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Irish medium education : cognitive skills, linguistic skills, and attitudes towards Irish

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IRISH MEDIUM EDUCATION:
COGNITIVE SKILLS, LINGUISTIC SKILLS, AND ATTITUDES TOWARDS IRISH.

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In memory of Tony.

No one speaks English, and everything's broken,

and my Stacys are soaking wet.

~Tom Waits, Tom Traubert's Blues

There’s a ghost of
another language
shadow-dancing
under my words.
A phantom
tongue that unravels
like liquor, inspires
like song.

~Sharanya Manivannann, First Language

Education is simply the soul of a society

as it passes from one generation to another.

~G.K. Chesterton

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Author’s Declaration

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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List of Abbreviations and Terms

BPVS	= British Picture Vocabulary Scale
CCC	= Cognitive Complexity and Control Theory
CSO	= Central Statistics Office, Republic of Ireland
DCCS task	= Dimensional Change Card Sort task
EF	= Executive Function/Functioning
EM(north)	= English medium education in Northern Ireland
EM(south)	= English medium education in Republic of Ireland
English medium	= English medium education
EP	= Extended Passage of Neale's Analysis of Reading Ability-Revised
ERF	= A school that commenced formal reading via English
EWCR	= Error:Word Count Ratio
Flanker Task-Modified	= Modified version of the Flanker Task-Original
Flanker Task-Original	= Original Flanker task based on the work of Yang and Lust (2005)
Gaelscoil	= Irish medium school
Gaelscoileanna	= Irish medium schools
Gaeltacht	= Irish-speaking regions mainly situated on the Western seaboard of the Republic of Ireland
GT	= School in the Gaeltacht
ICT	= The Irish Cloze Test
Immersion	= Irish medium education
IRF	= A school that commenced formal reading via Irish
IVT1/IVT2	= Irish Vocabulary Test
L1	= First language
L2	= Second Language
MHL	= Children who went to English medium education and received Higher Level Irish language lessons
MLU	= Mean Length Utterance
MOL	= Children who went to English medium education and received Ordinary Level Irish language lessons
Morphosyntactic	= Combines morphology—patterns of word formation within a language—and syntax—patterns of rules for word formation of grammatical sentences within a language.
NARA	= Neale's Analysis of Reading Ability-Revised
NI	= Northern Ireland
Raven's	= Raven's Progressive Matrices
ROI	= Republic of Ireland
SART	= Sustained Attention to Response Task based on the work of Bialystok, Craik, and Luk (2008)
WMC	= Working memory capacity
YO	= Years old or Years of age

Abstract

The purpose of this research was to investigate the effects of Irish medium education (immersion) on children's first language (L1; English) skills in the educational setting and on their executive functioning (EF) skills. A battery of tests was used to compare 8 Year-Old and 12 Year-Old children's performance on a range of tasks testing their L1 vocabulary, reading, writing, creative, and descriptive (academic) skills and their attention, inhibition, and task switching (EF) skills.

Data were collected in two school types (immersion and English medium) in two areas in the Republic of Ireland and one school type (English medium) in one area in Northern Ireland to represent a monolingual sample. As such, this provided a comparison of three school types and, in particular, the effects of learning a second language (L2) to varying degrees of ability—either total immersion (successive bilingualism) or L2 learning for approximately 3.5 hours per week—upon children's L1 and EF skills.

Overall, results revealed that immersion education in Irish had no detrimental effects on children's L1 (English) or EF skills. Indeed, results suggest that whereas immersion may have helped to enhance children's attention to and control of their L1, successive bilingualism itself had limited influence on EF skills, although there were some evidence of heightened performance in tasks of attention, inhibition, and task switching.

These findings, in addition to the majority of research into bilingualism in the worldwide setting, could be used to inform parents and policy makers that Irish medium education has no negative effects upon children's L1 skills in the educational setting or their EF skills of attention, control, and inhibition.

Outline

Although Irish is the official language of Ireland, English is the language mostly used in the majority of communities and schools. For instance, 92% of children conduct the majority of their education through the medium of English (L1): 69% learn Irish as a subject only (approximately 3.5 hours per week), and 23% learn Irish as a subject only and taught at least one other subject through Irish. However, nearly 5% of children receive their entire education through their second language (L2; Irish). This sector of education—known as immersion education—has seen massive growth in recent times, mainly due to various interest groups, such as parents' organisations, and people's concern over the decline of the use of the Irish language. Currently, immersion is highly sought after and highly regarded by some people; other people however, continue to have concerns as to the efficacy of such programmes.

Although the general "negative effect" of bilingualism charge seems to have waned if not disappeared entirely in esoteric research circles, myths or misunderstandings about the negative effects of learning two languages still exist amongst people unfamiliar with bilingual research and education. Indeed, for those who are unfamiliar, perhaps it is reasonable to say that it is somewhat "counter-intuitive" to believe that a child's learning of the curriculum through an L2 does not have any negative effects upon his/her first language (L1) skills or academic abilities. Over the last few decades a number of research studies conducted around the world has been undertaken to investigate this matter. The general consensus of this research is that, overall, bilingual education in its multiple forms has no negative effects on children's L1 and cognitive skills, and can indeed enhance such skills (see Chapters 2 and 4). Such investigations can provide a more accurate representation of the effects of immersion which can help parents and policy makers alike to make informed decisions as it pertains to them.

However, a paucity of research into these matters has been conducted in the Irish setting. As such, the current study set out to investigate the effects of Irish medium education on children's L1 academic abilities and executive functioning (EF) abilities, namely attention, control, and response inhibition. This was achieved by comparing 8 Year-Old (8YO) and 12 Year-Old (12YO) children's performance on a range of tasks testing their L1 vocabulary, reading, writing, creative, and descriptive (academic) abilities and their attention and control (EF) abilities. Researching these skills in the Irish context would help identify children's said skills in Ireland, and contribute to our understanding of the effects of learning a second language (L2) to varying degrees of ability—either total immersion (successive bilingualism) or L2 learning for approximately 3.5 hours per week—upon children's L1 and EF skills.

The first chapter starts with a historical overview of the Irish language and then moves on to the current status of the language and its use in Ireland.

Chapter 2 outlines (i) the journey of Irish in the education system since the formation of the state to the present day, (ii) current children's strength in and usage of the Irish language, and (iii) more recent literature that investigated the costs and benefits of learning more than one language.

Chapter 3 reviews current literature on the complexities of Irish people's attitudes towards the Irish language and how such attitudes compare to and/or contradict with actual usage of Irish in communities and within the educational sector. Additional consideration is given to attitudes towards Irish medium schools and to Irish in English medium schools.

Chapter 4 gives a historical overview of the (mis)understandings of the effects of bilingualism. Additionally, pertaining to research conducted outside of Ireland, further investigation is presented as to the current (i) attitudes towards bilingualism and (ii) literature understanding as to costs and benefits of bilingualism. In particular, EF is given considerable focus in relation to theories of its development and how it is affected by bilingualism.

Chapter 5 presents the Methods of data collection.

A foreword as an introduction and overview of analyses performed precedes the results chapters. Chapters 6 to 12 present the results of various analyses. Chapter 6 to 8 present the findings of 12YOs background details, performance on L1 and Metalinguistic, and performance on EF tasks respectively per school group. Chapters 9 to 11 follow the same pattern of presentation as Chapters 6 to 8 but relates to the findings of analyses of 8YOs background details and task performance. Chapter 12 presents findings of parents' and children's attitudes towards and use of the Irish language within the family, community, and schooling system.

Finally, Chapter 13 presents a discussion of the analyses of the data-set presented in this thesis, and of the implications that arise within the data.

Chapter 1

The Irish Language

Historical Perspective of the Irish Language

The Irish language (or Irish as it will be referred to herein) originates from the Proto Indo-European language which was spoken in the Caucuses area 7,000 years ago. Proto Indo-European is the parent language of Latin, from which Italian, French, Spanish, Catalan, Portuguese, and Romanian languages derive; Proto-Germanic, from which German, Dutch, English, and the Scandinavian languages derive; Proto-Celtic, or Celtic, from which Irish, Welsh, Scottish, Manx, Breton, and Cornish languages derive; and many other languages including Slavic, most other European languages, and several Asian languages (Ó hUiginn, 2008).

Although there is no precise date denoting when the Celtic language was introduced to Ireland, or when it eventually overtook the then indigenous languages, the process is thought to have commenced at least 500B.C. when Celts invaded Ireland (Ó Siadhail, 1989; cf Hindley, 1990, who stated that Irish was introduced to Ireland 200B.C.) and was completed within 1,000 years (Ó hUiginn, 2008). In the 5th century, with the introduction of Christianity—and with that Latin, literacy, and recorded history—records state that, at this stage, there were no other indigenous languages spoken in Ireland, and that Irish was the language of the people. Soon after its introduction, Irish usage escalated, and, along with Latin and Greek, Irish has the oldest literature in the world (Nettle & Romaine, 2000) and it is one of the oldest written languages in Europe that is still a living dialect (Fiontar, 2009).

Despite the various language influences that came from Latin/Christianity (as noted above), from the Norse/Viking Invasions in the 9th and 10th century, and the French/Anglo-Norman invasion in the 12th century, Irish continued as the language of the majority of people in Ireland. It did, of course, borrow from the above languages (for example, respectively, church = *eaglais*, came from the Latin *ecclesia*; rudder = *stiúir*, came from the Norse *styri*; room = *seomra*, came from the French *chaumbre*) and mostly reflected novel items, cultural, administrative, and/or religious concepts. But it was The Tudor Conquest, completed in the 17th century, that effectively changed the language use in Ireland (Ó hUiginn, 2008). Along with the 1801 Act of Union, The Great Famine in 1845-1852 (Ó Tuathaigh, 2008), a negative disposition of the Irish and Anglo-Irish dominant class, and promotion of language replacement through national schools and prestigious secondary schools, Irish was replaced within a period of two generations (Mac Gréil & Rhatigan, 2009) and came close to extinction (Ó Tuathaigh, 2008).

From the 17th century, Irish language use in Ireland changed substantially. For instance, a decline in use can be seen in Irish literature and in the social hierarchy. Regarding Irish literature, the amount of work undertaken was reduced because of the death, exile, or reduced financial circumstances of the Irish aristocracy who were the sponsors of such work. Regarding the social hierarchy, English became the language of social progression because of the introduction of English-speaking settlers during *Plantation*, who were given positions of power and/or administration. During this time there was huge immigrant and native population growth, and as the overall percentage of people who spoke Irish decreased, the overall amount of people who spoke Irish increased. However, Irish, invariably, was the language of the social underclass.

This “language-class divide” remained until The Great Famine in 1845—a time when there were more speakers of Irish than at any other time in Irish history (Ó hUiginn, 2008). According to de Fréine (1978) in 1841 there were 8 million habitants of Ireland, 2.5 million of whom were L1 Irish speakers; as such, Irish was ranked in the top 100 spoken languages in the world in regards to the amount of speakers. However, the effects of the Famine, which impacted greatly on the Irish-speaking community in particular (Romaine, 2008), accelerated the process of learning the English language for survival, social progression, and emigration. The Irish language did survive this threat of extinction however, but Irish as a community language has been in decline ever since the Famine that occurred in Ireland in the 19th century[1] (Ó hUiginn, 2008).

Regarding the 26 counties of the presently called Republic of Ireland, by 1851, only 1.49 out of 5.11 million people were Irish speakers; by 1881, only 0.92 out of 3.87 million people were Irish speakers; and by 1911, only 0.55 out of 3.14 million people were Irish speakers, as stated in Central Statistics Office (CSO; 2008a). Such a decline, or near extinction of the Irish language (Nic Pháidín & Ó Cearnaigh, 2008), and extreme Anglicisation of the Irish people prompted The Gaelic Revival, in the last quarter of the 19th century, to "de-anglicise" the Irish people and to promote Irish culture and language with the aid of several organizations including The Gaelic Athletic Association, The Gaelic League (*Conradh na Gaeilge*) and *Sinn Fein* (de Longbhuel, 2008)—these groups are still active today. Also, since the formation of the state in 1922, successive governmental policies have endeavoured to protect, promote, and revive the Irish language—which has been mainly conducted through the educational system: a starting point shared by revivalists of many minority languages (Gorter & Cenoz, 2011). A question remains, therefore, has the language been revived or maintained or is it declining to its ultimate

[1]De Fréine (1978) states that if a similar huge and drastic language shift had occurred elsewhere in Europe many European languages, including Danish, Estonian, Finnish, Latvian, and Lithuanian, would now be extinct.

demise?

Current Status of the Irish Language

Towards the end of the 20th century, some researchers stated that the Irish language is declining to its ultimate demise. For example Hindley (1990) states Irish is irrefutably dying whilst Carnie (1995) states Irish will probably not last more than one or two generations. With such stark statements as these one might conclude that the survival prospects of Irish are bleak. However, the validity of these statements is moot. Census 2006 (CSO, 2008b) data show that 1.65million (40.9%) people in Ireland can speak Irish, and, since the formation of the state, data show a near consistent rising trend in Irish speakers (see Figure 1).

These data show Irish language usage has remained firm nearly one generation after predictions of its imminent demise (above). However, Irish language usage as reported by the Census data is speculative, as a thorough understanding of a respondee's ability in and use of Irish is beyond the scope of the Censuses conducted in Ireland. Therefore, Census data should be considered tentatively—perhaps, not at all—when relating them to the general population's quality and amount of Irish language usage.(See also p. 10 and Chapter 3, pp. 49-52 below.)

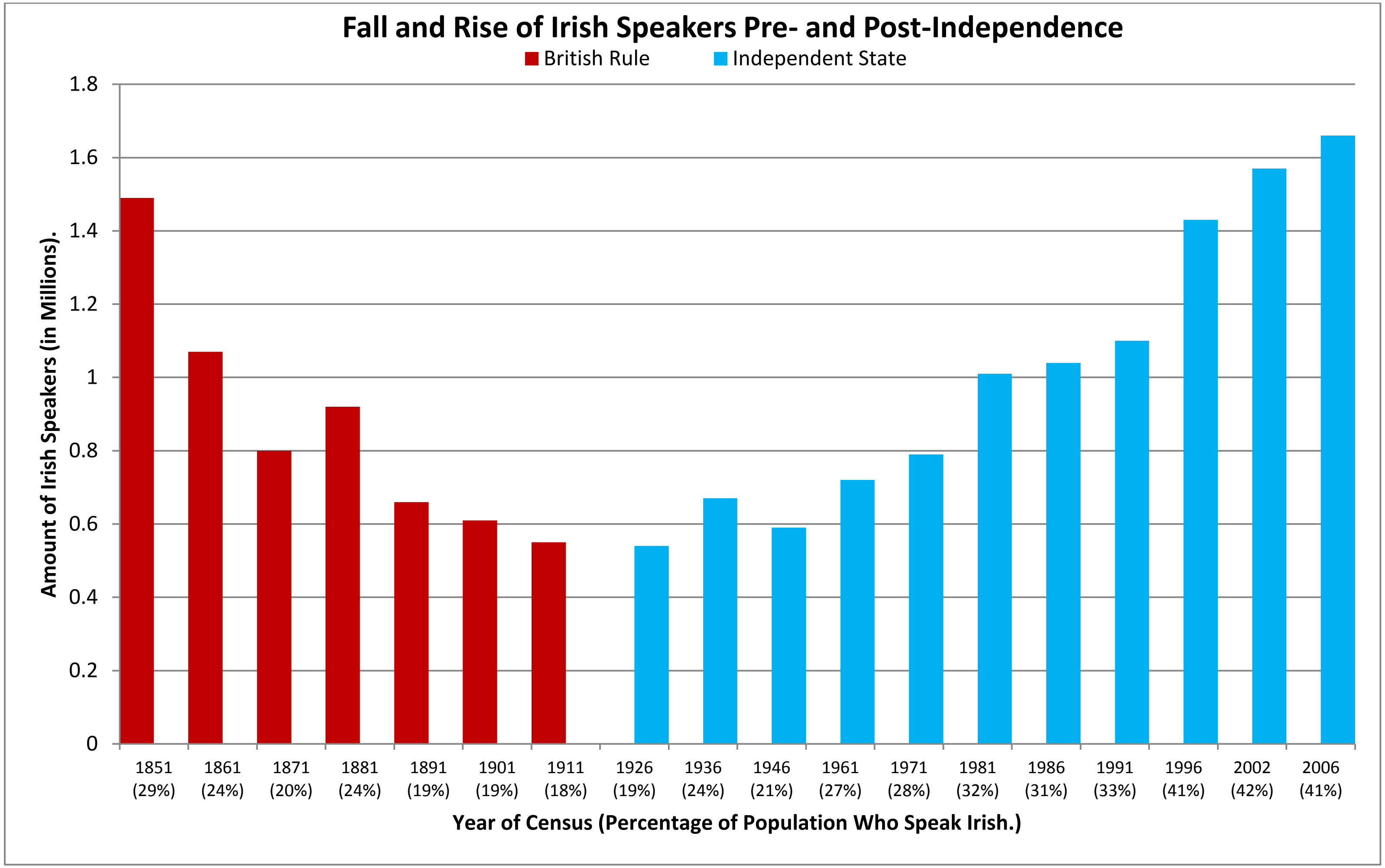

Figure 1. The fall and rise in the amount of Irish speakers in Ireland Pre- and Post-Independence, according to Census Data. Adapted from CSO data online (see CSO, 2008a, 2008b).

Questions Relating to Irish Language Use

Throughout the years, the Census has used differently phrased questions relating to Irish language use. Starting in 1841 and as recently as 2006, the Census in Ireland has been conducted 23 times; 15 times as an independent state (see Punch, 2008 for a review). A question relating to speakers' use of Irish was introduced in 1851 and continues to this day, but the question structure has changed throughout the years. (See Table 1 for a list of the Irish language questions asked since its inception in the Census in 1851 to the latest Census of 2006.)

Although the Census data throughout the years might provide ample information on the relationship between language use and gender, age, geographic and socioeconomic status, and more, the Irish language use questions contained in the majority of Censuses conducted since 1851 are, for our purpose, flawed because they require a subjective and imprecise measure of language proficiency and use with no clear description of what an "Irish speaker" is. For the purposes of the Census, an "Irish speaker" could be a novice or fluent speaker, thus, data purporting proficient Irish speakers are most likely exaggerated (Carnie, 1995). Moreover, various research suggests that despite their positive views of Irish, few people speak Irish regularly in the communities (e.g., Benton, 1986; Mac Gréil & Rhatigan, 2009) or in the homes (e.g., Benton, 1986; Ó Riagáin, 2008), and that the use of Irish in the communities is diminishing (e.g., Ó Riagáin, 1992, 1996)--even in the *Gaeltacht* (e.g., Ó Giollagáin & MacDonnacha, 2008; Ó Riagáin, 1992, 1996). Such findings should be considered in conjunction with the Census data, as presented here.

Nevertheless, it is interesting to see how in recent years the language question used in Censuses has been modified and, when the data are examined further, how Irish usage in Ireland might, at first, seem to be more vibrant and prolific than it really is.

Table 1. The varying Census questions throughout the years since its inception to present asking about Irish language usage. * Irish language use was part of an education question in these years. ** Irish language use appeared as a separate question from 1881 to present. *** Additional point made in 1961, and retained to present, which coverage restricted to those of 3 years and older. Adapted from Punch (2008).

