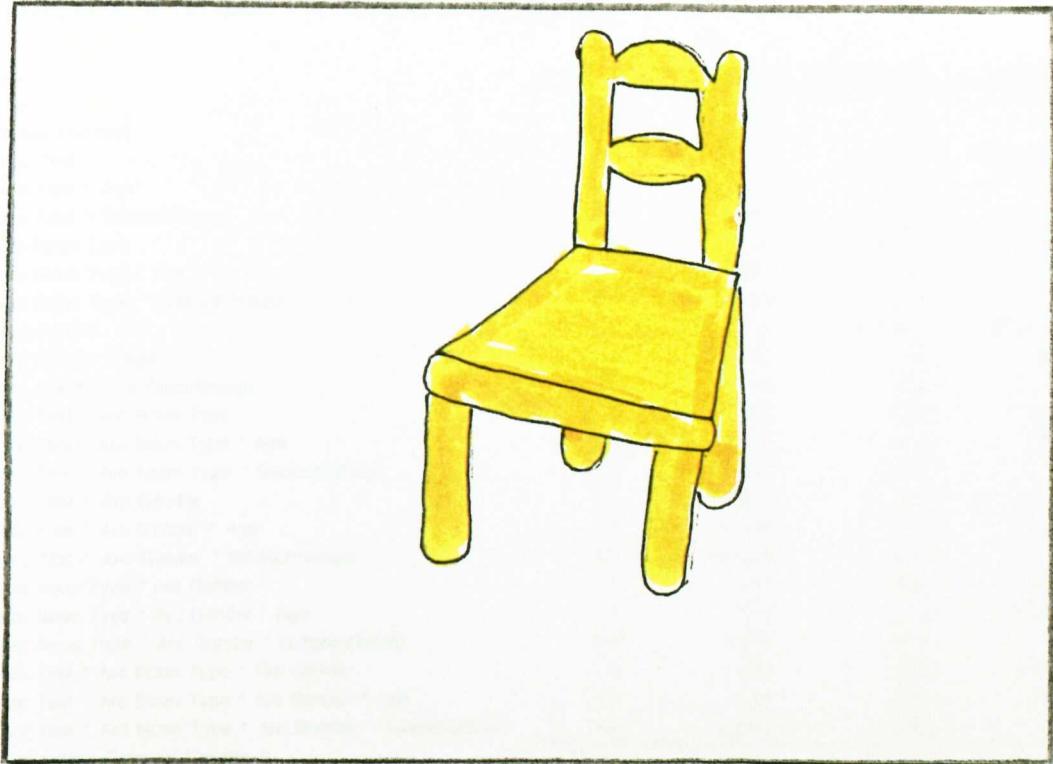












Set 1 analysis: Adults in C222m

Result

Age

Gender

Sex Test

Sex Test 2

Sex Test 3

Sex Test 4

Sex Test 5

Sex Test 6

Sex Test 7

Sex Test 8

Sex Test 9

Sex Test 10

Sex Test 11

Sex Test 12

Sex Test 13

Sex Test 14

Sex Test 15

Sex Test 16

Sex Test 17

Sex Test 18

Sex Test 19

Sex Test 20

Sex Test 21

Sex Test 22

Sex Test 23

Sex Test 24

Sex Test 25

Sex Test 26

Sex Test 27

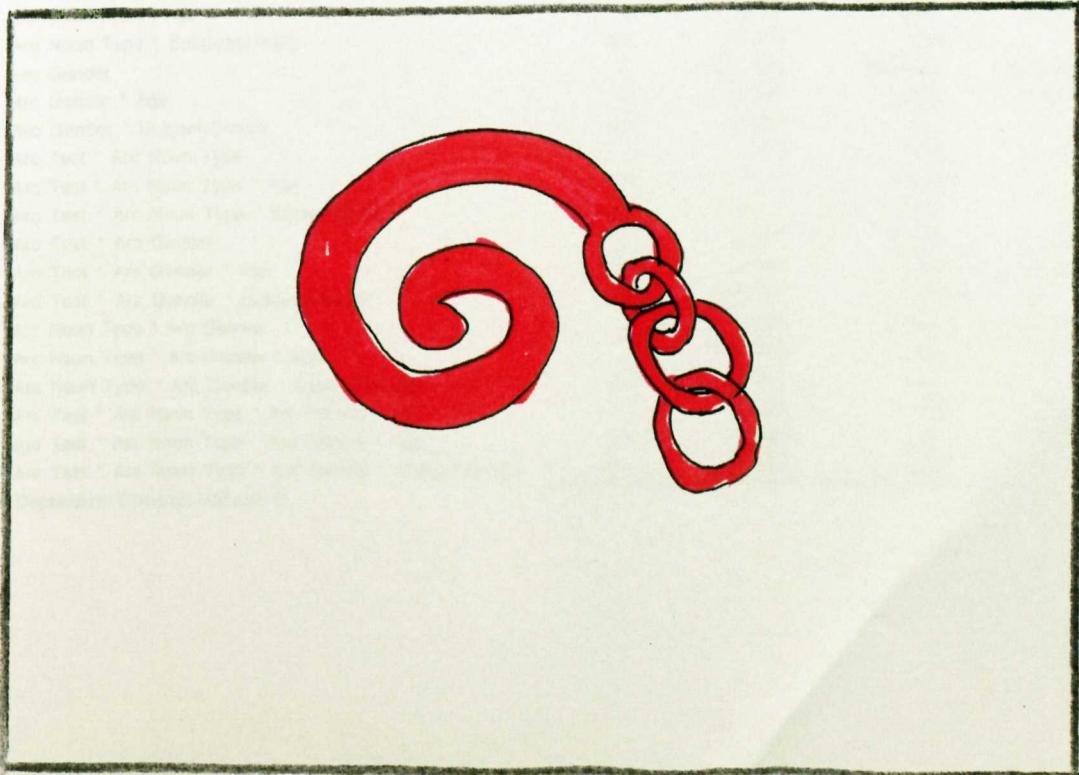
Sex Test 28

Sex Test 29

Sex Test 30

Sex Test 31

Sex Test 32



Set 1 analysis: Children

* Dependent variable 1 = Arcsine scores for all.

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	3	.018	.006	.049	.9854
Subject(Group)	33	4.096	.124		
Arc Test	5	1.777	.355	9.273	.0001
Arc Test * Age	15	.657	.044	1.144	.3217
Arc Test * Subject(Group)	165	6.323	.038		
Arc Noun Type	1	2.637	2.637	22.865	.0001
Arc Noun Type * Age	3	.336	.112	.972	.4178
Arc Noun Type * Subject(Group)	33	3.806	.115		
Arc Gender	1	310.603	310.603	874.411	.0001
Arc Gender * Age	3	3.997	1.332	3.751	.0201
Arc Gender * Subject(Group)	33	11.722	.355		
Arc Test * Arc Noun Type	5	.432	.086	2.504	.0324
Arc Test * Arc Noun Type * Age	15	.391	.026	.756	.7245
Arc Test * Arc Noun Type * Subject(Group)	165	5.690	.034		
Arc Test * Arc Gender	5	6.948	1.390	9.712	.0001
Arc Test * Arc Gender * Age	15	5.428	.362	2.529	.0021
Arc Test * Arc Gender * Subject(Group)	165	23.606	.143		
Arc Noun Type * Arc Gender	1	.904	.904	15.512	.0004
Arc Noun Type * Arc Gender * Age	3	.343	.114	1.963	.1388