	The Irish Language Question
Years	Question categories
1851, 1861, 1871*	"Irish" is to be added to the name of each person who speaks Irish but not English.
	"Irish and English" is to be added to the name of each person who can speak Irish and English.
1881**, 1891, 1901, 1911	"Irish" is to be added to the name of each person who speaks Irish but not English.
	"Irish and English" is to be added to the name of each person who can speak Irish and English.
	In other cases no entry should be made in this column.
1926	"Irish only" is to be added to the name of each person who speaks Irish only.
	"Irish and English" for native speakers who speak English also.
	"English and Irish" who speak both languages.
	Read but cannot speak Irish.
	Do not write anything opposite the name of the person who can neither speak nor read Irish.
1936, 1946, 1951, 1956, 1961***, 1966, 1971, 1979, 1981, 1986, 1991	"Irish only" is to be added to the name of each person who speaks Irish only
	"Irish and English" who speak both languages.
	Read but cannot speak Irish.
	Do not write anything opposite the name of the person who can neither speak nor read Irish.
1996, 2002	Indicate with tick if person can speak Irish.
	If so, daily, weekly, less often, never.
2006	Indicate with tick if person can speak Irish.
	If so, daily within education system, daily outside education system, weekly, less often.

The 2006 Census data, for instance, show that 1.65 million (40.9%) people speak Irish; however, of these, only 439,225 (10.82%) speak it daily, 50,243 (1.2%) of whom speak it daily outside of education (see Figure 2).

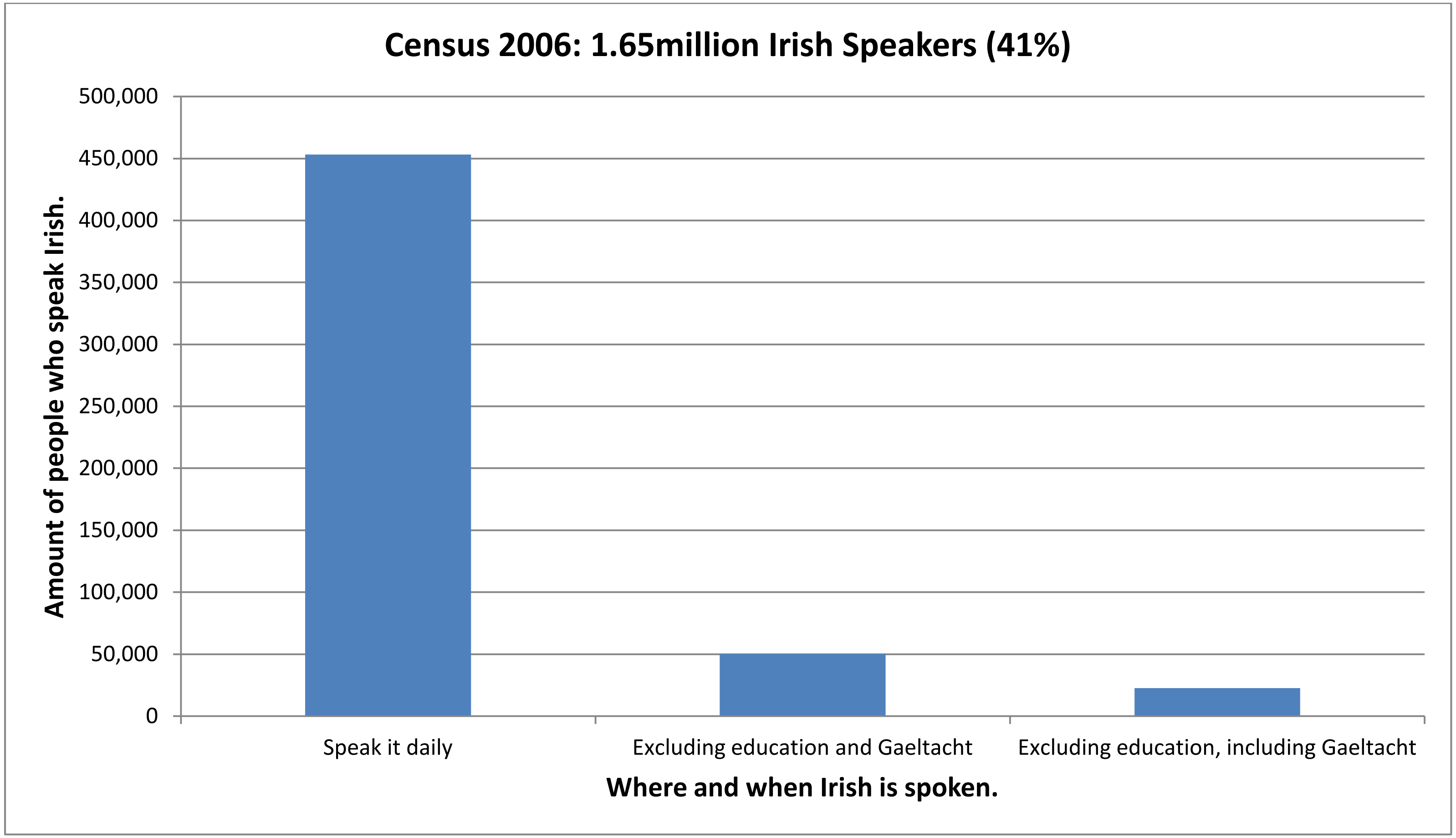

Figure 2. Census 2006 data of self-reported Irish speakers as per their daily Irish language use inside or outside of education and the *Gaeltacht*. Adapted from CSO data online (see CSO, 2008c).

These data exclude the *Gaeltacht*—regions in Ireland, mainly on the West Coast, where the community language is Irish—which contains 22,515 (0.6%) daily Irish speakers who speak Irish outside of education. The subtotal, therefore, is 72,758 (1.8%) people out of 4.1 million people who speak Irish daily in the community (CSO, 2008c) thus, showing—contrary to what Census data initially suggest—that people's use of Irish in the community is a scarcity and the survival prospects of Irish is in peril. Likewise, in the State of Northern Ireland, the future of the Irish language is unsafe. However according to Harris (2007) there is much more vitality towards Irish in Northern Ireland than there is in the Republic of Ireland, despite the widespread knowledge of Irish in the Republic and the language protections and maintenance programmes used therein.

Historically, in Northern Ireland, the Irish language had been excluded from all areas of official policy and culture since the formation of the State in 1922 because of the Unionist majority's assertions of their British-ness, it was considered as Catholic/nationalistic dissidence, and it was generally unwelcome (Ó Tuathaigh, 2008). A question relating to Irish language use was only introduced to the Northern Ireland Census in 1991 showing that 10.4% (167,000) of the population had "knowledge" of the Irish language, 75,000 of whom could speak or write it (Romaine, 2008).

Given these figures, it is clear that the future of Irish on the island of Ireland is unsafe. Only a minority speak it proficiently, despite the fact that the majority of people, in the Republic, are taught Irish as a subject in school for up to 13 years—the majority of whom only attain a moderate speaking skill in the language and a growing minority attain a negligible speaking skill in the language (Ó Riagáin, 2008). Also, a growing minority of children attain dispensations from sitting Irish as a subject in post-primary school, thus intensifying doubts as to the safety of the Irish language.

Ó Caollaí (2009) states that in the year 2006, "11,871 pupils were exempted from learning Irish to the level of Leaving Certificate [final school examinations] on the basis of certificate of learning inability" (p. ix). Such exemptions are given for the following reasons: if a pupil (i) received education outside of the state for at least 3 years prior to application for exemption; (ii) functions at a level of average or above intellectual capacity but has a specific learning disability that prevents expected attainment of language skills; (iii) has a general learning disability due to serious intellectual impairment which prevents expected attainment of language skills; (iv) has a general learning disability due to sensory impairment which prevents expected attainment of language skills; and/or (v) is from a different state and has no understanding of English—s/he must study several subjects but can choose to study English or Irish or both (Department of Education and Science, 2010).

Ó Caollaí (2009) questions the merit of this process by highlighting that although the majority of those exempted are native Irish, a minority of these pupils might be immigrants—thereby, potentially, increasing alienation and decreasing integration. Ó Caollaí (2009) further adds, somewhat sardonically, that the professional consultants seem to have discovered a new form of mental handicap—"a language learning ability which applies only to one language—Irish!" (p. ix)—because over half of those exempted from Irish lessons in 2006 overcame their "mental handicap" or inability to learn the Irish language and went on to study one or more continental languages.

Furthermore, it seems the trend in the reduction of pupils sitting their final state examinations of the subject Irish continues (Ó Riagáin, 2007) as can be seen by data from the State Examination Commission (2009). Of the pupils who, in 2009, sat the core Leaving Certificate subjects Irish, English, and Maths, substantially less sat Irish (45,643) than English (51,033) or Maths (51,905)—overall, 58,281 pupils were due to sit the Leaving Certificate in June, 2009, 6,739 of whom held Irish exemptions (J. Wade, Department of Education and Science, personal communication, February, 26, 2010).

Such data, in addition to research pertaining to the lack of language transmission in the home—which stands at 5% including the *Gaeltacht* (Ó Riagáin, 2008)—are a cause for concern as to the quality and use of Irish in schools and communities and to the efficacy of programmes attempting to revive the language. Indeed, over the years, several researchers have claimed that the language revival has failed (e.g., Carnie, 1995; Dorian, 1988; Hindley, 1990; Macnamara, 1972; Moriarty, 2011).

This failure in reviving Irish into a community language is attributed to numerous factors, including a disproportionate responsibility placed upon the education system to revive Irish (Carnie, 1995) and their ineffective teaching practices used to revive it (Carr, 2008; Moriarty, 2011). Carnie (1995) additionally states that (i) the reduced interaction between the *Gaeltacht* areas, or *Gaeltachtaí* (because of their geographical separation), (ii) the negative attitudes towards Irish being a difficult and badly taught language, (iii) the importance of knowing English to progress socially and become financially secure, and (iv) the majority of the people who are "sufficiently selfish" (p. 13) in their unwillingness to make the sacrifice to learn Irish further compounded the failure to revive Irish as a community language. It would seem that such failure occurs/occurred even though the majority of people believe in the importance of Irish for the country as a whole; however, a sizeable minority do/did not see it as important to them personally (Watson, 2008).

Survival Story of the Irish Language

Since its near extinction over a century ago, Irish has nevertheless survived in an inhospitable environment (Nic Pháidín & Ó Cearnaigh, 2008), both North and South of the island. This survival can be attributed, partly, to the State's recognition of the language in the Republic, and, on all parts of the island, education, and/or people's Irish political and/or cultural (Macnamara, 1966) and/or ethnic identity (Cummins, 1978). In recent times, this survival has been especially helped by people's changing perception of Irish and Irish-ness (e.g., Carnie, 1995; Fagan, 2003; Ó Hearn, 1998).

Beyond academia, journalists and other non-academic commentators have presented carefully considered arguments that explore issues of a changing Irish identity, although, sometimes, without presenting supporting research to back up their claims. For instance McWilliams (2005) succinctly states that Irish society's changing perception of Irish and Irish-ness includes four causal factors: (i) booming economy—the country's financial success permitted many Irish people the "indulgence" to explore their own culture; (ii) *Riverdance*—the global success of this event transformed many Irish people's inactive or limited engagement in Irish culture into an active engagement in Irish culture; (iii) The Good Friday Agreement—the success of this agreement permitted many Irish people to reclaim a language and/or culture which hitherto had been "commandeered" by Provisionalism; and (iv) *TG4* or *Teilifís na Gaeilge (a Ceathair)*—the success of this Irish language television station transformed many Irish people's perception of Irish from unattractive to attractive, from passé to sexy, from insipid to aspirational, or from extraneous (to everyday life) to simply normal (McWilliams, 2005). Whilst these points are anecdotal in nature, there is research that seems to support such claims.

For instance, the economic boom or “Celtic Tiger” of the mid-1990s onwards was unparalleled (Truetzschler, 2008) and transformed the economic, social, and cultural makeup of Ireland (Ó Hearn, 1998), a country which, previously, had been commonly perceived as a “Third World Country” (Caherty, Storey, Gavin, Molloy, & Ruane, 1992). From such rapid growth, states Hussey (1995), a contemporary Ireland grew, with Irish people more willing and able to exuberantly express and revive their own cultural identity and traditions. However, Fagan (2003) states that some of these “traditions” or “cultural identifications”, for instance Riverdance, the ubiquitous “Irish Pub”, and U2, are merely products of a “global cultural industry” (p. 114) and not true expressions of Irish identity. (See Conway, 2006, and Negra, 2006, for similar claims.) Nevertheless, the global success of *Riverdance* promulgated an aspect of Irish culture (Ó Hearn, 1998) from which Irish cultural pride, identification, and heritage in many Irish people grew (e.g., Carnie, 1995), and perhaps, promoted an interest in various aspects of Irish culture in non-Irish people too (McCubbin, 2010).

Regarding the Irish language specifically, it has often been deemed as a correlate of Irish Nationalism in Britain (Ó Conchubhair, 2008), Northern Ireland (Pritchard, 2004; Wright, 1990), and the Republic of Ireland (McDonagh, Varley, & Shortall, 2009), and has been used to polarise various community and political groups for political gain (e.g., Pritchard, 2004; Wright, 1990). In addition, Irish, and other various aspects of Irish culture (e.g., Irish arts and sport), have been used to promote people’s sense of Irish-ness as distinct from being British or Unionist (see Wright, 1990), thereby denying some people the right to experience (their) Irish culture (Pritchard, 2004; Wright, 1990).

For instance, many unionist children of Northern Ireland have been denied the Irish language through an overwhelmingly Anglo-centric orientated education system that also failed to provide children many aspects of their cultural heritage (Pritchard, 2004). This, states Pritchard (2004), worsened the “Troubles” in Northern Ireland as it “alienated unionists from cultural capital which rightfully and historically belongs to both traditions, and in so doing has promoted a “frontier mentality” among them” (p. 62).

In efforts to bring harmony to Northern Ireland, The Good Friday/Belfast Agreement (1998) committed various political parties of Northern Ireland, Britain, and the Republic of Ireland, to the process of peace, co-operation, and respect for each of the communities in the North and between the UK and Ireland. Whereas the agreement emphasises the importance to respect, understand, and tolerate linguistic diversity, including Irish and other languages, it resulted in the British government actively supporting Irish language education in Northern Ireland (Andrews, 1991), and seems to have had a positive effect in the promotion of Irish both north (Harris, 2007; Pritchard, 2004) and south (Harris, 2007) of Ireland[2]. Indeed, in their study on attitudes towards Irish, Mac Gréil and Rhatigan (2009) found that Irish could be used as a basis of unity between north and south, especially amongst younger people (18 to 25 Years-Old) “whose experience in their teens was post-Northen Ireland “Troubles” and during a mini-Renaissance of Irish language and culture” (p. 96).

Further promotion of the Irish language can also be seen in the rise of Irish language print and broadcast media since the start of the economic boom of the mid-1990s (Truetzschler, 2008) which has facilitated the accessibility of Irish to a broader customer base (see Atkinson & Kelly-Holmes, 2010; Truetzschler, 2008; Watson, 2002).

[2]However, just as negative attitudes towards the Irish language remain within a wide sector of Northern Ireland society (McCoy, 1997; McKendry, 2007), there is also disappointment for the failings of the Agreement to provide legal status for the Irish Language (Nic Craith, 1999).

Specifically, the success of TG4 (Harris, 2007), has provided more opportunities for Irish-speakers [and non-Irish speakers] to engage with the Irish language and culture. Furthermore, since the arrival of TG4, more Irish language programmes are being broadcast in the media (Watson, 2002) and more Irish speaking "celebrities" exist (Atkinson & Kelly-Holmes, 2010), which is helping to transform the image of the Irish language from a traditional image to more youthful, cool, topical, and accessible image (e.g., Atkinson & Kelly-Holmes, 2010; Kelly-Holmes & Moriarty, 2007; Kelly-Holmes, 2006).

As part of the economic boom, Ireland also experienced a new wave of immigration which could also have played a part in Irish people's changing perception of what it is to be Irish. Throughout the years, Ireland as a country has been more familiar with emigration rather than immigration which grew in the 1990s (Conway, 2006; Garner 2004; Cullen 2000). As many people from many parts of the world came to Ireland creating a more linguistically and culturally diverse country, the changing demographics provided a more pluralistic view of different cultures and languages. It could have simultaneously encouraged Irish people to (further) evaluate and (further) embrace Irish culture on a linguistic, historical, and community bases.

Finally, there has been a growing interest in the Irish language and culture around the world as there are over 30 third level colleges and universities providing Irish language and Celtic studies programmes (Fiontar, 2009). For instance, in America, Notre Dame University has an Irish Language and Literature Department; in Canada, a 60 acre facility providing all year round Irish language education opened in 2007 (North American *Gaeltacht*, 2011); in Australia, there are Irish classes in several cities throughout the country (Ó Conchubhair, 2008); and in Great Britain, there are several universities

(Aberdeen, Aberystwyth, Edinburgh, Glasgow, and Liverpool) offering Irish as a language course—such is the growth of Irish language usage in Britain that various professionals (Irish Governmental figures and teachers and clergymen in Britain) met at a conference, *Gaeilge na Breataine*, Salesian College, September 2010, to examine the reasons for the growth in Irish language use and to seek official support in British schools (Irish Times, 2010).

Such developments seem to place Irish in a less vulnerable position.

Summary

In relation to the question, "in Ireland, has the language been revived or maintained or is it declining to its ultimate demise?", perhaps the answer is that it is somewhere in between. To say Irish is revived is inaccurate at best and disingenuous at worst. Although Irish has been revitalised by changing perceptions of the language (Atkinson & Kelly-Holmes, 2010; Watson, 2002, above) and the incredible growth in *Gaelscoileanna* (see Chapter 2) it is neither flourishing nor "brought back to life" as an active vibrant language in the communities. Whereas, to say Irish is dead or dying is, also, inaccurate at best and disingenuous at worst. Of course Irish is under threat from many sources, including homogeneity/globalisation through media and modern culture, "dilution" of the *Gaeltachtaí* with the influx of more and more monolingual English speaking people, and sliding standards of teaching Irish and reduction of time allocated to teaching Irish in English medium education schools (see below, Harris, Forde, Archer, Nic Fhearaile, & Ó Gorman, 2006, pp. 34-36) but to say Irish is dead or dying is plainly untrue.

At the most optimistic, Irish language use is being maintained as can be seen by the use of Irish in media, schools, administrative system, and universities around the world, as well as its ubiquity in everyday life, e.g., on road signs, road markings, shop signs, and health warnings. But closer to the truth, perhaps, is that Irish language use, in both frequency and quality, is still in decline (see Chapter 2), and although there is an all-pervading Irish, the majority of people seem to be evading Irish.

However, the one realm where the majority of people cannot evade Irish is within education, which is an essential component of Irish language revival (Ó Laoire, 2005) and survival (Watson & Nic Ghiolla Phadraig, 2011). (See also Williams' (1994) five stages of revitalising a minority language). As much research data (e.g., Census, 2008a; Ó Riagáin, 2008) suggests that the majority of Irish people do not or can not use Irish in the homes and communities, the inclusion of Irish on the curriculum is paramount to aid children's education and active participation in a language with which they might otherwise not effectively come into contact. Irish on the curriculum, therefore, is a key element from which all other successes can be built.

The next chapter outlines (i) the journey of Irish in the education system since the formation of the state to the present day and (ii) children's ability in and use of the Irish language.

Chapter 2

Irish Education and Bilingualism

Irish, in the Republic of Ireland, has endured mainly because of its inclusion in the school curriculum (Murtagh, 2003). Importantly, this inclusion has ensured the production of Irish speakers; however, it has been considered less successful in producing bilinguals who use Irish regularly in the homes (Murtagh, 2003) and in the community (Harris, 2008a). Nevertheless, the State continues to use teaching of Irish as its foremost method in promoting societal bilingualism (Murtagh, 2007).

With the exception of the majority of children attending special educational needs schools, "all school going children in Ireland study Irish from when they enter primary school [the vast majority of whom continue to do so: a growing minority are exempted however (see p. 14 above)] until they complete their secondary education" (Murtagh, 2007, p. 432). The process of teaching Irish to children in mainstream English medium education (English medium) and Irish medium education (immersion) has been employed since the formation of the State.

This chapter outlines Irish in the education system from both a historical perspective and a current perspective. It will also look at the Irish and English language abilities of children in immersion, English medium, and *Gaeltachtaí* schools. Also, this chapter will look at the advantages of bilingualism in terms of metalinguistic awareness and look at some of the purported disadvantages of bilingualism in terms of lexical retrieval. First to be discussed however, are some of the many forms of bilingual education with particular emphasis placed upon immersion—the education model provided by *Gaelscoileanna* (*Gaelscoileanna,* 2010).

Bilingual Education: Globally

Globally, there are many types of bilingual educational systems that differ in their delivery and their purpose, and in the needs, skills, and limitations of their student base (see Baker, 2007, pp. 213-223, for review). In brief, Baker (2007) highlights several types of bilingual education (and sub-categories thereof) and classifies them by the (i) typical language skills of their students, (ii) classroom language, (iii) societal and educational aims, (iv) language outcome aims, and (v) efficacy of the schooling system in promoting bilingualism and biliteracy. Some common forms of bilingual education, as described by Baker (2007), include maintenance/heritage language systems, immersion, and mainstream with L2 teaching.

Maintenance/heritage language education. Maintenance/heritage language education teaches the curriculum to minority language children predominantly through their L1, but tuition is also provided through the L2. This system aims to strengthen children's languages and cultural identity, and is highly effective in developing bilingualism and biliteracy (Baker, 2007; however, see Otheguy & Otto, 1980, for a distinction between static maintenance, which aims to maintain a child's L1 skills at the level in which he/she entered school, and developmental maintenance, which aims for full biliteracy and bilingualism in the child).

As found in numerous countries with a minority language facing continual threat of decline and/or extinction, research shows that when used, maintenance/heritage language education can improve the revitalisation and use of the threatened language. Such success has been found in (i) Wales, where the Welsh language is threatened by English (e.g., Gathercole & Thomas, 2009; Lewis, 2008), (ii) D-model programmes in the

Basque country, part of which is found within Spanish borders, where Basque is threatened Spanish (e.g., Gorter & Cenoz, 2011; Sierra & Olaziregi, 1989, 1991), and (iii) Canada, where the French language is threatened by English (e.g., Collier & Thomas, 2004; Cummins, 1998), and indigenous and other minority languages which are threatened by English and/or French (e.g., Duff & Li, 2009; Cummins, 2005).

Of course, in many such maintenance/heritage education systems, students' linguistic backgrounds are not necessarily homogeneous; rather, as is often evidenced, some children may be first language speakers of the target language of the school, whilst others (often the majority of pupils) are experiencing an immersion education experience (Gorter & Cenoz, 2011; Cummins, 1998; Gathercole & Thomas, 2009; Gorter & Cenoz, 2011; Lewis, 2008; Macnamara, 1972; Mayr & Davies, 2011).

Immersion education. Contrary to maintenance/heritage language education, immersion education teaches the curriculum to majority language children predominantly through their L2, but tuition is also provided through the L1. Similarly however, immersion also aims to strengthen children's languages [and, often, cultural identity], and is highly effective in developing bilingualism and biliteracy (Baker, 2007; for the efficacy of such programmes; see also Cummins, 1998; Johnson & Swain, 1997; Swain & Lapkin, 1982).

The fundamental aim of immersion education is to replicate the normally subconscious process of children's L1 acquisition by establishing a naturalistic setting for L2 acquisition (Swain & Lapkin, 1982). From their first day in school, children are spoken to in the L2—the target language—thus providing and/or promoting authentic and meaningful L2 communicative experiences.

Research consistently shows no significant differences in the L1 skills of older children in immersion education and their monolingual peers (e.g., Bamford & Mizoknwa, 1991; Collier & Thomas, 2004; Cummins, 1978, 1998; Genesee, 1987; Gray, 1986; Swain et al., 1981). Although in terms of attainment levels, there have been reports of delayed L1 acquisition in immersion educated students; generally, however, such “disadvantages” are (i) temporary, occurring at the initial stages of bilingual acquisition, when the child is “sorting through” two linguistic systems, and (ii) disappear when the child has accumulated enough “critical mass” of exposure and experience with either language (e.g., Cummins, 1981; Collier, 1987, 1989; Gathercole, 2002; Genesee, 1985; Swain & Lapkin, 1982). Such findings support claims that immersion can be an effective way to facilitate L2 acquisition in children at no cost to their L1 (e.g., Collier & Thomas, 2004; Cummins, 1978, 1998; Klee, Lynch, & Tarone, 1998; Swain and Lapkin, 1982)—and more effective than mainstream education with L2 instruction as a subject (mainstream with L2 education) (Baker, 2007).

Mainstream with L2 education. Mainstream with L2 education teaches the curriculum to majority language children through their L1, with tuition provided in an L2 as a classroom subject. However, distinct from immersion and maintenance/heritage language systems, mainstream with L2 education aims to provide limited bilingualism and is a weak form of developing bilingualism and biliteracy (Baker, 2007). The poor efficacy rates of such programmes have been demonstrated in many countries. For example, researchers have found limited success of A-model programmes in the Basque country, whereby L1 Spanish speakers learn the curriculum through Spanish with Basque as a subject four to five hours a week (Gorter & Cenoz, 2011; Sierra & Olaziregi, 1989, 1991; Zalbide & Cenoz, 2008).

Of course, not all mainstream with L2 education programmes, or pupils thereof, are destined to fail linguistically. Success in acquiring an L2 is contingent upon various factors including those external to education, e.g., patterns and frequency of exposure (Gathercole & Thomas, 2005), attitudes and motivation (Cenoz, 2003; Dörnyei, 2006; Ó Muircheartaigh & Hickey, 2008), utilitarian and/or vocational needs (Baker, 2007; Murtagh, 2007), and one's confidence or perceived ability in a particular language (Gass, 1997; Baker & MacIntyre, 2000). Moreover, such factors could apply to all types of bilingual education; nevertheless, the general trend in research does seem to suggest that mainstream with L2 education programmes have poorer efficacy rates than maintenance/heritage language systems and immersion.

Although maintenance/heritage language systems, immersion, and mainstream with L2 teaching vary as to the efficacy in developing bilingualism, ranging from "strong" to "weak", typically, they all provide additive bilingualism (i.e., learning an L2 at no cost to an L1)—as opposed to subtractive bilingualism (i.e., learning an L2 at a cost to an L1) which can be seen in mainstreaming/submersion and transitional forms of education (see Baker, 2007). Additionally, the term additive bilingualism can be applied to Ireland's education systems (Baker & Jones, 1998)—of which, the principal differences are language of delivery and, to a lesser extent, home language of the students.

Bilingual Education: The Republic of Ireland

Whereas immersion education is typically provided to L1 (English) children who attend *Gaelscoileanna* (Baker & Jones, 1998; Harris, 2005; Ó Muircheartaigh & Hickey, 2008; Ní Bhaoill & Ó Duibhir, 2004; Ní Ríordáin & Ó Donoghue, 2009; Watson & Nic Ghiolla Phadraig, 2011), maintenance/heritage language education is typically provided to L1 (Irish) children who attend an Irish medium school in the *Gaeltacht* (Baker & Jones, 1998; Ní Bhaoill & Ó Duibhir, 2004). However, *Gaeltacht* schools have limited support structures and (similar to maintenance/heritage language education elsewhere) contain children with diverse linguistic backgrounds with varying skills in the language of instruction (Irish) which intensifies the challenges of effective teaching practices (Harris et al., 2006; MacDonnacha, Ní Chualáin, Ní Shéaghdha, & Ní Mhainín, 2005; Ó hIfearnáin, 2007) and has resulted in the decline of Irish use and quality over the years (see Harris et al., 2006; Hickey, 2001, 2007; Ó Giollagáin & MacDonnacha, 2008; Ó Murchú, 2001; Ó Tuathaigh 2008). Conversely, the efficacy of *Gaelscoileanna* has remained steadfast over the years (see Harris et al, 2006).

However, as outlined in Table 2, the most common form of education is mainstream with L2 teaching, or English medium, which is provided to the majority of children (Ó Laoire, 2005) most of whom are L1 (English)—few of whom attain mastery in Irish listening, speaking, and general comprehension skills (Harris et al., 2006). It would seem that in Ireland, as elsewhere, (i) Baker's (2007) claim that mainstream with L2 teaching is a weak form of developing bilingualism and biliteracy applies, but (ii) of course, there are myriad factors external to education per se that positively affects the success of children's L2 acquisition, e.g., child's attitudes towards the language motivation to learn and use it, and parental attitudes and support in their child learning Irish (e.g., Harris, 2005).

The efficacy of schooling systems in developing L1 and L2 skills are further explored on pp. 34-36, subsequent to issues pertaining to some historical and current perspectives of Irish medium education. Additionally, various types of bilingualism are explored in terms of definition and exposure to languages on pp. 104-105. Overall, the discussion and exploration of such topics are integral to one of the main planks of this study which compares the L1 skills of children who attend Irish medium or English medium education in Ireland.

Table 2. Statistics of pupils per primary school type, 2009. Adapted from T. Shanks, Department of Education and Skills, personal communications, March, 21, and June, 7, 2011).

Pupils per Primary School Type, 2009		
School Type	Number	Percentage
English medium	2188	69.1
Mixed[3]	727	23.0
Gaelscoileanna	147	4.64
Gaeltacht-Irish medium†	103	3.25

Historical Perspective of Irish Medium Education

In 1922, in the newly independent Irish State, attempts were made to re-popularise the Irish language. Irish was chosen to be the first language of the country with recognition given to the English language also (Coady, 2001; Ó Tuathaigh, 2008). It was declared that Irish was to be taught or used as a medium of instruction for at least one hour per day in all national schools (Owen, 1992). In addition to cultural significance, encouragement was given for teaching through Irish in the forms of capitation grants to students who were taught through Irish (Hindley, 1990; Ó Riagáin, 1997), by giving extra stipends for teachers who taught through Irish (Coady, 2001), and by the ruling—which discontinued in 1973 (Ó Riagáin, 1997)—that Irish language competence was necessary in order to be awarded State certificates, to become a civil servant, to become a teacher, or to enter university (Owen, 1992). Consequently, many schools became Irish medium.

Irish medium schools grew in number and by the 1940s 55% of all schools, both

[3] Mixed schools, as represented here, refers to a type of school that teaches at least two subjects through L2, Irish. †A further 20% of schools in the Gaeltacht are not "All-Irish" as in terms of language of curriculum delivery.

primary and secondary, taught the curriculum through Irish either partially or fully (Ó Tuathaigh, 2008)—the peak of Irish immersion (Cummins, 1978; Ó Buachalla, 1988; Ó Tuathaigh, 2008; Ó Riagáin, 1997). Over 250 immersion schools were situated outside the *Gaeltacht* (Coady, 2001; Cummins, 1978; Ó Riagáin, 1997)—circa 12% of primary schools (4.9% according to Ó Riagáin, 1997), and 28% of post-primary schools in English-speaking areas (Ó Buachalla, 1988).

However, the 1950s, a time of mass emigration and mass poverty, heralded the decline of this type of education (Ó Tuathaigh, 2008). Attributable to this decline was that among the people, a growing set of attitudes arose that were not favourable to the Irish language. Some of the many attitudes included a lessening of support towards Irish in the education system because teachers' ability was based solely on their ability to teach Irish, not their ability to teach other areas (Coady, 2001; Cummins, 1978) and resentment of the language because of a sense of hypocritical necessity of competence in it to progress socially even though the language was often not required (Hickey, 1999). Additionally, Ó Tuathaigh (2008) states that people's misgivings about the achievement of educational objectives, their uncertainty on the efficacy and usefulness of the language policy, their sense of "need" of Irish for purposes of emigration, and a growing Catholic identity as opposed to an Irish identity yet affiliation and sense of pride in the worldwide success of numerous countrymen including Shaw, Yeats, Joyce, and McCormack further contributed to the decline in Irish medium schools.

This decline had hastened by the 1960s (Harris, 2005; Ni Fhearghusa, 2002; Ó Duibhir, 2009) and by 1972 there were only 11 primary and 5 post-primary Irish medium schools (*Gaelscoileanna Teo*, 2007). However, throughout the 1980s and 1990s the amount of Irish medium schools increased because of "various interest groups, such as parents' organisations, and concerns over the decline of the use of the Irish language" (Kennedy, 2007, p. 159; also see Coady, 2001; Hickey, 2009; Ó Riagáin, 1997; Watson & Nic Ghiolla Phadraig, 2011) and parents' perception of the advantages afforded by immersion because of their smaller class size and larger range of equipment (Ó Laoire, 1995). This rise has continued into the early part of this century.

Current Status of Irish Medium Education

Recently, and although Irish medium education represents only 7.90% (immersion represents 4.64%) of the total number of primary schools in Ireland (T. Shanks, Department of Education and Skills, personal communications, March, 21, and June, 7, 2011[4]), the health and representation of immersion has significantly improved. This is attested by the fact that by 2010, in Northern Ireland, there were 31 *Gaelscoileanna* (primary schools) and 2 *Gaelcholáistí* (secondary/post-primary schools), and in the Republic of Ireland, there were 139 *Gaelscoileanna* and 37 *Gaelcholáistí*. This adds up to more than 37,800 children, outside the *Gaeltacht*, on the island of Ireland, not including the children of pre-school immersion (*naíonraí*) which by 2007 stood at 42 in Northern Ireland and 167 in the Republic of Ireland (*Gaelscoileanna*, 2010). Regarding the *Gaeltacht,* by 2007, there were a further 101 primary schools, 21 post-primary schools, and 71 *naíonraí* (*Gaelscoileanna Teo*, 2010) teaching all subjects (other than English) through the medium of Irish.

As of 2007, *Gaelscoileanna* had seen a rise of 10% in the previous 10 years; a growth of over 900% in the previous 30 years during and a growth of 1225% in both the

[4] Although there is much research showing the ratio of Irish and English medium schools in Ireland, many of these are out-dated. Those provided by Shanks (2011) are more relevant as they represent current trends. However, even though they are provided by the Department of Education and Skills they are not published data and should therefore be considered with caution.

North and Republic of Ireland combined in the previous 30 years (see *Gaelscoileanna* Teo, 2007). Coady and Ó Laoire (2002) state that in addition to perceived language and educational advantages for their children, the growth in *Gaelscoileanna* is significantly related to parents seeking a less traditional educational regime for their children, i.e., less emphasis upon Catholic education, and more parental power in contributing to their children's education and in the organisation of the school. Such factors contributed to the popularity of *Gaelscoileanna* which are one of the fastest growing sectors of schooling in Ireland (*Gaelscoileanna Teo*, 2010) and are highly sought after (Ó Caollaí, 2009).

Indeed, growth of *Gaelscoileanna* is too slow to meet the demand as they are oversubscribed and have to turn children away (*Gaelscoileanna Teo*, 2010). Despite such placement shortages, their popularity among parents (e.g., Ó Riagáin, 2007; MacMurchaidh, 2008), and some parents' active participation in establishing schools, *Gaelscoileanna* can nevertheless encounter challenges in recruiting teachers (Ní Ghallachair, 2008) and in gaining official governmental recognition (as recently experienced by *Gaelscoil Ráth Tó*, County Meath). Choice of schools, it seems, is far broader for parents who want to send their children to English medium than for parents who want to send their children to immersion. For instance, according to Ó Riagáin (2007), a further 23.4% of parents stated they would have sent their children to a *Gaelscoil* had there been one close to their home and a further 23.8% stated they were undecided on the matter. This shows there is potential for approximately half of Ireland's children being educated in their native language if they could gain access to a *Gaelscoil*.

Furthermore, contention abounds as to accessibility of *Gaelscoileanna* and certain privileges being awarded them by the state. However, it is likely that many such claims are not based on research pertaining to the socio-economic status (SES) of those who attend *Gaelscoileanna* as there are few or indeed no research conducted on such topics (Borooah, Dineen, & Lynch, 2009). Rather, such claims are likely based on common representations of Irish speakers and education, e.g., a common [mis] representation of the Irish language is that it is spoken by either advantaged urban dwellers or by disadvantaged rural dwellers (Coleman, 2004). As such, and with the lack of research that would help to resolve the contentious issues pertaining to *Gaelscoileanna* and SES factors and state privileges, the legitimacy of any comments of *Gaelscoileanna* "elitism" mostly remain in the area of anecdote and/or opinion (Borooah et al., 2009).

However, although an elitist charge may indeed be believed by many people in Ireland (MacMurchaidh, 2008) any such claims can be brought into doubt when one takes into consideration that *Gaelscoileanna* is heavily reliant upon parents, is a community led movement (MacMurchaidh, 2008), and exists in many strong working class areas such as *Cabra*, *Tallaght*, and *Finglas* (see *Gaelscoileanna,* 2008, for more on locations of *Gaelscoileanna*). Furthermore, whilst Hickey (1999) initially found that parents of children who attend *naíonraí* were more likely to have a higher occupational status and twice as many had third-level education when they were compared to parents of children in the non-*naíonraí* sector, upon further analyses Hickey (1999) showed that upward to approximately 33% of *naíonraí* parents also represent lowest and no education qualification. Thus demonstrating that, for *naíonraí* at least, an elitist charge is somewhat debateable because parents do not represent a homogenously educated group.

Regarding the pupils of *Gaelscoileanna,* it could be said that they are advantaged by the ruling that pupils gain extra points for answering their final state exams in Irish which could help them gain entry to university over their peers who conduct their exams in English. However, in their study of several Leaving Certificate subjects conducted in Irish, Mac Aogáin, Millar, & Kellaghan (2010) found that the bonus point system was performed on a sliding scale, and that high-achievers benefited minimally, i.e., a little over 50% of students received no bonus points, just fewer than 50% received five bonus points, only 5% received ten bonus points, and that the statistical odds that a student's bonus points would change an A2 to an A1 was 100,000 to 1.

Furthermore, although Watson and Nic Ghiolla Phadraig's (2008, 2009, 2011) research has found a connection between Irish language ability and university attendance, this link seems to apply to people born in the 1950s and 1960s and not to younger people. Although this could very well point to educational advantages throughout society (Watson & Nic Ghiolla Phadraig, 2011), it is also important to note that one could not enter university in the 1950s or 1960s without competence in Irish (Ó Riagáin, 1997; Owen, 1992) and that such links do not apply to the modern day *Gaelscoileanna*.