Arc Noun Type * Arc Gender * Subject(Group)	33	1.922	.058		
Arc Test * Arc Noun Type * Arc Gender	5	1.038	.208	4.315	.0010
Arc Test * Arc Noun Type * Arc Gender * Age	15	.682	.045	.944	.5166
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	165	7.939	.048		

Dependent: Compact Variable 2

Set 1 analysis: Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	4	3.432	.858	4.173	.0058
Subject(Group)	46	9.459	.206		
Arc Test	5	3.168	.634	11.385	.0001
Arc Test * Age	20	1.152	.058	1.035	.4219
Arc Test * Subject(Group)	230	12.799	.056		
Arc Noun Type	1	8.175	8.175	54.379	.0001
Arc Noun Type * Age	4	5.212	1.303	8.666	.0001
Arc Noun Type * Subject(Group)	46	6.916	.150		
Arc Gender	1	337.682	337.682	1087.229	.0001
Arc Gender * Age	4	26.538	6.634	21.361	.0001
Arc Gender * Subject(Group)	46	14.287	.311		
Arc Test * Arc Noun Type	5	.378	.076	1.436	.2120
Arc Test * Arc Noun Type * Age	20	.714	.036	.677	.8470
Arc Test * Arc Noun Type * Subject(Group)	230	12.119	.053		
Arc Test * Arc Gender	5	14.175	2.835	17.956	.0001
Arc Test * Arc Gender * Age	20	9.352	.468	2.962	.0001
Arc Test * Arc Gender * Subject(Group)	230	36.312	.158		
Arc Noun Type * Arc Gender	1	2.108	2.108	20.628	.0001
Arc Noun Type * Arc Gender * Age	4	.973	.243	2.381	.0653
Arc Noun Type * Arc Gender * Subject(Group)	46	4.700	.102		
Arc Test * Arc Noun Type * Arc Gender	5	2.395	.479	8.243	.0001
Arc Test * Arc Noun Type * Arc Gender * Age	20	1.623	.081	1.396	.1252
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	230	13.365	.058		