Suffice it to say contention abounds as to privilege bestowed children—parentally and/or governmentally—of immersion. Contention also abounds as to the efficacy of English medium and Irish medium schools in producing children who gain mastery in both English and Irish. The latter point shall be addressed first.

Irish Language Abilities of Children in Irish Medium, English Medium, and *Gaeltachtaí* Schools

It is interesting to note that whilst immersion has successfully produced more and more proficient Irish language users throughout the years, English medium is "no longer playing the revitalisation and language maintenance role it traditionally did" (Harris, 2007, p. 361) as it seems to be producing a growing minority of lesser skilled Irish language students.

Harris et al. (2006) compared the Irish listening and speaking skills of 12-Year Old children from 1985 to 12-Year Old children of 2002 and showed a near consistent declining trend in ability of children from *Gaelscoileanna*, *Gaeltachtaí* , and mainstream English medium (see Table 3 and 4 below). Regarding those who attain mastery in receptive and productive Irish language skills, statistics show there (i) was no significant difference in *Gaelscoileanna* results between 1985 and 2002, (ii) was a significant difference in *Gaeltachtaí* results between 1985 and 2002 in listening vocabulary, and (iii) were significant differences in English medium results between 1985 and 2002 for listening, general comprehension, and speaking vocabulary (see Table 3).

Table 3. Percentage of children who attain mastery of receptive and productive Irish language skills and how this has changed from 1985 to 2002. Three school types are represented: *Gaelscoileanna*, *Gaeltacht*, and English Mainstream Education. Adapted from Harris et al. (2006). Statistically significant differences are indicated with *.

Receptive and Productive Language Skills: 1985 to 2002 (1)

Percentage of Children Who Attained Mastery in Irish

	Listening Vocabulary			General Compr'sion			Speaking Vocabulary		
Year / Difference in Scores	1985	2002	+/-	1985	2002	+/-	1985	2002	+/-
Gaelscoileanna	90.4	89.3	-1.10	96.4	96.3	-0.10	72.0	66.4	-5.60
Gaeltacht	80.1	65.3	-14.8*	84.7	73.3	-11.4	73.6	59.2	-14.4
Mainstream Education	42.0	5.90	-36.1*	48.3	7.80	-40.5*	22.8	8.80	-14.0*

Regarding those who fail to attain minimal progress in receptive or productive Irish language skills, statistics show there (i) was no significant difference in *Gaelscoileanna* results between 1985 and 2002, (ii) was a significant difference in *Gaeltachtaí* results between 1985 and 2002 in listening vocabulary, and (iii) were significant differences in English medium results between 1985 and 2002 for listening, general comprehension, and speaking vocabulary (see Table 4).

Table 4. Percentage of children who fail to attain minimal progress in receptive and productive Irish language skills and how this has changed from 1985 to 2002. Three school types are represented: *Gaelscoileanna*, *Gaeltacht*, and English Mainstream Education. Adapted from Harris et al. (2006). Statistically significant differences are indicated with *.

Receptive and Productive Language Skills: 1985 to 2002 (2)									
	Percentage of Children Who Fail to Attain Minimal Progress								
	Listening Vocabulary			General Compr'sion			Speaking Vocabulary		
Year/Difference in Scores	1985	2002	+/-	1985	2002	+/-	1985	2002	+/-
Gaelscoileanna	0.70	0.50	-0.20	0	0	0	4.50	9.40	+4.90
Gaeltacht	1.40	4.90	+3.50*	1.40	4.30	+2.90	8.50	16.8	+8.10
Mainstream Education	14.3	42.3	+27.9*	11.8	36.2	+24.4*	48.5	65.9	+17.4*

These data show the Irish language abilities of children from *Gaelscoileanna* have remained steadfast over the years and they are still performing better on these skills when compared to their peers in the *Gaeltachtaí* and English medium. Importantly, this gap is widening. The cause, it seems, is that the Irish language abilities of children from the *Gaeltachtaí* and, particularly, English medium are in drastic decline. Decline per group is discussed below.

First, Harris (2007) states the decline in English medium children's performance on tests used by Harris et al. (2006) is attributable, in part, to various factors including (i) lack of suitable methods and materials for teaching Irish; (ii) substantial reduction in amount of time in teaching Irish—coming from a minimum of 5.6 hours per week in 1976 to a minimum of 3.5 hours in 1999; (iii) teacher disillusionment of a disproportionate responsibility of keeping the language alive; and (iv) lack of engagement by parents in using or learning Irish despite their having positive attitudes towards their children learning Irish (see Harris et al., 2006 for review). However, although there is no evaluation complete at this stage, new methods and materials of teaching Irish seem to be having a positive effect (Harris, 2007)—which creates optimism for an improvement in children's Irish language abilities in mainstream schools.

Second, decline in *Gaeltachtaí* children's performance on the tests is due, in part, to various factors including: children's diverse linguistic background and ability and exposure to Irish both in home and school (Harris et al*.,* 2006; cf ; Hickey, 2001, 2007; MacDonnacha, Ní Chualáin, Ní Shéaghdha, & Ní Mhainín, 2005; Ó hlfearnáin, 2007; Ó Murchú, 2001; Ó Tuathaigh 2008); linguistic complexity in addition to teaching Irish as a second language in *Gaeltachtaí* are having negative effects on L1 children's Irish ability (Ó Giollagáin & MacDonnacha, 2008) ; and the influx of in-migrants in communities [learners and non-learners of Irish] is exerting negative-effects/reduction on native Irish speakers language use and ability (Ó Giollagáin & MacDonnacha, 2008). The *Gaeltacht*, states Ó Tuathaigh (2008), "is melting away as inexorably as the polar ice-cap" (p. 40).

Finally, despite the massive growth of enrolment in *Gaelscoileanna,* Harris et al. (2006) found no statistical change in *Gaelscoileanna* children's performance when compared across years, but did find that *Gaelscoileanna* children outperformed their peers from English medium and *Gaeltachtaí* when compared on tests used in their study. Harris et al. (2006) hypothesise that as *Gaelscoileanna* expanded they continued to attract children from an educational, linguistic, and/or family background that are conducive to producing high achievement in Irish, and this could also partly explain the decline in Irish ability of children from mainstream education.

English Language Abilities of Children in Irish Medium, English Medium, and *Gaeltachtaí* Schools

There has been a paucity of research in Ireland that investigated the effects of immersion on children's L1 academic ability (Kennedy, 2007; Ó Muircheartaigh & Hickey, 2008). Naturally, such a shortage can reduce the level of confidence in the claims relating to the efficacy of this type of education. Beyond Ireland however, where much research has been conducted on this topic, the general consensus is that immersion is an effective means of education (e.g., Bamford & Mizoknwa, 1991; Collier & Thomas, 2004; Cummins, 1978, 1998; Genesee, 1987; Gray, 1986; Swain et al., 1981).

Typically, bilingual children can initially "lag" behind their monolingual peers in L1 skills; however, such differences often quickly disappear when bilingual children attain increased exposure to their L1 (Gathercole, 2002; Genesee, 1987; Swain & Lapkin, 1982). In fact, such is the characteristic success of immersion children's L1 acquisition that typical disadvantages of bilingualism are often not present. For instance, although "simultaneous"[5] bilinguals are often found to score lower than their monolingual peers on receptive vocabulary tasks in both of their languages (e.g., Bialystok, 2007; Oller, Pearson, & Cobo-Lewis, 2007) "successive" bilinguals do not necessarily experience such drawbacks in their L1 (e.g., Bamford & Mizoknwa, 1991; Gray, 1986; Swain et al., 1981). Indeed, in a similar vein, many other linguistic advantages, e.g., divergent thinking (Ianco-Worrall, 1972), that have been associated with "simultaneous" bilinguals (perhaps solely) can also be acquired by immersion children, e.g., creativity (Lasagabaster, 2000) and descriptive abilities of formulating scientific hypotheses (Kessler & Quinn, 1987).

However, "costs" of bilingualism do exist for immersion educated people. This can be typically seen in tasks requiring rapid lexical retrieval that can be negatively

[5] Baker (2007) highlights a distinction between simultaneous and sequential bilingualism. For example, whereas simultaneous bilinguals can acquire two languages in the home from birth, a sequential bilingual might acquire one language in the home and their other language in school. Sequential and successive bilingualism can be considered synonymous (cf Glennan, 2002; Goodz, 1994; Grosjean, 1982).

impacted by bilingualism, be that “sequential” bilingualism (Bialystok, 2009) or “successive” bilingualism (Linck, Kroll, & Sunderman, 2009), as lexical selection is hindered by the necessity of inhibiting one language when choosing another (e.g., Green, 1998, see below).

Regarding research on the effects of immersion in Ireland, Parsons and Lyddy’s (2009a) results seem to correspond to research of the global scene—that immersion education does not negatively affect children’s English academic abilities (see Parsons & Lyddy, 2009a, 2009b, for review). Parsons and Lyddy (2009a) compared the English and Irish reading abilities of 12 groups of children (3 age-groups from 4 different schools). The children came from the following types of schools: English medium (n = 1) and immersion (n = 3)—2 *Gaelscoileanna;* one which started formal reading in English (ERF), one which started formal reading in Irish (IRF); and 1 school in the *Gaeltacht* (GT), which started formal reading in Irish. In brief, results show that children who were exposed to English language early in their education statistically outperformed those who were exposed to English later. Importantly however, such differences were not found after 6 years of education as children who received English later in education had eventually caught up with their peers (see Table 5).

Furthermore, in longitudinal analysis of the youngest children who were tested after 2, 3, and 4 years of education, Parsons and Lyddy (2009b) found that when compared to their English medium peers on English reading ability, *Gaelscoileanna* children had “caught up” whilst *Gaeltacht* children, who scored significantly lower, were, potentially, beginning to “catch up”. Also, after four years of education, children from all school types attained parity on scores of vocabulary. As such, Parsons & Lyddy (2009b) state, with a degree of caution due to the possibility of a school effect, that it seems, in

Ireland as elsewhere, “the language in which reading is formally introduced is not critical to later first language word decoding skill” (p. 27).

Table 5. English reading and vocabulary knowledge of four groups of children differentiated by their introduction to English language reading on the school curriculum. Adapted from Parsons and Lyddy (2009a).

English language skills of children differentiated on their introduction to English			
Year of Education	2	4	6
English reading ability	English Medium and ERF>IRF and GT	English Medium, ERF, and IRF>GT	No difference
English vocabulary	No difference	English Medium, ERF, and IRF>GT*[6]	No difference

Further corroboration of non-existent negative effects of immersion on English academic abilities comes from Ó hAinifèin (2008) who compared the reading abilities of children from *Gaelscoileanna*—over 70% of these schools took part—on national standards scores of the *Drumcondra Primary Reading Test* and the *Mary Immaculate College Reading Attainment Tests*. Children in 2nd Class (4 years of education) and children in 5th Class (7 years of education) performed significantly better than the expected equally proportioned 33% range per lower, middle, and upper category—achieving, instead, 22.5% for lower range, 35% for middle range, and 42.5% for upper range in 2nd Class and 21.2 % for lower range, 36.5 % for middle range, and 42.3 % for upper range in 5th Class. Based on these findings Ó hAinifèin (2008) concludes that children from *Gaelscoileanna* are “way ahead” (p. 46) of children from English Medium.

Metalinguistic Awareness

There are three cognitive dimensions of language proficiency—oral, literate, and metalinguistic—and each subsequent dimension requires higher levels of analysis and

[6] Parsons and Lyddy (2009a) suggest this difference is a cohort effect because there is no difference in the older children group.

control (Bialystok, 2005). However, whereas a basic understanding of the terms "oral" and "literate" are apparent (speaking and reading and writing), an understanding of the term "metalinguistic" is less obvious.

Of the many definitions of the term "metalinguistic awareness" most descriptions have the underlying concept that metalinguistic awareness is the ability to understand, control, and attend to a language and its properties. The focus is not on one's ability to use a language per se but on one's ability to understand and manipulate the components of a language, e.g., the ability to decipher the accuracy, and correct if necessary, the grammar, word order, morphological structure of sentences. This suggests a certain level of overlap between linguistic awareness and metalinguistic awareness; however, although both share the same foundations, both also develop and operate independently (Bialystok, 2005).

For instance, some definitions of metalinguistic awareness include (i) being conscious of linguistic form and structure to enable consideration of how such form and structure relates to and produces the fundamental meaning of words (Cazden, 1974); (ii) the capacity to manipulate and consider words (Tunmer & Herriman, 1984); (iii) "the ability to attend and reflect upon the properties of language" (Galambos & Hakuta, 1988, p. 143); and (iv) "the explicit representation of abstract aspects of linguistic structure that become accessible through knowledge of a particular language" (Bialystok, 2005, p. 124).

Generally, whether one is monolingual or bilingual, repeated exposure to a language will enhance linguistic and metalinguistic skills. However, it seems that bilinguals have an advantage when compared with monolinguals in their metalinguistic awareness (e.g., Ben-Zeev, 1977; Bialystok, 1986, 1988; Hakuta, 1986; Jessner, 1999) because becoming [and being] a bilingual necessitates the learner [or user] to consider language as an object of thought (Cummins, 1978, 1993) rather than a means of communicating ideas alone. Generally, unlike the learning or production of their L1, children's learning and production of their L2 is aided by knowledge of their other language, which can often need to be inhibited (Carlisle, Beeman, Davis, & Spharim, 1999); consequently, children need a higher degree of control and attention when using their L2 as opposed to monolingual speakers using their language (e.g., Carlisle et al., 1999; Gathercole, 2002; Bialystok, 2005). Evidence of such higher degrees of analysis and control upon one's language use can be seen in studies relating to grammatical judgement tasks whereby children must decipher whether or not the test stimuli of written/spoken sentences are correct or not (e.g., in terms of grammar, morphology, word order). Bilinguals, it seems, perform better than their monolingual peers on such tasks.

For example, when compared to their monolingual peers, Bialystok (1988; cf Bialystok, 1986) found a bilingual advantage in French-English bilingual children's syntactic awareness in terms of their ability to correct written sentences whereby errors lay in verb tense, negation, particle placement, agreement, and word order. Similarly, Gathercole (2002) found a bilingual advantage in English-Spanish bilingual children's morphosyntactic awareness in terms of their ability to correct spoken sentences whereby errors lay in (i) mass/count distinction in English, (ii) gender in Spanish, and (iii) *that*-trace structures in both English and Spanish. It seems that such bilingual advantages are due to the language experiences of being a bilingual, i.e., the necessity of perpetual and high degrees of analysis and control to enable effective and appropriate communication.

Because bilinguals' two languages are activated even when only one language is in use (e.g., Green, 1998), this necessitates consistent attention and control, and improves intra-language use as well as inter-language use on a linguistic and metalinguistic level. Evidence indicates that knowledge of one language is transferable to any new language being learnt because language learners draw on various aspects of previous language learning in any subsequent language learning (Bild & Swain, 1989; Klein, 1995; Ó Laoire, Burke, & Haslam, 2000). This suggests that learners of a second language, or multiple languages, understand the (i) flexibility of word meaning and (ii) interconnectivity of languages and can use this knowledge to support further learning and use of other languages. Such cross-linguistic influences were reported by Dillon (2009) who found that when compared to their peers in *Gaeltacht* or English medium schools, *Gaelscoileanna* children were more likely to use their metalinguistic awareness of the structures of languages by creating associations between their L1, L2, and L3 when learning a third language.

Furthermore, when considering a bilingual's language use, Grosjean (2001, 2002) emphasises the importance of "language mode"—whereby a bilingual's languages and their processes are activated or deactivated (cf Green, 1988 above) in relation to various points of a situational continuum which is contingent upon various contextual factors (e.g., why, what, with whom they speak in any particular setting). Depending upon the interlocutor and/or context, Grosjean (2001, 2002) adds that a bilingual can be a in a monolingual mode, availing of use of one of his/her languages only, or in a bilingual mode, availing of both languages and perhaps blending, code-switching, borrowing, etc. as the circumstances may warrant.

A bilingual's discernment of the potential arbitrariness and flexibility (or inflexibility) of language use could extend to his/her understanding of the arbitrariness of language users—insofar as that not only can objects be represented in several different ways by different languages, but that objects can also be represented in several different ways by different language users. Such knowledge, states Goetz (2003), could help to promote children's theory of mind—the capacity to comprehend that other people have beliefs, desires and intentions different from one's own and using this understanding to predict other people's behaviour (Premack & Woodruff, 1978).

Disadvantages of Bilingualism

The evidence above shows that there are many benefits to having two languages and that bilingualism and the benefits accrued from it can be delivered through immersion education. However, there may also be a cost of bilingualism because of the lexical conflict that occurs from having two languages.

Regarding L2 literacy acquisition, there is a considerable body of research showing that bilinguals' L2 literacy acquisition, although initially less accelerated, eventually gains equivalency to that of their monolingual peers (e.g., Genesee, 1987; Parsons & Lyddy, 2009a, 2009b; Swain & Lapkin, 1982). Early delays need not be considered a disadvantage since bilingual children eventually do become as proficient as their monolingual peers, particularly in their most dominant language, but also in their less dominant language, as they gain more and more exposure and experience with each language.

However, psycholinguistic tasks have highlighted specific disadvantages that may arise from having two linguistic systems. Usually, such tasks pertain to the speed of response on linguistic tests, not to the linguistic or semantic skills specifically (e.g., Bialystok, Craik, & Luk, 2008; Johnson & Newport, 1989; Weber-Fox & Neville, 1996). Bilinguals' performance on such tasks include the following: more tip-of-the-tongue experiences in adults (Gollan & Silverberg, 2001); longer naming latencies for adults—but no semantic deficits (Gollan, Montoya, Fennema-Notestine, & Morris, 2005); slower lexical retrieval (Bialystok, 2008; Bialystok et al., 2008); more errors in picture naming (Roberts, Garcia, Desrochers, & Hernandez, 2002); and vocabulary deficits for fluently bilingual children (Genesee, Nicoladis, & Paradis, 1995; Lanvers, 2001; Oller & Eilers, 2002).

Additionally, regarding metalinguistic awareness, although it seems that bilingualism provides an advantage overall, there are instances whereby the experience of being bilingual can hinder performance on certain metalinguistic tasks because of the conflict that arises from knowing two languages (Bialystok, 2005). For example, the Lexical Fluency task, which typically is a task with three trials each lasting a minute whereby participants are required to name as many words that (i) begin with a certain letter (often F, A, or S), (ii) belong to a certain category (often animal or used in the kitchen), and (iii) begin with a certain letter and belong to a certain category of (i) and (ii) above. This is a metalinguistic task because it requires the cognitive processing and/or filtering of language selection and production using several arbitrary constraints (e.g., linguistic, semantic, or linguistic and semantic) and typically demonstrates a bilingual disadvantage particularly in the linguistic and semantic category (e.g., Bialystok, 2008; Gollan, Montoya, & Werner, 2002; Portocarrero, Burright, & Donovick, 2007).