Dependent: Compact Variable 2

Set 1 analysis: Adults

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	2	.421	.210	.468	.6380
Subject(Group)	11	4.942	.449		
Arc Test	5	2.412	.482	4.643	.0013
Arc Test * Age	10	.762	.076	.734	.6895
Arc Test * Subject(Group)	55	5.714	.104		
Arc Noun Type	1	13.018	13.018	48.703	.0001
Arc Noun Type * Age	2	.169	.085	.316	.7352
Arc Noun Type * Subject(Group)	11	2.940	.267		
Arc Gender	1	29.156	29.156	161.996	.0001
Arc Gender * Age	2	.585	.293	1.626	.2406
Arc Gender * Subject(Group)	11	1.980	.180		
Arc Test * Arc Noun Type	5	.249	.050	.485	.7862
Arc Test * Arc Noun Type * Age	10	.771	.077	.750	.6750
Arc Test * Arc Noun Type * Subject(Group)	55	5.657	.103		
Arc Test * Arc Gender	5	14.390	2.878	15.705	.0001
Arc Test * Arc Gender * Age	10	2.627	.263	1.434	.1904
Arc Test * Arc Gender * Subject(Group)	55	10.079	.183		
Arc Noun Type * Arc Gender	1	2.177	2.177	11.062	.0068
Arc Noun Type * Arc Gender * Age	2	.613	.306	1.557	.2538
Arc Noun Type * Arc Gender * Subject(Group)	11	2.165	.197		
Arc Test * Arc Noun Type * Arc Gender	5	2.828	.566	6.822	.0001
Arc Test * Arc Noun Type * Arc Gender * Age	10	.866	.087	1.045	.4199
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	55	4.560	.083		

Dependent: Compact Variable 2

Set 2 analysis: Adults

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	2	1.116	.558	.926	.4251
Subject(Group)	11	6.630	.603		
Arc Test	3	1.743	.581	4.430	.0101
Arc Test * Age	6	.238	.040	.303	.9310
Arc Test * Subject(Group)	33	4.328	.131		
Arc Noun Type	1	2.559	2.559	23.311	.0005
Arc Noun Type * Age	2	.008	.004	.036	.9647
Arc Noun Type * Subject(Group)	11	1.208	.110		
Arc Gender	1	10.756	10.756	35.060	.0001
Arc Gender * Age	2	.572	.286	.933	.4224
Arc Gender * Subject(Group)	11	3.375	.307		
Arc Test * Arc Noun Type	3	1.154	.385	3.397	.0291
Arc Test * Arc Noun Type * Age	6	.437	.073	.644	.6942
Arc Test * Arc Noun Type * Subject(Group)	33	3.735	.113		
Arc Test * Arc Gender	3	17.132	5.711	33.205	.0001
Arc Test * Arc Gender * Age	6	.993	.166	.963	.4654
Arc Test * Arc Gender * Subject(Group)	33	5.675	.172		
Arc Noun Type * Arc Gender	1	.190	.190	.713	.4163
Arc Noun Type * Arc Gender * Age	2	.441	.221	.828	.4624
Arc Noun Type * Arc Gender * Subject(Group)	11	2.930	.266		
Arc Test * Arc Noun Type * Arc Gender	3	7.100	2.367	13.478	.0001
Arc Test * Arc Noun Type * Arc Gender * Age	6	.355	.059	.336	.9126
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	33	5.795	.176		

Dependent: Compact Variable 2

* Dependent variable 2 = Arcsin transformations for all.

Set 2 analysis: Children

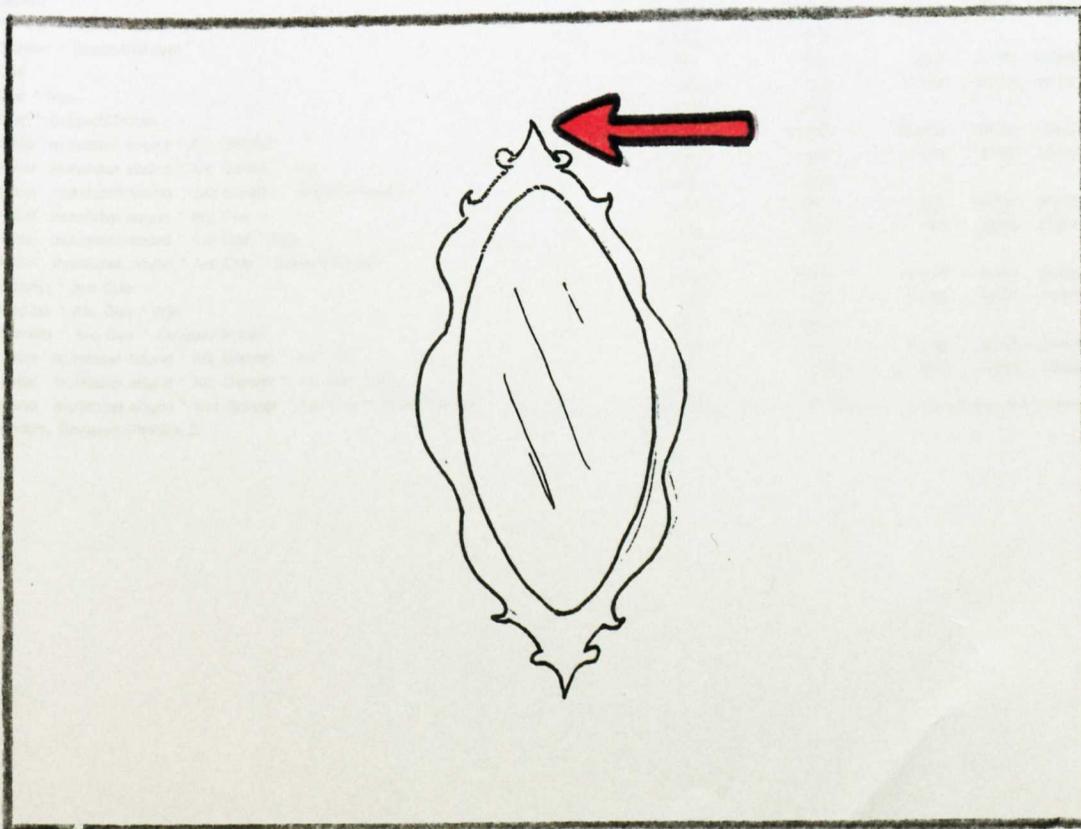
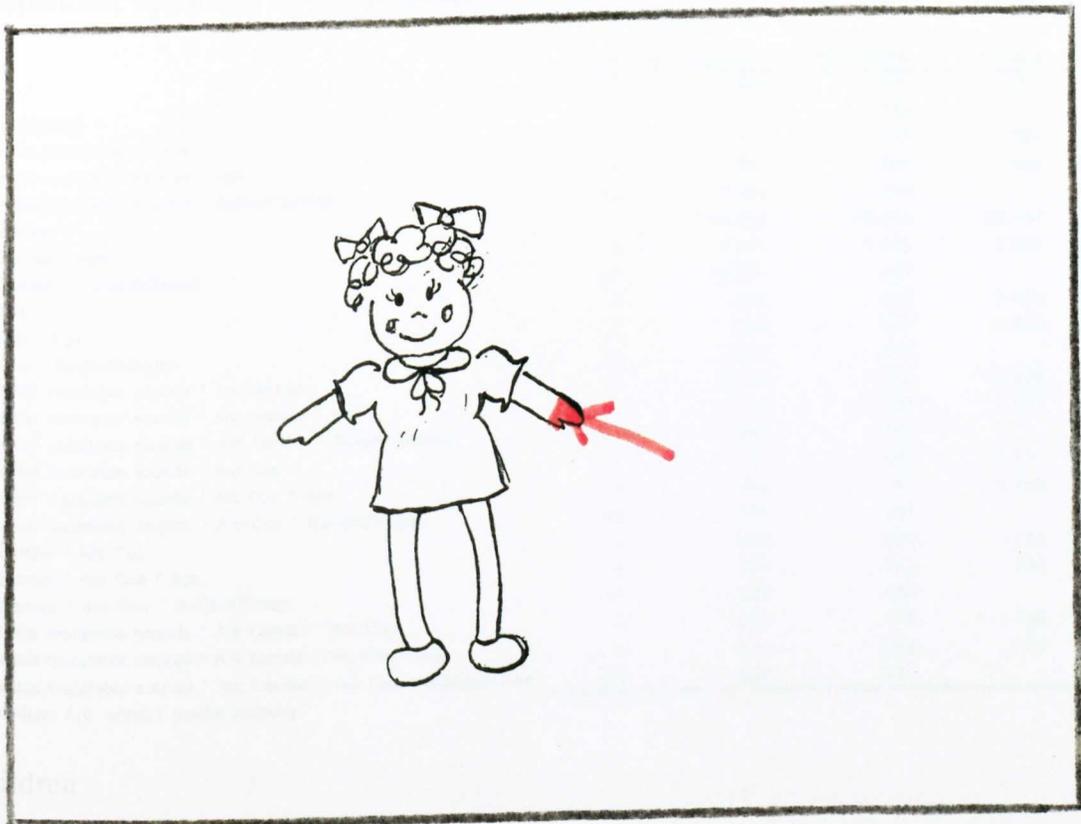
Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	3	.279	.093	.510	.6783
Subject(Group)	33	6.030	.183		
Arc Test	3	1.228	.409	4.384	.0061
Arc Test * Age	9	.572	.064	.681	.7248
Arc Test * Subject(Group)	99	9.242	.093		
Arc Noun Type	1	3.606	3.606	39.296	.0001
Arc Noun Type * Age	3	.153	.051	.555	.6487
Arc Noun Type * Subject(Group)	33	3.028	.092		
Arc Gender	1	200.274	200.274	857.251	.0001
Arc Gender * Age	3	2.045	.682	2.918	.0486
Arc Gender * Subject(Group)	33	7.710	.234		
Arc Test * Arc Noun Type	3	.391	.130	1.787	.1545
Arc Test * Arc Noun Type * Age	9	.926	.103	1.411	.1936
Arc Test * Arc Noun Type * Subject(Group)	99	7.220	.073		
Arc Test * Arc Gender	3	4.816	1.605	12.368	.0001
Arc Test * Arc Gender * Age	9	5.243	.583	4.488	.0001
Arc Test * Arc Gender * Subject(Group)	99	12.850	.130		
Arc Noun Type * Arc Gender	1	2.476	2.476	32.279	.0001
Arc Noun Type * Arc Gender * Age	3	.141	.047	.611	.6125
Arc Noun Type * Arc Gender * Subject(Group)	33	2.531	.077		
Arc Test * Arc Noun Type * Arc Gender	3	1.205	.402	4.930	.0031
Arc Test * Arc Noun Type * Arc Gender * Age	9	.582	.065	.793	.6231
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	99	8.068	.081		