There are several possible reasons for the bilingual deficits as outlined above. Three reasons include the following: (i) when compared with monolinguals, bilinguals' reduced exposure time in any one language creates "weaker links" in connections required for language selection (Michael & Gollan, 2005); (ii) the age of acquisition of the second language can affect the processing of syntax, morphology, and phonology thereby affecting the speed of language selection (Hernandez & Li, 2007); and (iii) parallel activation of both of their languages and cross interaction of both languages will require the need for attention, inhibition, monitoring, and switching thereby causing a "lexical conflict" that slows down lexical retrieval (e.g., Costa, 2005; Green, 1998). However, these disadvantages pertain to speed of activation and not to the linguistic and semantic understanding of language (as stated above), and are far outweighed by the advantages accrued from bilingualism (see Chapter 4: Executive Function) as well as the potential cultural, pluralistic, and heritage significance gained by knowing two languages.

Summary

The findings of Parsons and Lyddy (2009a; 2009b) and Ó hAinifé in (2008) which showed children from immersion education systems, who predominantly came from English speaking backgrounds, acquired no negative effects on their L1 (English) literacy skills due to being educated through their L2 (Irish) is integral to the research focus of this dissertation. Likewise, similar importance is given to the evidence showing the largely positive effects of bilingualism on children's metalinguistic awareness. Such importance is given to these two areas because among several themes investigated in the present study, particular attention is given to English language abilities—Reading, writing, vocabulary, and metalinguistic awareness—of 2nd Class and 6th Class immersion children who come from English speaking backgrounds.

Regardless of the type of education received, and despite the common perception and common negative experience of Irish as a badly taught subject [in English medium] the majority of Irish people favour it been taught in schools and favour its development and use (Nic Pháidín & Ó Cearnaigh, 2008), as well as favouring the ethos and appreciating the success of *Gaelscoileanna* in increasing the use of Irish on the island of Ireland (MacMurchaidh, 2008). It seems that when it comes to the Irish language in general, many Irish people have a positive attitude. Use, however, is inconsistent with these attitudes.

* * *

The next chapter focuses on the complexities of these attitudes showing, specifically, that although there is a general positive attitude towards Irish the majority of Irish people are reluctant or unable to personally engage in the Irish language and/or the Irish medium education sector.

Chapter 3

Attitudes and Use

Although the majority of Irish people's view of the Irish language is favourable, attitudes towards Irish are, nevertheless, complex. Many factors contribute to the intricacy of thoughts and feelings about Irish, including, age, area, educational background, marital status, parental status, occupational status, social status, and gender (e.g., Mac Gréil and Rhatigan, 2009; Ó Riagáin, 2007), thereby increasing the richness and diversity of attitudes towards Irish, whilst, simultaneously, increasing the research difficulty in acquiring a comprehensive view of people's stance. Such views can be attained by surveys on attitudes, which can provide information on people's current thoughts, beliefs, desires, and preferences (Baker, 1992) and can be used to influence governmental policy (Dunleavy, Margetts, Bastow, Bouçek, & Campbell, 2003). Additionally, such views can help researchers identify people's current perceptions and use of a language and help children, parents, teachers, and language planners promote effective use and attitudes towards a language (e.g., Ó Muircheartaigh & Hickey, 2008).

This chapter outlines current attitudes toward the Irish language and its use in society, looks at attitudes toward Irish language in English medium and Irish medium education, and shows evidence of current immersion and English medium children's and parents' attitudes towards and use of Irish.

Attitudes towards the Irish Language

Throughout the years, various surveys have shown that the majority of Irish people have positive attitudes towards Irish (see Committee on Irish Language Attitudes Research, CILAR, 1975; Institiúid Teangeolaíochta Éireann, ITÉ, 1983, 1993; Ó Riagáin & Ó

Gliasáin, 1984, 1994; Irish Marketing Surveys, 1978, 1979, 1980, 1982, 1985; Mac Gréil, 1990; Mac Gréil and Rhatigan, 2009; see Ó Riagáin, 1997, for review), as Irish is seen as an ethnic symbol of cultural identification (e.g., McDonagh, Varley, & Shortall, 2009; Ó Fathaigh, 1997; Ó Riagáin, 2007). Specifically, Ó Fathaigh (1997) reports a composite score of several of the above surveys (1975-1990) which shows that 35% of people are "somewhat in favour of Irish", 21% of people are "strongly in favour of Irish", and 60% of people agree that Ireland would lose part of its separate identity if it lost Irish-speaking people (pp. 5-6). Mac Gréil and Rhatigan's (2009) study, one of the most current and comprehensive research on this issue, found similar findings.

Mac Gréil and Rhatigan (2009) researched over 1,000 adult Irish people's attitudes toward, competence in and use of Irish and found continued increase in support for Irish and competence in it. Data show that while only 6.7% of people would like to see Irish discarded the remainder would either like to see it preserved (52.9%) for its cultural value and spoken in the *Gaeltacht,* revived (38%) into a bilingual Irish/English speaking society, or revived (2.4%) into an Irish speaking community. However, the findings of people's attitudes toward Irish and their competence in it, when compared to their use of Irish are inconsistent. For Instance, regardless of age, gender, marital status, educational status, or occupational status, people's favourable attitude towards Irish grows substantially whilst they are out of education and less exposed to Irish (from 42.6% to 56.7%), and, importantly, of the 47% of people who claimed reasonable ability in Irish, only 23% used Irish regularly (under half of whom used it weekly or more often).

Ó Riagáin (2007) found similar results showing that whereas 8.4% of people would like to see Irish discarded, 34.8% would like to see it preserved, 43.4% would like to see it used throughout society, and 61.5% claimed ability in speaking Irish. (Ó Riagáin (2007) does not present frequency use of Irish data.)

Indeed, Mac Gréil and Rhatigan (2009) and Ó Riagáin (2007) (cf other surveys mentioned above) demonstrate that many Irish people value Irish as an integral part of their identity and Ireland's identity. However, the gap between the symbolic and (personal) instrumental importance attributed to Irish is long-standing and widening and Irish is becoming more commonly seen as a language that has lost its utility (McCubbin, 2010, p. 458).

As referred to by McCubbin (2010), the MORI Ireland (2004) survey found that whilst 89% of 1,200 respondents agreed that the maintenance of Irish was important to Ireland's identity, only 39% felt that their using Irish was important to their Irish identity. Such disparities, claims McCubbin (2010), suggest that most people place the onus of Irish utilisation elsewhere, i.e., the *Gaeltacht*; despite (i) most people's acquisition of at least some knowledge of Irish throughout their school years (see education chapter, p. 22) and (ii) many people's (approximately 50%) claims of ability in speaking Irish (cf Census data, p 9; cf other surveys mentioned above).

In addition, Harris and Murtagh's (1999) showed a similar disparity between English medium parents' self-reported attitude towards Irish and their involvement and/or commitment in the process of their children's learning Irish. Specifically, whereas two-thirds of parents reported that their attitude to Irish was "strongly/somewhat in favour", frequent homework help ("usually help") was more likely to be given with mathematics (70%) or English (48%) than with Irish (35%). Also, children's Irish scholastic achievements received less praise from parents than any other subject. This further highlights an inconsistency between attitude and behaviour.

Although lack of motivation (Mac Gréil & Rhatigan, 2009) or commitment could partly explain the incongruence between people's positive attitudes towards Irish and their use of Irish (as use is more associated with commitment than attitude (CILAR, 1975)), there may be other factors involved. For instance, such factors may include (i) limited opportunities within communities for one to use Irish resulting in many people losing their ability to communicate effectively in Irish (Mac Gréil, 1990; Ó Fathaigh, 1997), (ii) limited Irish ability (Ó Riagáin & Ó Gliasáin, 1984, 1994) despite several years of education (see Harris et al., 2006, above, p. 34-36), (iii) embarrassment as the social standing of using Irish over the years was low, but is now rising (Mac Gréil & Rhatigan, 2009; see also Atkinson & Kelly-Holmes, 2010, Kelly-Holmes & Moriarty, 2007, Kelly-Holmes, 2006), and (iv) unawareness of interlocutor's skill in Irish thereby choosing English as the default language (see CILAR 1975).

However, considering Irish is virtually ubiquitous in Ireland, e.g., on streets (shop signs), on roads (road signs), and in the media (television, radio, and newspapers), there is nevertheless a majority of people who do not engage with the language, even at minimal levels of exposure. For instance, a composite score of the CILAR and ITÉ surveys show that 90% of people use Irish infrequently, and 70-80% of people do not use Irish through various forms of media—i.e., radio, television, newspapers, books, magazines—or in their homes (Ó Fathaigh, 1997), which seems to have had remained steady over the years. More recent comparisons (Mac Gréil, 1990; Mac Gréil & Rhatigan, 2009) show similar results.

Findings from the above research seems to suggest that people's attachment to Irish is less part of their lifestyle than part of their ideology and seems to correspond with Williams' (2009) statement that cultural and group identity (and moral) terms are more often used for reasons of supporting minority languages, rather than, say, utilitarian aspects. A similar sentiment is expressed from Hodges (2011), investigating immersion education (albeit in a Welsh context), that parents' primary reasons for enrolling their children are cultural, followed by educational and, to a lesser degree, economic.

Attitudes towards Irish Medium Education

There are however, sections of Irish society actively engaged in Irish language use and survival—this is best demonstrated by the demand-led, grass roots movement *Gaelscoileanna* (Coady & Ó Laoire, 2002) which has seen exponential growth in recent years. This schooling system, which currently stands at 4.64% (T. Shanks, Department of Education and Skills, personal communications, March, 21, and June, 7, 2011), is heavily reliant upon parents and is a community led movement (MacMurchaidh, 2008) rather than a governmentally led movement. Such is the desire for *Gaelscoileanna* that were there more available they could potentially represent an even larger proportion of the education system as up to 23.4% of parents of school going children state they would send their children to a *Gaelscoil* if there was one close to their home (Ó Riagáin, 2007). Such parental responses display enthusiasm for *Gaelscoileanna* and the Irish language and suggest the possibility of an active engagement and interest in the revival of Irish throughout a large portion of Irish society.

Despite the success of *Gaelscoileanna* and further parents' willingness to engage in immersion, parents nevertheless have a complex view of immersion. When asked what type of schooling they would send their child to nearly a quarter of parents said they would send their child to a *Gaelscoil*. However, when asked what type of schooling is suitable for most children only 5.1% said immersion and a further 9.6% said bilingual education with some subjects taught through English and some taught through Irish. The vast majority (71.1%) preferred English medium with Irish as a subject only (Ó Riagáin, 2007). This could suggest that for a certain portion of parents willing to send their children to immersion, they do so for ideological reasons and are willing to "sacrifice" some abilities in other parts of the curriculum to gain in Irish language. However, it might suggest that such parents might have other concerns (parental commitment, sustainability, limited resources, etc.), especially if they are aware/believe that no academic disadvantages exist by receiving immersion education when compared to other forms of education provided in Ireland (for more on comparative studies of reading ability, see Harris et al., 2006; Ó hAiniféin, 2008; Parsons & Lyddy, 2009a, 2009b).

For instance, perhaps these parents are concerned or aware, as per McCubbin, (2010) above (i) of a general incongruence amongst people regarding their "personal dis-engagement" with Irish whilst perceiving it to be important for the country as a whole and (ii) that some of these people are potential parents of *Gaelscoileanna* children who might place the onus of utilisation of Irish on their own children, whilst not fully engaging with Irish themselves. Such could be seen as a potential to negatively affect all children's immersion education and dilute the process as a whole, and might partly explain why some parents feel that immersion is not suitable for everyone. (See Harris & Murtagh (1999), p. 53 below, for more on disparities between parental attitudes and commitment to Irish language use with their children.)

Attitudes towards Irish in English Medium Education

As mentioned above (Harris et al., 2006, p. 34-36), where the *Gaelscoileanna* are succeeding in producing competent Irish language users, English medium is failing. Nevertheless, many English medium teachers, some of whom believe that Irish language teaching is in crisis (Ó Raghailligh, 2005), are calling for a reduction in the hours of teaching Irish for subjects like mathematics or science (Coady, 2001). Likewise, the failings of Irish on the curriculum have led to (i) almost constant criticism from the media, states Ó Laoire (2007) and (ii) *Fine Gael*'s Enda Kenny (the incumbent *Taoiseach* = Ireland's Prime Minister) to propose scrapping Irish as a compulsory subject for pupils sitting their Leaving Certificate (see MacMurchaidh, 2008). However, whether or not this is supported by the Irish public remains unclear.

At primary school level however, research shows that teachers (Carr, 2008) and parents (Harris & Murtagh, 1999; Ó Riagáin, 2007) are in favour of Irish on the curriculum. For instance, whereas Ó Riagáin (2007) found 85.8% of parents preferred their children being taught Irish (of whom 71.1% chose Irish as a subject only), Harris and Murtagh (1999) found that 75% of parents were "strongly/somewhat in favour" of their children being taught Irish, and 83.3% felt that teachers were doing their best.

The failure in the education system is seen as predominantly due to poor materials (Harris et al., 2006; Little, 2003) and poor teaching methods (Carr, 2008; Little, 2003) even though many teachers' attitudes to Irish in mainstream education are favourable (81.3%; Carr, 2008). However, this favourable outlook is significantly in decline—down 8.9% since 1985 when compared to 2002 (Harris, 2008b). Also in decline are teachers' ability in teaching Irish (see Department of Education and Science, 2007, for review). According to the Department of Education and Science (2007), of all the evaluated teachers of primary school level—who were qualified to teach—almost 25% had weaknesses in their own language ability, 9% had deficiencies in teaching Irish, and nearly half only achieved a standard of fair or poor Irish teaching ability.

Carr (2008) states, however, that the decline is due to a changing topography of background of teachers who were once predominantly from the *Gaeltacht*—where Irish is a home and community language. The current trend shows teachers predominantly from English speaking areas who learned Irish in schools via ineffective methods which the Department of Education and Science knew were ineffective (Carr, 2008). It seems that the decline in quality of use of Irish in the education system is in part due to the previous generations of educationalists and policy makers.

Attitudes of Irish Medium and English Medium Children (and Parents) towards the Irish Language

Coady (2001) surveyed the use of Irish among 6th Grade children and their values of bilingualism on a social level (based on the importance of learning/knowing an L2 to facilitate meeting people) and on a personal level (based on the importance of learning/knowing an L2 to facilitate better grades and career). Children came from two school types—Irish Medium and English medium. In addition parents received the social and personal values sections of the survey.

Analyses revealed that there were no significant differences between both groups on self-reported social and personal values of Irish but Irish Medium children did have a higher mean score than their peers on the majority of measures; thus, states Coady (2001), suggesting that Irish Medium children were more likely to be aware of the benefits of being bilingual. However, Irish Medium children used Irish significantly more than did their English medium peers. Although use of Irish findings could be expected, results do show limited use of Irish outside of school and that school groups did not significantly differ on this variable, which suggests similar efficacy rates of Irish medium and English medium in their transmitting Irish into the communities.

Attitudes and Use

When compared to their English medium peers, Irish Medium parents were significantly more likely to report that knowing Irish helps to meet different kinds of people; otherwise, parents' social and personal values were mostly similar across groups.

Further research by Murtagh (2007) looked at Leaving Certificate—Irish Medium, Mainstream Higher Level (MHL), and Mainstream Ordinary Level (MOL)—children's current attitudes towards and use of Irish and found a near rising trend (MOL to MHL to immersion) in self-reported desire to learn, ability in, use of, and opportunity to speak Irish. Specifically, the data shows that desire to learn Irish is stronger in groups where children learn more or higher level of Irish—on a scale of 3, self-reported desire to learn Irish are as follows: immersion are 2.5; MHL are 2.0, and MOL are 1.7; all groups, however, report that desire comes more so from a utilitarian value than an interest in Irish value as proficiency in Irish can enhance career possibilities.

Regarding children's ability in Irish, approximately 19% of immersion children report ability at "most conversations" level and 81% report ability at native speaker level, whereas 48.1% of children in MHL and 3.7% of children in MOL report ability at "most conversations" level. None report native speaker level. This further supports claims that English medium is failing in transmitting Irish language to native speaker abilities.

Of course, the method used by Murtagh to gather information, Self-Report, is open to respondent bias. It could be argued that some students responded in line with how they thought they should respond and that their responses do not reliably match their actual beliefs or ability. However, it is reasonable to assert (i) that such sentiments could apply across all groups, (ii) that desire and ability are not mutually exclusive and work in harmony in a learning environment, (iii) that skill in a language is more likely to generate transmission of a language, and (iv) that students' overall utilitarian value to language rather than a cultural value is indicative of their frankness and openness in response.

Regarding children's use of Irish outside of school, many situations of use were investigated (see Murtagh, 2007, for review) and showed that immersion children were more likely to seek and use Irish in various settings than were their MHL or MOL peers. However, among the more striking self-reported use of Irish was that familial use of Irish was lower than might be expected with the immersion group (12.5%) when compared with the MHL group (19.2%) and the MOL group (14.8%). This could suggest that Irish is somewhat a "school phenomenon" (as per Baker, 2007, p. 272; see also Swain & Johnson, 1997) as immersion children applied an element of attained "my daily quota" approach (see attitudes segment in results section below). It could also suggest differences in use in relation to ability—those with native like skills would be less likely to seek help from parents than those with "most conversations" levels or lower.

Also, 18.8% of immersion children used Irish to socialise with friends whereas both MHL and MOL groups did not use Irish to socialise with friends. This suggests that immersion is more efficacious in transmitting Irish into the community than English medium—both at higher and ordinary Irish level.

Summary

The findings outlined above are important as they give an indication of the current positive attitudes towards Irish, whilst showing a disparity in the usage of Irish in Ireland within several sectors of the country. It is self evident that a passion for Irish, especially in terms of its ethno-cultural significance, exists, so too does a shortage in use—bridging this gap is tantamount to the survival of Irish, because group identity and cultural aspects, although very important, are not enough to reverse language shift (McCubbin, 2010). English medium is succeeding in passing on an element of Irish heritage via Irish language education but is failing in transmitting Irish language to native speaker abilities and is declining in transmitting Irish language to conversational level ability.

Gaelscoileanna, however, are succeeding in transmitting Irish heritage and transmitting Irish language to native speaker abilities, but this schooling system still faces challenges. Some of the many challenges include governmental reticence or resistance in establishing new schools (Mac Gréil & Rhatigan, 2009) and (regarding the majority of parents) parental lack of engagement in Irish (Harris, 2008b; Harris & Murtagh, 1999) and the belief that English medium with Irish as a subject is suitable for most children (Ó Riagáin, 2007).

Research can help *Gaelscoileanna* confront or overcome some of the challenges it experiences by showing the cultural and linguistic benefits provided by immersion in transmitting Irish cultural knowledge and in transmitting Irish language to native speaking ability at no cost to children's first language. Such knowledge can help to allay any parental concerns regarding children's first language acquisition, and help parents make informed decisions of the type of schooling for their children, and, potentially, strengthen their willingness to enrol their children in immersion. This would increase the numbers of parents willing to enrol their children—at present 23.4% of parents (see above) are unable to send their children to their preferred type of education, in this case immersion, because of the lack of availability of Irish medium schools. Equipped with increased parental demand for immersion and research showing the efficacy of immersion, *Gaelscoileanna* could be helped in their promotion of immersion and petitioning of the Department of Education and Skills to establish more immersion in regions where it is desired and in regions where it is potentially desired.