Dependent: Compact Variable 2

Set 2 analysis: Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age Group	4	3.177	.794	2.652	.0449
Subject(Group)	46	13.776	.299		
Arc Test	3	2.271	.757	7.565	.0001
Arc Test * Age Group	12	.983	.082	.819	.6311
Arc Test * Subject(Group)	138	13.809	.100		
Arc Noun Type	1	5.590	5.590	60.592	.0001
Arc Noun Type * Age Group	4	.282	.070	.763	.5546
Arc Noun Type * Subject(Group)	46	4.244	.092		
Arc Gender	1	206.873	206.873	816.366	.0001
Arc Gender * Age Group	4	23.367	5.842	23.053	.0001
Arc Gender * Subject(Group)	46	11.657	.253		
Arc Test * Arc Noun Type	3	.291	.097	1.177	.3210
Arc Test * Arc Noun Type * Age Group	12	2.155	.180	2.175	.0160
Arc Test * Arc Noun Type * Subject(Group)	138	11.393	.083		
Arc Test * Arc Gender	3	12.287	4.096	28.956	.0001
Arc Test * Arc Gender * Age Group	12	10.965	.914	6.460	.0001
Arc Test * Arc Gender * Subject(Group)	138	19.519	.141		
Arc Noun Type * Arc Gender	1	1.728	1.728	13.471	.0006
Arc Noun Type * Arc Gender * Age Group	4	1.505	.376	2.933	.0305
Arc Noun Type * Arc Gender * Subject(Group)	46	5.902	.128		
Arc Test * Arc Noun Type * Arc Gender	3	1.390	.463	4.497	.0048
Arc Test * Arc Noun Type * Arc Gender * Age Group	12	6.866	.572	5.554	.0001
Arc Test * Arc Noun Type * Arc Gender * Subject(Group)	138	14.217	.103		

Dependent: Compact Variable 2



Study 3: Adults

* Dependent variable = Arcsin proportion scores

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	2	.380	.190	1.158	.3498
Subject(Group)	11	1.807	.164		
Arc initial mutatable sounds	2	.076	.038	.351	.7080
Arc initial mutatable sounds * Age	4	.364	.091	.842	.5137
Arc initial mutatable sounds * Subject(Group)	22	2.381	.108		
Arc Gender	1	36.056	36.056	36.177	.0001
Arc Gender * Age	2	6.491	3.245	3.256	.0775
Arc Gender * Subject(Group)	11	10.963	.997		
Arc Cue	1	.444	.444	3.750	.0789
Arc Cue * Age	2	.909	.454	3.840	.0543
Arc Cue * Subject(Group)	11	1.301	.118		
Arc initial mutatable sounds * Arc Gender	2	2.189	1.095	8.929	.0014
Arc initial mutatable sounds * Arc Gender * Age	4	.516	.129	1.051	.4037
Arc initial mutatable sounds * Arc Gender * Subject(Group)	22	2.697	.123		
Arc initial mutatable sounds * Arc Cue	2	.181	.091	1.111	.3470
Arc initial mutatable sounds * Arc Cue * Age	4	.569	.142	1.745	.1762
Arc initial mutatable sounds * Arc Cue * Subject(Group)	22	1.793	.081		
Arc Gender * Arc Cue	1	.008	.008	.155	.7010
Arc Gender * Arc Cue * Age	2	.017	.009	.163	.8514
Arc Gender * Arc Cue * Subject(Group)	11	.582	.053		
Arc initial mutatable sounds * Arc Gender * Arc Cue	2	.319	.159	1.756	.1961
Arc initial mutatable sounds * Arc Gender * Arc Cue * Age	4	.117	.029	.322	.8599
Arc initial mutatable sounds * Arc Gender * Arc Cue * Subject(Group)	22	1.998	.091		