Also, research can help *Gaelscoileanna* confront challenges by showing how children who acquire bilingualism through immersion compare to those from English medium on cognitive tasks. Previous studies have highlighted certain benefits for bilinguals on specific aspects of cognitive abilities. Such benefits which boost linguistic and non-linguistic control processes and quality of life include increased attention, inhibition, memory, and task switching, which can all be classed as hyponyms of "executive functioning" (EF), and are most advanced among those who constantly switch between their two languages, leading to a regular suppression mechanism that serves to block out one language whilst activating another. Since children attending immersion schooling in Ireland are switching between English and Irish (and hence inhibiting one language whilst using the other) on a daily basis, it would be interesting to explore whether the immersion experience provides the relevant experience that leads to such benefits over those children whose engagement with Irish is limited to a classroom subject only. The issues relating to bilingualism and EF are dealt with in the next chapter.

Chapter 4

Executive Functioning

There are many benefits accrued by being bilingual. Obviously, bilingualism provides the ability to communicate in another language either on a social, practical, and an economic level, but bilingualism can also provide enhanced cognitive skills such as attentional control and response inhibition. As already mentioned in Chapter 2, children receiving Irish immersion can be classified (by one defining measure) as successive bilinguals. This is because they are exposed to a second language later than simultaneous bilinguals (i.e., not from birth), but earlier than is typical of L2 speakers (i.e., upon school entry at age 4). Nevertheless, some may classify immersion children as L2, based on their low proficiency in Irish. However, for the purpose of this present study, the daily exposure to Irish and to English, coupled with speakers' constant and regular switching between the two languages, renders this population an interesting one to study in relation to executive functioning (EF), as it can help answer some important questions relating to the exact nature of the "bilingual" experience that heighten the suppression/inhibition mechanism that is said to underlie EF abilities.

Many people might intuitively believe that bilingualism has detrimental effects on a person's language and cognitive skills as speaking two languages poses more cognitive and linguistic challenges than speaking one language. Informing parents of the benefits of bilingualism (as well as the costs, as mentioned in Chapter 2) can help parents make informed decisions when choosing an education system for their child.

This chapter outlines the historical and current perspective of the effects of bilingualism, and highlights the changing sets of attitudes towards bilingualism from what was once negative to what is now positive. This chapter particularly focuses on EF, first, in terms of what it is and theories of how it develops, and second, by how these functions are enhanced by being bilingual.

Historical Perspective of the Effects of Bilingualism

Historically, it was thought that the effects of bilingualism and biliteracy upon the person were detrimental, leading to mental confusion, low self esteem, identity crisis, and poor L1 academic abilities (e.g., Saer, 1923). However, such findings are considerably flawed and are vastly unsupported in recent research. Perceptions of the effects of bilingualism across the 20th century can be aligned to three camps: negative, neutral, and positive (Kennedy, 2007, based on Baker, 1998).

Camp of perceived negative effects. Early researchers suggested that bilingualism led to disabling effects (see Carlson & Meltzoff, 2008) and was atypical and abnormal, resulted in cognitive retardation, and/or caused harmful effects on intelligence and language development (see Yang & Lust, 2005). Such conclusions were promulgated by prominent researchers such as (i) Laurie (1890), who stated that a bilinguals' "intellectual and spiritual growth would not be doubled [by being bilingual] but halved" (p. 15); (ii) Jespersen (1922), who stated that a bilingual child "hardly learns either of the two languages as perfectly as he would have done if he had limited himself to one" and that "the brain effort required to master two languages...diminishes the child's power of learning other things" (p. 148); (iii) Saer (1923), who stated "mental confusion is seen to exist in bilingual children to a higher degree than in monoglot children" (p. 38); and (iv) Adler (1977), who stated "bilingualism can lead to split personality and, at worst, to schizophrenia" (p. 40).

In recent times, however, such findings showing negative effects of bilingualism have been refuted because they are, often, (i) based on naturalistic data of children's codeswitching behaviour which was thought to be a sign of confusion within each child; (ii) came from studies that were not designed to study bilingualism; or (iii) contained numerous methodological limitations—including a lack of control of variables such as socio-economic status, gender, age, type of schooling received, parental occupation, and catchment areas (for review, see Baker & Prys-Jones, 1998; Hakuta, 1986; Peal & Lambert, 1962). Such variables need to be matched otherwise results are often inclined to favour one of the groups—usually monolingual groups.

For example, Jones (1959) studied 2,500 children in Wales, and found monolinguals scored significantly better on IQ than their bilingual peers. However, after re-analyses—omitting the results of the children with parents from "high-quality" occupations—he found monolinguals and bilinguals did not differ significantly in terms of IQ. Also, Kellaghan (as cited in Macnamara, 1966) found amongst 12-Year-Old Irish children, English medium children had a wider ranging vocabulary than their immersion peers. However, Macnamara (1966) attributed this result to better teaching methods in the English medium school, and not the teaching medium per se.

Finally, it is important to utilise a degree of caution when comparing monolingual to their bilingual peers. When analysing bilinguals' responses, further considerations must be given to (i) distinguishing between language interference and codeswitching, which is commonly accepted as an appropriate way of communicating; (ii) efficacy of communicative needs; (iii) culture, as a bilingual is also bicultural (Grosjean, 1998) thus potentially leading to misinterpretations of communicative ability; and (iv) the appropriateness of test norms, since most tests that children take to measure linguistic, intellectual or educational competence are usually normed on monolingual age-matched samples. Such considerations were often not held in the camp of perceived negative effects.

Camp of perceived neutral effects. Researchers in this camp believed that there was no significant difference between monolinguals and bilinguals in terms of IQ. Such conclusions were crucial in the development and encouragement of bilingualism in homes, schools, and communities because it helped to show the methodological faults of previous research and helped to challenge the belief that bilinguals were "mentally confused"—this belief is now generally considered to be incorrect.

For example, Hill (1936) matched Italian-American children on IQ, sex, socio-economic status, and mental age, and ascertained their bilingualism by questionnaire and on the basis of language background. He found no significant differences between monolinguals and bilinguals on verbal, non-verbal, and performance tests. However, Peal and Lambert (1962) suggested there was a bias in selecting more academically minded children as they were matched on IQ and mental age. Thus, they say, differences between the children on intelligence tests would have been slight since all groups would have been approaching ceiling. Nevertheless, Hill's (1936) findings of neutral effects of bilingualism were important at the time, because they seem to be among the earliest research suggesting bilingualism does not have negative effects, which, previously, had been intensely promoted. Yet, intense damage to the reputation of bilingualism prevailed, especially in the realm of education.

Camp of perceived positive effects. More recent research suggests that bilingualism can have positive effects on aspects of children's verbal and non-verbal skills and can enhance their educational achievements and interpersonal relationships. Such conclusions were initiated by Peal and Lambert's (1962) prominent study which examined the effects of bilingualism on children's intelligence. This was the precursor to "the modern approach to bilingualism and cognitive functioning" (Baker & Prys-Jones, 1998, p. 111) because it (i) obtained more control over most of the methodological flaws of the research from the camp of perceived negative effects and highlighted by the camp of perceived neutral effects, (ii) stated that bilingualism can lead to cognitive advantages when compared to monolingualism, and (iii) highlighted areas, other than IQ, that could be researched, e.g., vocabulary size, semantic awareness, and grammatical awareness of words within sentences (Baker & Prys-Jones, 1998).

Peal and Lambert (1962) matched monolinguals and bilinguals on L1, age, gender, and socio-economic status. Bilinguals were matched on their degree of bilingualism. Participants were given a battery of tests, including a word association task, a word detection task, and the Peabody Picture Vocabulary Test to determine the children's degree of bilingualism, and the Lavoie-Laurendeau Test and the Raven's Progressive Matrices to determine IQ. Also, the participants' teachers rated them in relation to their peers on how well they performed in the subjects that they undertook in class. This included L1 academic skills such as spelling, reading, and composition.

Peal and Lambert's (1962) results ran contrary to their predictions. They found that bilinguals scored significantly better than monolinguals on verbal and non-verbal tests of IQ, and there was no significant difference between monolinguals and bilinguals in their L1 spelling, reading, and composition skills. Whilst these results support bilingualism, Macnamara (1966) criticised the interpretations, stating it is inconclusive whether (i) the bilingual children became bilingual because they had better language learning skills than the monolinguals, or (ii) the acquisition of two languages increased the bilinguals' ability in the tests. Furthermore, Macnamara (1966) argues there was a bias towards the bilinguals because they were chosen from a native French-speaking group and were balanced bilinguals. As such, he claims, these children were naturally gifted at acquiring languages, and “any linguistic comparison between these children and the monoglots was probably biased in favour of the former” (p. 21). The sample, he says, was not representative. (Indeed many have argued against the existence of “balanced” bilinguals, and studies looking at the linguistic achievements of various types of bilinguals do not demonstrate advanced abilities among simultaneous bilinguals—e.g., Gathercole & Thomas, 2005; Gathercole, Laporte & Thomas, 2005; Gathercole & Thomas, 2009). The study can also be criticised on its sampling only from middle class children: negative effects have been reported when bilinguals come from a lower socio-economic status (e.g., Bialystok, 2001; Hakuta, 1986).

Nevertheless, Peal and Lambert’s (1962) conclusions of positive effects of bilingualism were important, because this was the first research to suggest bilingualism may have positive effects on people’s cognitive functioning which opposed all previous research on the effects of bilingualism (Bialystok, 2008). Since then, much research has been conducted which studied the effects of bilingualism on linguistic and non-linguistic behaviours, with the general result showing certain benefits for bilinguals.

Effects of Bilingualism: Current Trends

In recent years, the common conclusion of research that investigated the effects of bilingualism and bilingual education is that bilinguals outperform their monolingual counterparts on tests of their executive functions—planning, organising, abstract thinking, complex decision making, regulation of emotions and impulses, understanding of goal-directed behaviour, and monitoring of thought and action (Fuster, 1989).

Research shows that bilinguals outperform their monolingual peers when compared on tests measuring lack of perseveration to old rules, attentional control, inhibition of response, metalinguistic skills, and, theory of mind, and it seems, bilingualism can be used to counteract the onset of symptoms of dementia (see below).

For instance, regarding preservation to old rules, this can be tested by the dimensional change card sort task (DCCS task; Frye, Zelazo, & Palfai, 1995; Zelazo, Frye, & Rapus, 1996). The DCCS task is performed by 3-5-Year-Old children, wherein, typically, a child is given two types of cards to sort into two boxes. Cards display a picture of either a blue car or a red ball whereas the boxes display a picture of either a red car or a blue ball. (For a similar test with adults see Wisconsin Card Sorting Test by Heaton, Chelune, Talley, Kay, & Curtiss, 1993.) As such, the cards can be sorted by either dimension, i.e., colour or shape. The child is given a card (e.g., red ball) and is asked to sort it by dimension (e.g., "Here is a ball, can you show me where this goes?"). The child sorts the card, and this is repeated over several trials where the child sorts by dimension of shape, i.e., car and ball. Then the child is told the game is being switched to the "colour game" and the child then has to sort the cards by the new dimension of colour, i.e., red and blue. In this set of trials the same set of cards now has to be sorted into the opposite boxes from those in previous sorting trials.

Various research using the DCCS task (e.g., Bialystok & Martin, 2004; Perner & Lang, 2004; Zelazo et al., 2003) has shown that 3-4 Year-Old children can successfully complete a simple task in relation to a newly learnt rule (pre-switch; e.g., sort cards by shape dimension). However, they generally fail to respond appropriately to a second newly learnt rule (post-switch; e.g., sort cards by a different dimension—colour) because the pre-switch rule perseverates—despite children demonstrating (i) understanding of the post-switch rule, as they are asked to reiterate this new rule, (ii) understanding of sorting by category, as they show this in pre-switch trials, and (iii) their having a "favourite" category, and whether or not this category was used in pre-switch or post-switch trials (Zelazo, Frye, Reznick, Schuster & Argitis, 1995).

Evidence that shows bilingual children perform better than their monolingual peers on the DCCS task (e.g., Zelazo et al., 2003) has been partially attributable to the children's bilingualism (e.g., Bialystok, 2008). Such benefits of bilingualism are attributed to the bilinguals' constant attention, control, and switching of languages which creates a more robust EF system (Bialystok, 2008) and improves their mental flexibility (Cummins, 2003). Neuroimaging studies have shown that when faced with difficult non-verbal tasks reliant upon EF bilinguals use brain areas that are usually used for language processing (Broca's area), whereas monolinguals rely upon brain areas that are used for conflict resolution (dorsolateral prefrontal cortex), and bilinguals are often found to be significantly faster than their monolinguals counterparts in such tasks (Bialystok et al., 2008). Novick, Trueswell, and Thompson-Schill (2005) argues that such bilingual advantages are because bilinguals who often and continually resolve language conflicts will use these brain parts when faced with a non-linguistic conflict as well, and such continual use will significantly strengthen performance.

Further, flexibility is enhanced by a bilingual's ability to use one language and exclude the other, to mix languages where appropriate, and to occupy different language modes which enhances skills of control, attention, and appropriate responding to external input and internal direction (Grosjean, 1997). Recent research shows that this is an incessant exertion because bilinguals have to control interference from the non-target language when they are producing words in their target language (e.g., Rodriguez-

Fornells et al., 2005). However, how they control this interference is still unresolved (Abutalebi & Green, 2008).

Non-target Language Interference

According to Rodriguez-Fornells et al. (2005), naming an object is a two stage process from concept to verbalization. In Stage One, lexical selection, the abstract lexical items (or lemmas) containing the word's syntactic features are selected by conceptual or semantic activation. In Stage Two, phonological encoding, the phonological form of the target word (or lexeme) is obtained by use of the lemma. As such, mapping a concept to sound entails semantic, syntactic, and phonological representations. This is more complex for bilinguals.

Green (1998) highlights that in recent years the approach to understanding the bilingual lexicon has changed from theories of intermittent activation of the lexical and semantic representations of one's two languages to constant activation (albeit at different levels of activation) of lexical and semantic representations of one's two languages. In recent years, it has been shown that when bilinguals are selecting the target language, lexical and semantic representations in both languages are active which interferes with target language selection (e.g., Costa & Caramazza, 1999; Costa, Miozzo, & Caramazza, 1999; Martin, Dering, Thomas, & Thierry, 2009; Thierry & Wu, 2004). However, it is believed that this interference in the selection process can be overcome by a control mechanism (e.g., Abutalebi & Green, 2008; Bialystok, 2007; Green, 1998; Halford et al., 1998; Pallier et al., 2003; Rodriguez-Fornells et al., 2005). But this comes at a cost.

Various neurological research has compared bilinguals' language production in their two languages to their monolingual peers who speak either of these two languages, e.g., comparing German/Spanish bilinguals to German monolinguals and Spanish monolinguals. Typically, results suggest the speed in which bilinguals produce words is negatively affected when they "switch" from producing words in one language to producing words in another language. Such "switch costs" can be seen when naming digits or objects, and when trial sequence adheres to (i) an unpredictable pattern of presentation, (ii) an alternating pattern of presentation where two trials in one language are presented followed by two trials in another language or (iii) an alternating pattern of presentation where the first trial of each pair is a "switch" trial and the second trial is a "non-switch" trial (see Abutalebi & Green, 2008). Green (1998) states such costs are partially due to the continued inhibition of the previously non-target language when it becomes the target language.

Rodriguez-Fornells et al. (2005) found such an effect when they compared German/Spanish bilinguals and German monolinguals' accuracy scores and reaction times in two experiments—one employing neuropsychological tools of electroencephalogram (using event related potentials—ERP) and one employing neuropsychological tools of functional magnetic resonance imaging (fMRI)—on a Go/No-go picture naming task. Participants had to access phonological representations of the displayed pictures and determine whether or not the initial phoneme of the word that represented the picture was a vowel or a consonant and respond appropriately—either "Go", by pressing the response button for words starting with a consonant or "No-Go", by not pressing the response button for words starting with a vowel. Stimuli were the same for all participants, but for bilinguals the language of response changed after each block of trials. Stimuli were classed in two ways (i) matched, whereby, for half the trials, the initial phoneme was a consonant or a vowel in both Spanish and German or (ii) mismatched, whereby, for the remaining half of trials, the initial phoneme was a consonant in German and a vowel in Spanish or vice versa. Decision making, therefore, was contingent upon accessing the phonological representation system.

Results showed that bilinguals (i) made more errors and took longer to respond than monolinguals and (ii) bilinguals made more errors when a picture's initial phoneme mismatched in their two languages than when they matched. This, states Rodriguez-Fornells et al. (2005), suggests phonological aspects of the picture's non-target language name interfere with target language naming.

Results also showed that during matched initial phoneme trials, there was brain activation in the left prefrontal cortex in bilinguals but not for monolinguals. This area has been shown to be involved in EF tasks of switching (Dreher, Koechlin, Ali, & Grafman, 2002), selecting different response alternatives (Garavan, Ross, Li, & Stein, 2000), and inhibiting irrelevant items held in working memory (Baddeley, Emslie, Kolodny, & Duncan, 1998). Thus, bilinguals manage second language interference by employing EF brain areas to inhibit the production of non-target language words (Rodriguez-Fornells et al., 2005). Such linguistic "conflict" that bilinguals continually experience not only increases their EF abilities to appropriately control, attend, and inhibit their two language systems but can further enhance their EF in non-linguistic areas also (Bialystok, 2001).

The following sections explore EF in greater detail.

Executive Function

An individual's EF begins its development in his/her infancy (e.g., Brodkin, 2007; Griffith, Pennington, Wehner, & Rogers, 1999), is a result of genetic endowment and experiences (Brodkin, 2007), and results in enabling the organisation of thoughts and plans and assisting goal orientated behaviour (e.g., Fuster, 1989). EF is a broad term (with a broad range of definitions) relating to various cognitive capabilities, and has been described as cognitive abilities that control and regulate other abilities and behaviours (Bialystok, 2007), including attention, inhibition, memory, and task switching (Daniels, Toth, & Jacoby, 2004).

EF has also been explained as brain functions that permit (i) the higher centres of the brain to control the lower centres (Jackson, 1884), (ii) the holding of information in mind and establishing a "mental set" (Goldstein, 1936), (iii) the analysing of situations into their components (Cronin-Golomb, 1990), and (iv) the application of "different behaviour strategies in response to both internal and external cues" (Kolb & Wishaw, 2003, p. 395). It is the role of the pre-frontal/frontal cortex to perform such tasks as listed above (e.g., Fuster, 1989; Goldman-Rakic, 1987) and it has been shown that those with frontal lobe damage are significantly affected in performance on these tasks (e.g., Kolb & Wishaw, 2003; Kroger et al., 2002).

Despite such clear definitions and despite its high appearance rate in the neuropsychological literature, the concept "executive function" has yet to be formally defined (Jurado & Rosselli, 2007). It seems EF is an elusive, indefinite term that is often described by what it achieves, not by what it is. At best these definitions are explananda—because "[t]reating executive function as a functional construct does not explain executive function" (Zelazo, Müller, Frye, & Marcovitch, 2003). In essence, EF has still to be fully and succinctly explained. However, attempts at understanding EF have provided the bases for explanations helping the development of hypotheses concerning the task of basic cognitive processes (e.g., attention, memory, action monitoring) in different components of EF. Additionally, this method (i) avoids interpreting EF as a homuncular ability [explaining the overall system by the roles and abilities of its parts] (Zelazo et al., 2003), (ii) highlights ways which different components of EF collaborate, and (iii) suggests tried and tested measures of EF.

There is an abundance of tests that measure EF and components thereof, and many of these tests have been used to compare monolinguals and bilinguals. An example of such tests are: verbal fluency, Simon and Flanker tasks, which measures controlled attention; Wisconsin and Dimensional Change Card Sort tasks, which measures perseveration of errors; the Stroop Test, which measures conflict resolution; sustained attention to response, Go/No-Go tasks which measures response inhibition; and the Luria-Nebraska Neuropsychological Battery which measures motor, language, intellectual, nonverbal auditory, and visual-spatial skills. This demonstrates the necessity of carefulness when choosing and using appropriate tests for their intended purpose. It also highlights potential difficulties in the interpretation of the results, particularly in relation to investigating the so called "bilingual advantage" when different types of bilinguals are compared. In the present study, a distinction is made between successive bilinguals who acquire their L2 through immersion exposure in school and L2 learners who are learning Irish as a school subject, and both are compared to a monolingual age-matched group. This increases the necessity of using sensitive measures to elucidate whether or not typical benefits or costs often seen with simultaneous or "balanced" bilinguals are also afforded successive bilinguals.

Executive Function Development

People gain understanding of their world/environment by rules which can originate both internally (within the individual) and/or externally (from another individual or object). Such rules are integrated in an ad hoc manner usually in silent self-directed speech (Zelazo et al., 2003; cf Vigotsky's Social Constructivism). Specifically, this understanding emanates from the knowledge of the relationship and dependency between consequences of behaviour, the behaviour itself, and their antecedents—i.e., three term contingencies. Such understanding, which permits the development and integration of rules, governs most of human behaviour (Malott, 1988).

For example, a child who sees an oven (antecedent) touches it (behaviour) and gets burnt (consequence), learns that the oven can induce pain and will probably then avoid the oven. However, as the complexity of the rules and environment increases so too does the child's understanding and EF capacity (Zelazo et al., 2003). For instance, when the child learns a new rule to the above example, say, that such danger only exists when the oven emits a red warning light, the child will then integrate the new rule to the old rule and plan accordingly—avoid oven when it emits a red warning light/can approach oven when it does not emit a red warning light. This is a simple example of development of EF because it demonstrates experiential learning and the creation and integration of rules and appropriate planning. An important element in such an example of EF is complexity—the significance of which has been documented in various research (e.g., Dias, Robbins, & Roberts, 1996; Zelazo et al., 2003)—however, inhibition of response and working memory could also be significant elements in the development of EF.

Theories of Executive Function Development

This section presents a brief outline of theories that propose potential relevance of inhibitory control, working memory, and complexity upon the development of EF; however, it should be noted that these represent a small number of psycholinguistic theories of EF development. A more comprehensive view is beyond the objectives of this study; however, for more on neuropsychological approaches to EF see Alvarez & Emory (2006), and developmental approaches see Zelazo & Müller (2010). (Additionally, further research pertaining to each of the presented theories are referenced in the appropriate sections below).

This section also presents outlines of research, in favour of some of the following theories, most of which has been conducted using the DCCS task.[7]

Inhibitory control. Dempster (1995, 1992) states the inhibition mechanism—a mechanism that suppresses and controls cognitive behaviour—contributes to the development of a child's EF, attention, memory, intelligence, and reading comprehension. An inhibition mechanism, which develops concurrent to the prefrontal cortex (Luria, 1961), can overcome problems of perseveration seen with some children performing the DCCS task. Two different potential explanations for why perseveration occurs are lack of response control and representational inflexibility.

Regarding lack of response control, children obtain a dominant response tendency when learning a rule and then have difficulty inhibiting this response when the rules change, despite their understanding the new rule (see Carlson & Moses, 2001; Perner & Lang, 1999). Such erroneous action is overcome by the development of executive inhibition (Perner, Stummer, & Lang, 1999), "which depends on children's conceptual understanding of the unintended consequences of action schemata" (Zelazo et al., 2003,

[7] The research presented shows a heavy reliance upon one type of test, however, the author felt that this would be a simpler and more concise approach than explaining many types of tests in detail, and would provide consistency in explaining and comparing the presented theories.

p. 15).

Regarding representational inflexibility, perseveration is caused by an immature inhibition mechanism which is eventually overcome by maturation of the dorsolateral prefrontal cortex (Kirkham, Cruess, & Diamond, 2003). Kirkham et al. (2003) state that a part of children's failure on the DCCS task is due to their inability to change their focus of attention to the new rules or dimensions particularly when the old rules or dimensions are present. They call this "attentional inertia" (p. 451). Children's difficulty to redirect their focus of attention from the pre-switch dimension to the post-switch dimension occurs because during the pre-switch trials children develop a mindset about the stimuli, from which they cannot extricate, and their attention gets "stuck" on a particular dimension (cf Piaget's Conservation Problems).

Kirkham et al. (2003) found that varying levels of children's success on the DCCS task was contingent upon (i) age, 4-Year-Olds performed better than 3-Year-Olds because they could represent a higher level of complexity due to brain maturation and experiential learning and (ii) on-going visual perception of the previously correct dimension as it obstructs the ability to inhibit the previously correct mental set and to refocus attention to the appropriate dimension.

Working memory. Working memory has also been ascribed importance in the development of EF. Working memory concurrently manipulates and maintains a representation in order that that representation can assist an action (Baddeley, 1986) and/or holds information and uses that information, alongside contextual specifics, to create future action (Roberts & Pennington, 1996). Simply put, working memory processes and stores information (Baddeley, 1986), and it is dependent on the prefrontal cortex to perform such actions (e.g., Fuster, 1989; Goldman-Rakic, 1987).

Executive Functioning

Working memory has been traditionally described as a tripartite system, comprising a supervisory control system and two slave systems. The supervisory control system—or central executive—co-ordinates and integrates information from the slave systems. The two slave systems are (i) the phonological loop, which processes and stores limited amounts of aural information and (ii) the visuo-spatial scratchpad, which processes and stores limited amounts of visual and spatial information (Baddeley, 1986; pp. 70-71).

Various research (e.g., Gordon & Olson, 1998; Pascual-Leone, 1970) states the development of a child's EF is attributed to the growth of working memory. For example, 3-4-Year-Olds could be limited in the amount of rules they can process and store—the role of the phonological loop. Consequently, regarding the DCCS task, children would fail in the post-switch phase when new rules are introduced because of extra demands placed on processing and storing information (Gordon & Olson, 1998).

Duncan, Emslie, Williams, Johnson, and Freer (1996) term people's failure to behave appropriately on tasks despite their demonstrating understanding of appropriate actions as "goal neglect'—this can describe children's failure to succeed in the post-switch dimension of the DCCS task, because despite their showing understanding of the rules they fail to act appropriately. Research has shown that goal neglect contributes to momentary lapses in working memory (Kane & Engle, 2003), whereas goal maintenance, contributes to persistence, and resistance to distractibility (Blair, 2002) and successful task switching (Marcovitch, Boseovski, Knapp, & Kane, 2010).

Marcovitch et al. (2010) found that varying levels of children's success on the DCCS task was contingent upon (i) Working memory capacity, those who performed well on memory tasks also performed well on both conditions in the DCCS task and (ii) goal neglect. Specifically, extra demands of conflict resolution where placed on the standard condition insofar as further cards that were “redundant” to or “conflicted” with target stimuli were also to be sorted. Children performed better in conditions with a higher ratio of conflict cards than redundant cards as repeated conflicts strengthen the necessity to keep the post-switch rule in mind.

Complexity. Halford, Wilson, and Phillips’ (1998) *Relational Complexity Theory* states as children cognitively develop they can understand increasingly complex relations among objects, and the “complexity’, as in the number of relations, are processed in parallel, or, in chunks (e.g., X in relation to Y is greater than Z). The capacity of such processing is constrained by the amount of independent dimensions that can be related correspondingly and not, necessarily, by the amount of information or number of items. However, the ability to process (in a particular domain) develops with experience (of processing in that domain).

However, although processing ability is due to experience, generally, the age of which the level of relational complexity achieved by children is (i) unary, by one year of age, (ii) binary, by two years of age, (iii) ternary, by five years of age, and (iv) quaternary, by eleven years of age. This was supported by Halford, Andrews, Dalton, Boag, and Zielinski’s (2002) “balance scale” experiments where children are shown a scale which can be manipulated by (i) weight or distance or (ii) weight and distance. This experiment shows children’s ability in processing relational complexity increases with age and only reaches the ternary level at five years of age.

Regarding experimental manipulations (i), weight is held constant and distance can vary or vice versa. This tests binary level of knowledge of how two objects (scale and weight or distance) can work in relation to each other and as such there is no need for integration of how the scale is affected by the weight or distance thus posing no conflict in relations. Whereas, regarding experimental manipulations (ii), weight and distances vary. This tests ternary knowledge of how three objects (scale and weight and distance) can work in relation to each other and as such there is a need for integration of how the scale is affected by the weight and distance thus posing conflict in relations. Halford et al. (2002) show that by two years of age children can predict the resulting effect of a balance scale when it is manipulated by either weight or distance. However, only by five years of age can children predict the resulting effect of a balance scale when it is manipulated by both weight and distance. This, they say, demonstrates children's ability to integrate rules and resolve conflict in relations of objects only occurs by five years of age.

Frye, Zelazo, and Burack's (1998) *Cognitive Complexity and Control (CCC) Theory* states as children develop cognitively they can understand increasingly complex relations among objects. However, the "complexity", as in the number of relations, is processed hierarchically—a hierarchical tree structure—(rather than processed in parallel as stated by Halford et al. (1998) above) on an *ad hoc* basis and by use of an internal monologue.

As children develop biologically their ability to contemplate rules and their representations increase. This in turn affects children's ability to formulate relational complexities about rules. For instance, using a previous example of rule formulation by a child burnt by an oven (p. 72), when contemplating this rule and what it represents, a child can differentiate this rule, and parts thereof, to other rules and embed them under higher order rules. In terms of this example, a child's conditional statement/understanding of the dangers of the oven can be dependent on the fulfilment of another condition—a setting condition—in this case, a warning light. Such increases in rule complexity permit flexibility in selection of certain rules for acting when several conflicting rules could be possible. As such, this permits a degree of flexibility in response rather than perseveration of response—permitting cognitive control rather than stimulus control.

Comparative study of aforementioned theories. Zelazo et al.'s (2003) comprehensive studies present a convincing argument in favour of a revised *CCC Theory* of EF development when compared to the above theories of inhibitory control, working memory, and rule complexity as measured on the DCCS task. In their studies containing several experimental manipulations of the DCCS task—directly testing memory load, inhibition, and rule complexity—results showed that 3-4-Year-Old children's cognitive performance on the test can be attributed to a hierarchical integration of rules approach. An outline of their first two studies follows (see Zelazo et al., 2003 for more).

Their first study, containing three experiments, investigated the role of memory in children's errors on the DCCS task. According to the memory accounts outlined above children are unable to retain four rules or post-switch rules in their working memory thus typically failing the post-switch phase of the DCCS task. However, the CCC Theory states that children will only have problems with conflict which arises when a test card has to be sorted first by one dimension and then by another dimension.

Children's performance on the standard version of the DCCS task was compared with performance on several manipulated versions of the task testing memory. Whereas the standard version challenges children's ability to resolve conflict between old rules and new rules (which typically shows children fail the post-switch phase of test as the rules of the pre-switch phase perseverate) the new versions presented no such conflict.

Rather, these tests challenged children's ability to remember varying amounts of rules (see Table 6 for an overview of DCCS task versions). Results suggest that children's perseveration of pre-switch rules that is typically found on the DCCS task is not due to memory or bidimensionality (in isolation); rather, it is due to their inability to resolve conflict between pre- and post-switch rules. This can be seen in Table 6 below which shows that (i) whereas only 5% of children passed (scoring more than 80% success on all 20 trials in each set) the standard version of the DCCS task, more than 76% of children passed four different versions of the task which places varying levels of demands on memory rather than on conflict resolution and (ii) children can successfully sort when sort rules change by dimension but poses no conflict between rules. Essentially, no conflict between rules occurs because individual sets of cards only have to be sorted in one way as opposed to sorted two ways in the Standard version.

Table 6. The Standard and new versions of the DCCS task testing conflict resolution and memory. Adapted from Zelazo et al. (2003). * Passed = 80%+ Correct

Dimensional Change Card Sort Task			
Experiment/ Version	Description	Abilities Tested	% who Passed*
Experiment 1			
Standard	Children are given 10 cards and told to sort them by one dimension (pre-switch phase; e.g., colour) and then told to sort the same cards by another dimension (post-switch; e.g., shape).	Conflict Resolution	5%
2+2 Rule	Children are given 10 cards and told to sort them by one dimension (e.g., pink or grey) and then children are given another 10 cards and told to sort them by same dimension but a different aspect of that dimension (e.g., yellow and green).	Memory—not conflict as individual cards have to be sorted only one way.	76%
4 Rule	Children are given 20 cards and told to sort them by one dimension (e.g., colour).	Memory—not conflict as individual cards have to be sorted only one way.	83%
Experiment 2			
2+2 Rule (bimensional—no overlap)	Children are given 10 cards and told to sort them by one dimension (e.g., colour = red boat and green car) and then told to sort a different set of 10 cards by another dimension (e.g., shape = yellow rabbit and green flower). As such, there is no overlap of rules.	Memory—not conflict as individual cards have to be sorted only one way.	81%
Experiment 3			
Standard	Same as Standard above except on each trial every card is labelled by the experimenter (e.g., “Here’s a flower”).	Conflict Resolution	45%
4 Rule (superordinate)	Children are given 20 unique cards (representing one of four dimensions: animals, vehicles, clothes, food) and told to sort them by one dimension (i.e., things (i) that walk, (ii) you ride, (iii) you wear, and (iv) you eat).	Memory—not conflict as individual cards have to be sorted only one way.	80%

Zelazo et al.'s (2003) second study, containing three experiments (one discussed here), investigates the role of inhibition in children's errors on the DCCS task. According to inhibition accounts above children's pre-switch rule formation dominates and over-rides the post-switch rule phase thus children typically fail the post-switch phase of the DCCS task. However, the CCC Theory states that children will only have problems when they have to nest rules under different setting conditions which arise when a child has to differentiate rules, and/or there parts, from other rules and embed them under higher order rules.

In Experiment 4 and 5, 3-4-Year-Old children's performance on the Standard version of the DCCS task was compared with performance on several manipulated versions of the task testing ability to nest rules under different setting conditions. Again, whereas the standard version challenges children's ability to resolve conflict between old rules and new rules, the new versions also presented conflict, but the "Pruned Tree" version contained two rules instead of the standard four rules and required sorting a single test card (i.e., green car) by two dimensional rules, first by one dimension (e.g., colour) and then by another dimension (e.g., shape), and the "Unidimensional" version also contained two rules instead of the standard four rules but required sorting a single test card (i.e., blue and green squares juxtaposed), first by one colour and then by the other colour. (See Table 7 for an overview of DCCS task versions).

Table 7. The Standard and new versions of the DCCS task testing conflict resolution, rule complexity, and inhibition. Adapted from Zelazo et al. (2003).

Dimensional Change Card Sort Task			
Experiment/ Version	Description	Abilities Tested	% who Passed
Experiment 4			
Standard (two test cards)	Children are given 10 cards and told to sort them by one dimension (pre-switch phase; e.g., colour) and then told to sort the same cards by another dimension (post-switch; e.g., shape).	Conflict Resolution	0%
Standard (single test card)	Children are given 5 cards and told to sort them by one dimension (pre-switch phase; e.g., colour) and then told to sort the same cards by another dimension (post-switch; e.g., shape).	Conflict Resolution	29%
Pruned Tree (single test card)	Children are given 5 cards and told to sort them by one dimension (e.g., colour) and then told to sort the same cards by another dimension (e.g., shape). There are two target cards (yellow car: green flower) which do not match the test card (green car).	Conflict Resolution—two setting conditions	30%
Experiment 5			
Unidimensional (single test card)	For example, children are given 5 test cards which contain two colours (one side blue: one side green) and told to sort them by colour green and then told to sort 5 more of the same test cards by colour blue. There are two target cards: one is blue the other is green.	Conflict Resolution—one setting condition.	92%

Results show that (i) whereas many children fail to sort correctly when given bidimensional rules, many children successfully sort when given unidimensional rules, even though both versions require children to switch rules and to overcome conflict resolution to perform the tasks successfully and (ii) children can treat a test card in two different ways thus demonstrating their ability to cease responding in a manner of which they had become accustomed to in the pre-switch trials. Results suggest that children's perseverations on the DCCS task are partly due to how children formulate the rules and their complexities.

Of course, Zelazo et al.'s (2003) conclusions are of huge importance to this thesis which contains children who need to understand the rules and their complexities of two languages as they switch use from language to another, inhibiting and resolving the conflict of activation of the non-target language as they do so. As immersion children control attention to two active language systems on a daily basis in school, it is worthy to investigate how such experiences can affect the EF skills of a population which hitherto has not been investigated.

Executive Function and Bilingualism

Although there are several varying accounts of development of EF, they all share the central feature that children perform better on tasks as they get older and/or gain more experience. Similarly, there are varying linguistic theories for language acquisition that account for children's increasing proficiency with age and experience. Formal theories posit endogenous mechanisms for language acquisition which lead to uniform and universally prescribed rule systems. Language proficiency, it is suggested, is the reflection of circumscribed and specialised knowledge that is an elaboration of an abstract template. Functional theories posit exogenous factors for language acquisition. This acquisition is based on social interactions that lead to specific linguistic forms being extracted from encounters which build up over time into more formal linguistic rules. Language proficiency, it is suggested, is the reflection of cognitive processes that extract regularities from the environment and record those generalities as knowledge (Bialystok, 2001). This same cognitive process is required for many non-linguistic abilities including those controlled by the EF process. The focus of recent debate is the extent to which linguistic experience supports linguistic processes, especially in relation to bilingualism.

Also, there are myriad factors influencing the development of bilingualism, many of which can have its own effect—positive or negative. Such factors can include political, cultural, ideological (McNamara, 1966), or other affiliations (Appel & Muysken, 1987), education, exuberant patriotism, cultural resentment, forced relocation, enforcement of dogmatic or dictatorial language policies, and historical perspectives of language use of dominancy or minority. The inclusion or exclusion of any of these important factors can make the comparison of bilinguals' language acquisition more arduous or/and exposed to confounding variables. Similarly, comparisons with monolinguals are also problematic.

However, when comparing monolinguals to bilinguals, research shows that bilinguals' EF seems to develop faster than monolinguals' EF. It is believed that the cognitive and brain processes bilinguals' use in (i) constantly choosing between two language representations and (ii) their executive control system, overlap resulting in enhanced EF (e.g., Green, 1998) and can have positive effects on linguistic and non-linguistic domains (Bialystok, 2008).

Bialystok (2007) claims that bilinguals are not "more intelligent" than monolinguals per se; rather, bilinguals have a stronger ability to use their knowledge in performing cognitive tasks because they can control their attention and ignore misleading information more proficiently. This ability develops earlier in bilingual than monolingual children, is more enhanced and sustains longer on tasks in bilingual than monolingual children/adolescents, and deteriorates at a slower pace for bilingual than monolingual adults—a trend that persists to old age(Bialystok, 2007). It seems all of these benefits develop—at least partially—from having two language systems which can contain two, or more, alternative ways of expressing a concept that are so similar that a conflict must arise within these systems if they are to successfully ignore the language that is not appropriate for the situation (Kroll & de Groot, 1997). This, thereby, improves bilinguals' ability to appropriately control, attend, and inhibit their two language systems.