Dependent: Arc correct gender marking

Children

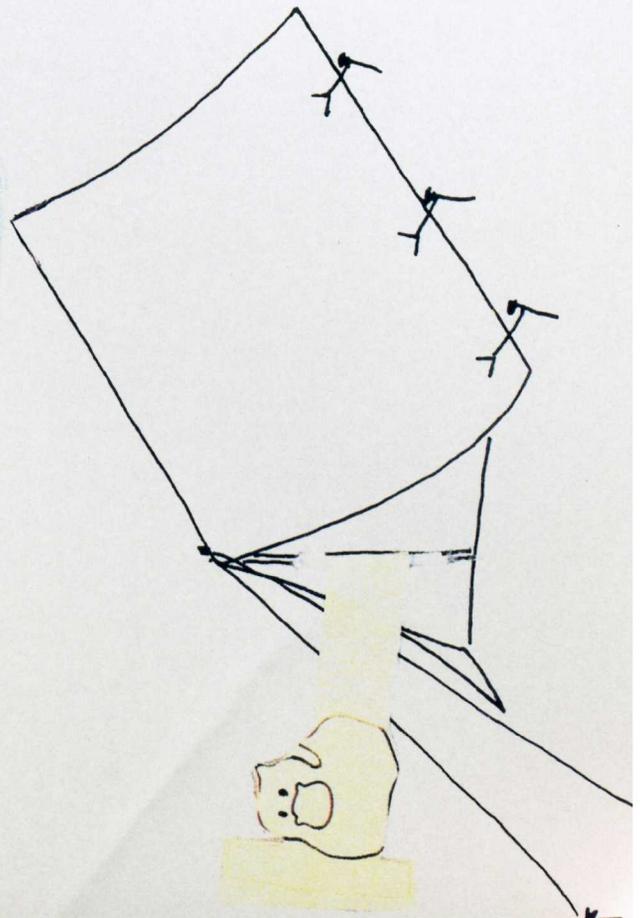
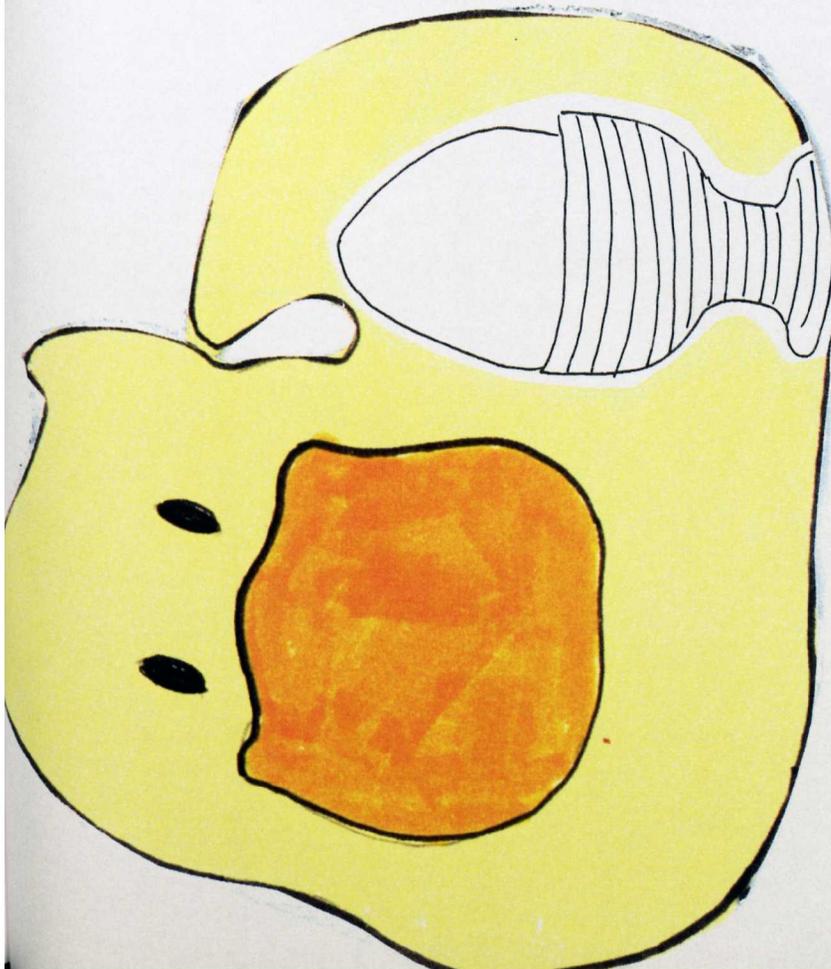
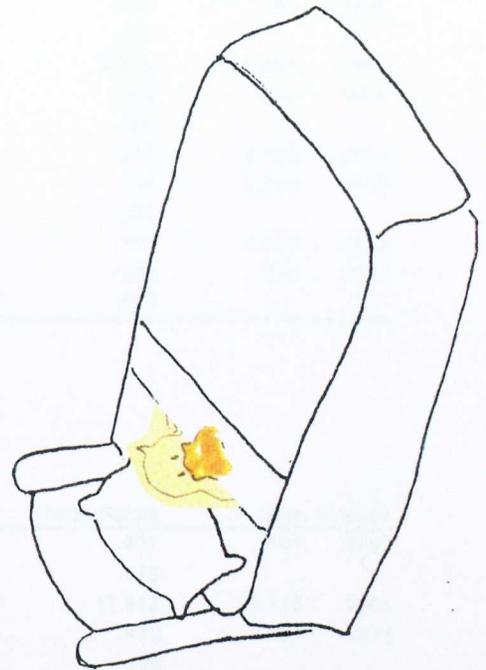
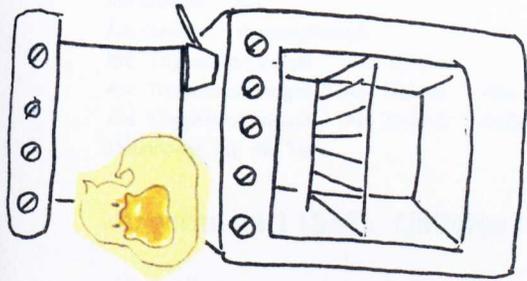
Source	df	Sum of Squares	Mean Square	F-Value	P-Value	G-G	H-F
Age	3	2.078	.693	2.595	.1009		
Subject(Group)	12	3.203	.267				
Arc Initial mutatable sound	2	1.985	.992	4.766	.0181	.0251	.0181
Arc Initial mutatable sound * Age	6	1.109	.185	.887	.5193	.5081	.5193
Arc Initial mutatable sound * Subject(Group)	24	4.998	.208				
Arc Gender	1	18.591	18.591	44.756	.0001	.0001	.0001
Arc Gender * Age	3	3.317	1.106	2.662	.0955	.0955	.0955
Arc Gender * Subject(Group)	12	4.985	.415				
Arc Cue	1	.001	.001	.011	.9196	.9196	.9196
Arc Cue * Age	3	.299	.100	1.664	.2272	.2272	.2272
Arc Cue * Subject(Group)	12	.717	.060				
Arc Initial mutatable sound * Arc Gender	2	7.464	3.732	13.085	.0001	.0005	.0001
Arc Initial mutatable sound * Arc Gender * Age	6	1.932	.322	1.129	.3757	.3775	.3757
Arc Initial mutatable sound * Arc Gender * Subject(Group)	24	6.845	.285				
Arc Initial mutatable sound * Arc Cue	2	.001	.001	.008	.9924	.9643	.9866
Arc Initial mutatable sound * Arc Cue * Age	6	.343	.057	.760	.6079	.5627	.5932
Arc Initial mutatable sound * Arc Cue * Subject(Group)	24	1.806	.075				
Arc Gender * Arc Cue	1	.068	.068	1.147	.3052	.3052	.3052
Arc Gender * Arc Cue * Age	3	.179	.060	1.016	.4197	.4197	.4197
Arc Gender * Arc Cue * Subject(Group)	12	.706	.059				
Arc Initial mutatable sound * Arc Gender * Arc Cue	2	.202	.101	1.748	.1955	.2047	.1955
Arc Initial mutatable sound * Arc Gender * Arc Cue * Age	6	.319	.053	.920	.4982	.4838	.4982
Arc Initial mutatable sound * Arc Gender * Arc Cue * Subject(Group)	24	1.387	.058				

Dependent: Compact Variable 2

Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	4	6.406	1.602	7.929	.0003
Subject(Group)	25	5.050	.202		
Arc Initial Sound	2	1.729	.864	5.267	.0084
Arc Initial Sound * Age	8	3.335	.417	2.540	.0210
Arc Initial Sound * Subject(Group)	50	8.206	.164		
Arc Gender	1	28.380	28.380	30.370	.0001
Arc Gender * Age	4	4.189	1.047	1.121	.3690
Arc Gender * Subject(Group)	25	23.362	.934		
Arc Cue	1	.023	.023	.194	.6630
Arc Cue * Age	4	.482	.120	1.026	.4132
Arc Cue * Subject(Group)	25	2.935	.117		
Arc Initial Sound * Arc Gender	2	10.450	5.225	22.509	.0001
Arc Initial Sound * Arc Gender * Age	8	5.187	.648	2.793	.0123
Arc Initial Sound * Arc Gender * Subject(Group)	50	11.606	.232		
Arc Initial Sound * Arc Cue	2	.032	.016	.190	.8275
Arc Initial Sound * Arc Cue * Age	8	.596	.075	.875	.5435
Arc Initial Sound * Arc Cue * Subject(Group)	50	4.257	.085		
Arc Gender * Arc Cue	1	.103	.103	1.935	.1765
Arc Gender * Arc Cue * Age	4	.295	.074	1.393	.2652
Arc Gender * Arc Cue * Subject(Group)	25	1.326	.053		
Arc Initial Sound * Arc Gender * Arc Cue	2	.095	.047	.662	.5201
Arc Initial Sound * Arc Gender * Arc Cue * Age	8	.815	.102	1.427	.2088
Arc Initial Sound * Arc Gender * Arc Cue * Subject(Group)	50	3.571	.071		

Dependent: Compact Variable 2



Experiment 1 (SM): Adults

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	2	.249	.125	.217	.8078
Subject(Group)	12	6.885	.574		
Arc Trigger/non-trigger	3	6.917	2.306	11.691	.0001
Arc Trigger/non-trigger * Age	6	.414	.069	.350	.9052
Arc Trigger/non-trigger * Subject(Group)	36	7.099	.197		
Arc Gender	1	.036	.036	1.136	.3074
Arc Gender * Age	2	.208	.104	3.324	.0710
Arc Gender * Subject(Group)	12	.375	.031		
Arc Trigger/non-trigger * Arc Gender	3	.329	.110	1.795	.1656
Arc Trigger/non-trigger * Arc Gender * Age	6	.215	.036	.585	.7398
Arc Trigger/non-trigger * Arc Gender * Subject(Group)	36	2.201	.061		

Dependent: Arc SM Task

Experiment 1 (SM): Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	3	1.011	.337	.708	.5565
Subject(Group)	25	11.910	.476		
Arc Trigger/Non-Trigger	3	53.439	17.813	90.718	.0001
Arc Trigger/Non-Trigger * Age	9	3.978	.442	2.251	.0275
Arc Trigger/Non-Trigger * Subject(Group)	75	14.727	.196		
Arc Gender	1	.145	.145	1.973	.1724
Arc Gender * Age	3	.014	.005	.064	.9786
Arc Gender * Subject(Group)	25	1.841	.074		
Arc Trigger/Non-Trigger * Arc Gender	3	.324	.108	1.808	.1529
Arc Trigger/Non-Trigger * Arc Gender * Age	9	.449	.050	.834	.5874
Arc Trigger/Non-Trigger * Arc Gender * Subject(Group)	75	4.484	.060		

Dependent: Compact Variable 2

Experiment 1 (SM) Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	4	9.970	2.492	5.104	.0021
Subject(Group)	39	19.044	.488		
Arc Trigger/non-trigger	3	60.136	20.045	105.454	.0001
Arc Trigger/non-trigger * Age	12	10.101	.842	4.428	.0001
Arc Trigger/non-trigger * Subject(Group)	117	22.240	.190		
Arc Gender	1	.176	.176	2.834	.1003
Arc Gender * Age	4	.018	.005	.073	.9900
Arc Gender * Subject(Group)	39	2.424	.062		
Arc Trigger/non-trigger * Arc Gender	3	.498	.166	2.816	.0422
Arc Trigger/non-trigger * Arc Gender * Age	12	.459	.038	.648	.7970
Arc Trigger/non-trigger * Arc Gender * Subject(Group)	117	6.899	.059		

Dependent: SM Arc

Experiment 2 (AM): Adults

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Age	2	.875	.437	.371	.6975
Subject(Group)	12	14.137	1.178		
Arc AM Trigger/non-trigger	2	14.289	7.144	24.821	.0001
Arc AM Trigger/non-trigger * Age	4	1.314	.329	1.141	.3610
Arc AM Trigger/non-trigger * Subject(Group)	24	6.908	.288		
Arc Gender	1	.035	.035	1.163	.3021
Arc Gender * Age	2	.207	.104	3.417	.0669
Arc Gender * Subject(Group)	12	.364	.030		
Arc AM Trigger/non-trigger * Arc Gender	2	.030	.015	.590	.5619
Arc AM Trigger/non-trigger * Arc Gender * Age	4	.180	.045	1.767	.1684
Arc AM Trigger/non-trigger * Arc Gender * Subject(Group)	24	.611	.025		

Dependent: Arc AM scores

Experiment 2 (AM): Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value	G-G	H-F
Column 2	3	.292	.097	1.355	.2743		
Subject(Group)	32	2.296	.072				
Arc AM Trigger/ Non-Trigger	2	96.620	48.310	749.553	.0001	.0001	.0001
Arc AM Trigger/ Non-Trigger * Column 2	6	.505	.084	1.305	.2680	.2785	.2734
Arc AM Trigger/ Non-Trigger * Subject(Group)	64	4.125	.064				
Arc Gender	1	.007	.007	.361	.5522	.5522	.5522
Arc Gender * Column 2	3	.043	.014	.759	.5256	.5256	.5256
Arc Gender * Subject(Group)	32	.605	.019				
Arc AM Trigger/ Non-Trigger * Arc Gender	2	.005	.003	.122	.8850	.7584	.7836
Arc AM Trigger/ Non-Trigger * Arc Gender * Column 2	6	.107	.018	.863	.5272	.4801	.4886
Arc AM Trigger/ Non-Trigger * Arc Gender * Subject(Group)	64	1.326	.021				

Dependent: Compact Variable 2

Experiment 2 (AM): Adults vs. Children

Source	df	Sum of Squares	Mean Square	F-Value	P-Value	G-G	H-F
Age	4	11.694	2.924	7.770	.0001		
Subject(Group)	46	17.308	.376				
Arc AM Trigger/ Non-trigger	2	110.068	55.034	410.062	.0001	.0001	.0001
Arc AM Trigger/ Non-trigger * Age	8	6.953	.869	6.476	.0001	.0001	.0001
Arc AM Trigger/ Non-trigger * Subject(Group)	92	12.347	.134				
Arc Gender	1	.021	.021	.806	.3740	.3740	.3740
Arc Gender * Age	4	.051	.013	.496	.7385	.7385	.7385
Arc Gender * Subject(Group)	46	1.176	.026				
Arc AM Trigger/ Non-trigger * Arc Gender	2	.012	.006	.253	.7774	.6995	.7241
Arc AM Trigger/ Non-trigger * Arc Gender * Age	8	.129	.016	.701	.6902	.6422	.6568
Arc AM Trigger/ Non-trigger * Arc Gender * Subject(Group)	92	2.117	.023				

Dependent: Arc scores