In concordance, Bialystok (2008) claims such benefits come in the realm of EF and accrue because of the bilingual's constant executive control of attention to the appropriate language being used. As such, this system of constant control is strengthened by continual use and can be transferred to other cognitive functions (Bialystok, 2001) which can also strengthen the process of executive control.

Research on Executive Function and Bilingualism

Researchers have shown positive effects of bilingualism on EF spanning from a person's formative years (enhanced development of theory of mind, see Goetz, 2003) to a person's latter years (delayed onset of dementia, see Bialystok, Craik, & Freedman, 2007). This section outlines some research which, predominantly, shows that bilinguals outperform their monolingual peers on several tests of EF, including the Simon task, Flanker task, Sustained Attention to Response Task, Stroop task, and Metalinguistic tasks.

Controlled attention. Research suggests that bilinguals perform better than monolinguals on tasks of controlled attention (see Martin-Rhee & Bialystok, 2008), e.g., the Simon task (Simon, 1969), which, typically, is a computerised test in which two stimuli (objects of either one of two colours) displayed on the monitor requires a unique response (press either one of two keyboard buttons) contingent upon colour of the target stimulus. In congruent trials, the target stimulus and response are on the same side of the monitor and keyboard. In incongruent trials—the more difficult trials—the target stimulus and response are on opposite sides of the monitor and keyboard, thus requiring the participant to (i) ignore the position of the stimulus and focus on colour only and (ii) ignore the more salient non-target stimulus and focus on the less salient target stimulus. Usually, incongruent trials take longer to analyse and respond to than the congruent trials and this response increase time is the Simon Effect (Simon, 1969). Interestingly, bilinguals respond faster on incongruent trials than their monolingual peers (e.g., Bialystok, 2006, Bialystok, Craik, Klein, & Viswanathan 2004), and it has been inferred that bilinguals' superior performance in this task is due to the benefits of bilingualism which increases controlled attention abilities (Martin-Rhee & Bialystok, 2008).

Martin-Rhee and Bialystok (2008) assessed controlled attention, as measured by the Simon task, of 34 children (N = 17 English monolingual, Age = 4;7 Years; N = 17 French-English bilingual, Age = 5;0 Years) matched on memory and vocabulary skills. The focus of this study was to investigate inhibitory control of monolingual and bilingual children and to identify how this control differed per group. Each of three versions of the Simon task created used different response time rules, requiring a response either immediately, 500ms, or 1000ms after the onset of a stimulus. Increased length of response delays was hypothesised to reduce the prominence of the misleading cues. Results showed that there were no differences between groups on the two delay versions of the task.

Results confirmed previous findings that bilinguals were faster than monolinguals in responding to congruent and incongruent trials in the standard immediate response version of the Simon task. Martin-Rhee and Bialystok (2008) suggests that (i) as tasks become easier when there is a forced delay between stimulus onset and response, this allows the child some time to solve the competition and permits a controlled response; (ii) differences between groups on conflict tasks that are based on interference suppression “occur at early stage of processing and are probably associated with the initial ability to control attention to complex stimuli” (p. 91); and (iii) bilinguals’ continuous experience of controlling attention between two active language systems enhanced their ability on this type of test.

Bilinguals’ enhanced attentional control can also be seen on other tests of executive control, including the Flanker task. However results from studies using the sustained attention to response task (SART) and the Stroop task have revealed mixed results.

Flanker tasks. The Flanker task (Eriksen & Eriksen, 1974) is, typically, a computerised test in which an array of stimuli (e.g., five fish) displayed on a computer monitor requires a unique response (press either one of two keyboard buttons positioned left or right of the keyboard) contingent upon the direction in which the target stimulus is pointing (left or right). In congruent trials, all stimuli point in the same direction (e.g., left) and the required response corresponds with the direction of the target stimulus and non-target stimuli (i.e., press button on left side of keyboard). In incongruent trials—the more difficult trials—the required response corresponds with the direction of the target stimulus but differs from the non-target stimuli, thus requiring the participant to ignore the more salient non-target stimuli and to focus on the less salient target stimulus. This creates a conflict within incongruent trials which usually take longer to analyse and respond to than the congruent trials.

Bunge, Dudukovic, Thomason, Vaidya, and Gabrieli (2002) showed that children are less accurate and slower than adults on controlled attention (and inhibition) tasks because of children's immature prefrontal activation which is involved in such attention skills. This suggests that eventually children improve to the standard of adults on such tasks as their EF develops. However, it seems that bilinguals have an advantage over monolinguals even at early ages.

Several studies have found bilinguals perform faster than monolinguals on Flanker tasks (e.g., Bialystok, 2001; Carlson & Meltzoff, 2008; Hernandez, Costa, & Sebastian-Galles, 2007; Yang & Lust, 2005). This "superior" performance on the Flanker task has been attributed to the nature of bilinguals' EF skills gained through their continuous experience of controlling attention between two active language systems (Bialystok, 2001).

For instance, Yang and Lust (2005) used the Flanker task to "probe developmental differences in attentional networks of alerting, orienting, and executive control" (p. 4) of Korean-English bilingual (N = 13) and English monolingual (N = 13) children (Mean age = 4;8 Years). They found that bilingual children were more accurate and faster on incongruent and congruent trials than their monolingual peers. Similar, results showing bilinguals outperform their monolingual peers on the Flanker task can be seen in participants aged in their 20s, (Costa, Hernández, & Sebastián-Gallés, 2007) and in their 40s (Emmorey, Luk, Pyers & Bialystok, 2008). And, although conflict resolution in elderly groups of bilinguals have been understudied (Hilchey & Klein, 2011), results from studies using the Simon task show that elderly bilinguals perform better than their monolingual peers (Bialystok et al., 2004). Such conclusions add to the field of research supporting the argument that bilingualism leads to enhanced EF from an early age and continues on into later life.

SART. The Sustained Attention to Response Task (SART; Robertson, Manly, Andrade, Baddeley, & Yiend, 1997) is a computerised test in which a stimulus (e.g., numbers 1 to 9, inclusive) displayed on the monitor requires a unique response (e.g., do not press response key for number 3, do so for any other number) contingent upon stimuli's features. Participants are required to control attention to stimuli (Bialystok et al., 2008; Chan, 2001) and to inhibit a response which has become somewhat automatic (Robertson et al., 1997) after many repeated trials requiring this response. The urge to respond and the requirement not to respond creates a conflict within the participant that should culminate in response errors and slower reaction times than if there was no such conflict. It was originally designed to work with people with traumatic brain injuries (Manly, 2009) and has shown that the performance of those with injuries in their frontal lobe (part of the EF system) is negatively affected when compared with their non-brain injured peers (Robertson et al., 1997).

In line with theories purporting EF advantages of bilinguals, it should be expected that bilinguals perform better on this task than monolinguals. However, this expectation is not necessarily supported by the (limited amount of) research using this test. Bialystok et al. (2008) compared younger (Mean Age = 20;1) and older (Mean Age = 67;9) monolinguals with bilinguals and found no statistical differences on their error rate or reaction times as measured on the SART. Interestingly, the trend showed that monolinguals were more accurate than their bilingual peers in both age groups, although there was no statistical difference. Similarly, Meuter and Simmond (2007; cf Meuter & Orr, 2011, for no bilingual advantage) studied younger (Mean Age = 23;3) and older (Mean Age = 74;6) monolinguals and bilinguals and found no bilingual advantage as measured on the SART. Interestingly, participants also performed a Simon task which did show a bilingual advantage in both the younger and the older groups, and a youth advantage (which suggests superior processing skills in bilinguals and that these skills deteriorate sooner for monolinguals than bilinguals). The SART and Simon task results in their study showed that the cognitive benefits of inhibition or controlled attention gained from being bilingual can be utilised for the Simon task but not the SART therefore suggesting that these tests measure two different aspects of EF.

There are varying interpretations as to the cognitive capacities employed when performing SART. For example, although Manly (2009) states performance on SART incorporates response inhibition to measure sustained attention, SART could also (i) be susceptible to rapid automatisation of response (Robertson, Manly, Andrade, Baddeley, & Yiend, 1997—however they attribute this to internal maintenance of attention rather than the external stimuli), (ii) be affected by sensory modality, event rate, stimulus uncertainty, memory load, and task complexity (Warm, 1993), (iii) encourage “mind wandering” because it is cognitively undemanding (Smith et al., 2006), and (iv) susceptible to impulsive responding (Helton, 2009).

For instance, Smith et al. (2006) state that whilst performing SART a participant’s mind can easily wander off task. They distinguish between two types of “mind wandering” or spontaneous thought: aware, which incorporates prefrontal cortex, and unaware, which incorporates temporal structures, both of which are part of the executive system (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009). Thus providing evidence of overlap between mechanisms of goal-orientation and spontaneous thought and highlighting the susceptibility of SART in maintaining participants' attention because it is a cognitively undemanding test. This might also apply to bilinguals.

Speculatively, such overlap could present a paradox regarding bilinguals' enhanced EF. Specifically, the very functions that enhance EF might also hinder it because as the mind wanders on this cognitively undemanding task the EF that should help to maintain attentional control are instead/also employed to help the mind wander. This negates any cognitive advantages often displayed by bilinguals on EF tasks due to prohibition, which might deny the utilisation of such advantages, or equilibrium, which might permit utilisation of the cognitive capacities but also permit excessive spontaneous thoughts which could detract from advantages that might otherwise be displayed. (See Hernandez et al. (2007) in the *Challenges to and clarifications of recent findings* section below for low levels of cognitive demands and lack of employment of bilingual cognitive advantage.)

Helton (2009) however, states that SART is a better measure of impulsive responding rather than sustained attention, and that the relative benefits of speed and accuracy of the test can increase impulsivity and response strategy. Also, Helton et al. (2005) state continual responding to the more common non-target stimuli might create a feed-forward motor program within the participant thus negatively affecting control and inhibition. Doyon, Prenhune, and Ungerleider (2003) further explains that this repeated response requires regulation by the supervisory attention system (Matthews, Davies, Westerman, & Stammers, 2000; Norman & Shallice, 1986; Shallice, 1988; Stuss, Shallice, Alexander, & Picton, 1995) and interferes with motor inhibition—even though the participant may be mindful of the stimuli (Helton, 2009). However, since this was one executive function task that was used by Bialystok and her colleagues to explore a potential difference between monolingual and bilinguals, it was included in the battery of tasks in the present study.

Stroop tasks. The Stoop task (Stroop, 1935) is a test in which a stimulus creates conflict between two potential responses. For example, participants are required to name the colour of a word stimulus written in a colour that is (i) congruent, i.e., “blue” written in blue ink or (ii) incongruent, i.e., “blue” written in pink ink. The latter creates a conflict within the participant because reading the word is more automatic than naming its colour. This interferes with the speed and accuracy of naming the colour of a word. Response times are larger for incongruent trials than for congruent trials and are known as the Stroop Effect which is a marker of automaticity and cognitive control (Botvinick, Cohen, & Carter, 2004). Naming the colour of the word requires inhibition of an automatic response of reading (Archibald & Kerns, 1999) and requires controlled attention (Homack & Riccio, 2004) to perform this task effectively. In effect, whereas reading, in general, requires automaticity, which relies on minimal attention and conscious effort (Samuels & Flor, 1997), performing a novel task like naming the colour of a word instead of reading it requires controlled attention to inhibit reading automaticity (Cohen, Dunbar, & McClelland, 1990). Therefore, success on the Stroop task is assisted by EF (e.g., Hernandez, Costa, Fuentes, Vivas, & Sebastian-Galles, 2010; Homack & Riccio, 2004) and is controlled by the inferior frontal junction (Derrfuss, Brass, Neumann, & von Cramon, 2005).[8]

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[8]It is of interest to note that the Stoop task has many varieties (see MacLeod, 1991) which differ from the original testing colour-word interference including position and hue of stimuli, emotion-word interference, picture-word interference, and more, as well as the type of modality used including visual, manual, and auditory.

In line with theories purporting EF advantages of bilinguals, it should be expected that bilinguals perform better on this task than monolinguals. However, findings of between group analyses present a mixed picture. Several researchers report a bilingual advantage (e.g., colour word Stroop for children in Gathercole et al., 2011; numerical Stroop for younger adults in Hernandez et al., 2010; colour-word Stroop for younger adults in Bialystok et al., 2008), others report a bilingual disadvantage (e.g., colour-word Stroop for younger adults in Biederman & Tsao, 1979), and several report no differences (e.g., Day/Night Stroop and picture naming Stroop for children in Martin & Bialystok, 2008; Golden Stroop for adults in Rosselli et al., 2002; colour-word Stroop for older adults in Bialystok et al., 2008) when compared to their monolingual peers.

The orthographic representations employed in a bilingual's two languages may influence performance on the Stroop task. This is particularly the case when comparing use of logographic to alphabetic scripts, i.e., orthographic variation hypothesis which states that reading different orthographies activates different brain processes. Biederman and Tsao (1979) state more competition occurs in the Colour-Word Stroop task when processing Chinese than it does when processing English because whereas the processing of English is a left hemispheric activity the processing of colour and Chinese characters are both right hemispheric activities (see also Chen & Tsoi, 1990; Long & Lyman, 1987; Tsao, Wu, & Feustel, 1981).

Indeed, recent neuroimaging research by Tang et al. (2010) shows that many anatomical and functional differences between typical Chinese brains and Caucasian brains. They state that each of these anatomical differences between groups have been shown to be (i) due to processing different languages and (ii) functionally different. As regards to reading, a similar language network is used when reading English and Chinese which permits the semantic and visuo-spatial analyses of words/logographs, however Chinese incorporates more right hemispheric regions and the right visual system because the intricate features of each Chinese logograph require a more in-depth visual analyses than graphemes or words in English (Tan et al., 2001). As such, it might be that the use of logographic alphabetic language users as subjects on the Stroop task is a confounding variable.

Interestingly however, other researchers (Chen, 1999; Lee & Chan, 2000; Smith & Kirsner, 1982) have found no differences between Chinese-English bilinguals and English monolinguals on the Stroop task when tested in English. Smith and Kirsner (1982) suggest that as processing colour and reading the logograph occur in the same area, processing the colour of the stimuli might reduce the capacity to read the irrelevant feature of the stimuli thereby increasing the ability on the test.

Regarding within bilingual group analyses, comparing bilinguals' ability on the Stroop task in both of their languages, the trend suggests that language proficiency is a key component of interference levels. Specifically, the bilingual's dominant language suffers more interference than their L2 because their superior expertise in their dominant language leads to more automaticity of response which increases demands on response inhibition. "Balanced" bilinguals seem to suffer interference in equal amounts in both of their languages (e.g., Kefi et al., 2004; Mägiste, 1984; Rosselli, 2001). As such, this urges the importance of matching subjects on their level of proficiency.

Challenges to and clarifications of recent findings. Although there are numerous studies supporting a bilingual advantage in EF, there are several studies challenging the general concurrence amongst researchers in their potential mis-accreditation of benefits of bilingualism as measured on certain EF tasks and to the appropriate use and elucidation of such measurements. Some researchers who have found no advantages of bilingualism on certain EF tests (e.g., Carlson & Meltzoff, 2008, on various "delay" and "conflict" tasks; Martin-Rhee & Bialystok, 2008, Delayed Simon task; Yang & Lust, 2005, DCCS task) have, however, found a bilingual advantage on other EF tests that were run within their same study. This thereby suggests that bilingualism, per se, is not necessarily advantageous on all aspects of EF and further provides (or highlights the necessity of gaining) a more fundamental understanding of EF and how to measure it. Additionally, such research, potentially, highlights the need to place more stringent demands on matching participants on numerous variables such as language background, cultural background, and so on.

For instance, Yang and Lust (2005) stated that the types of languages bilinguals acquire could be a factor in their enhanced cognitive advantages when compared to their monolingual peers. Specifically, the phonology, morphology, and syntax of bilinguals' two languages could be similar or disparate thus affecting the extent of any cognitive advantage accrued due to learning two languages.

Carlson and Meltzoff (2008) address a similar issue. They performed a comprehensive investigation of the possible effects of bilingualism on young children's EF. In this study they highlighted some potential limitations of previous research, i.e., in terms of cultural differences and few measures of EF within a study.

Regarding cultural differences, Carlson and Meltzoff (2008) stress the importance of replication and suggest the use of caution when attributing benefits of bilingualism on selective attention of certain cohorts. For example, Chinese bilinguals' enhanced EF (Bialystok, 1999; Bialystok & Martin, 2004) could be a feature of their culture rather than bilingualism per se, as enhanced EF skills has been reported for monolingual Chinese children when compared to bilingual children from United States (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Similarly, Yang and Lust (2007) found EF advantages for American Korean-English bilinguals when compared to American English monolinguals on accuracy scores as measured on an Attention Network task. However, Choi, Won and Lee (2003) have shown that Chinese-Korean bilingual children outperformed their Chinese monolingual peers on tests of selective attention thus supporting the argument that bilingualism exerts important influence on a child's EF since Chinese-Korean bilinguals and Chinese monolinguals share similar cultural background.

The amount of EF measures within a study needs to be sufficient in order to examine the specifics of the effect (Carlson & Meltzoff, 2008). Carlson and Meltzoff (2008) overcame these potential limitations by using a battery of nine tests measuring EF on a group hitherto, they state, were unstudied—Spanish-English Bilinguals (Mean Age = 6 Years; N = 12 Spanish-English Bilingual background, 31 Spanish-English immersion educated, and 17 English monolingual).

Carlson and Meltzoff (2008) build on the distinction (proposed by Carlson & Moses, 2001) between (i) "delay tasks" (e.g., Delay of gratification, Statue task), where the task is to delay/temper a predominant response, and places demands on inhibition and low levels of working memory [which can also include the SART], and (ii) "conflict tasks" (e.g., DCCS, Attention Network/Flanker task), where the task is to make a novel response whilst inhibiting a conflicting, predominant response, and places demands on inhibition and higher levels of working memory. As such these distinctions help to isolate specific aspects of tasks measuring EF (Bialystok, 2008) and to clarify areas of a bilingual advantage.

Results show that there were no differences on children's performances on "delay tasks" however children from a bilingual background performed better than children in the other two groups on "conflict tasks" (similar to Bialystok, 2008, above). These conflict tasks contain certain similarities to language conflicts that are experienced when using/choosing between two competing languages. This suggests bilinguals' better performance in these tasks is in part attributed to their being bilingual. This demonstrates that test choice is crucial in obtaining an accurate representation of the existence or not of a bilingual advantage. Likewise, how a single test is manipulated is essential to obtaining an accurate representation of the existence or not of a bilingual advantage.

Further, Hernandez et al. (2007) found that such advantages to bilinguals only occur under conditions of moderate conflict difficulty when comparing conflict effect. They define conflict effect as the difference between the reaction times of incongruent trials and congruent trials. In their study, four types of Flanker tasks were used and varied on one condition—the congruent:incongruent ratio within trials. The ratios were the following: (i) 8%:92%; (ii) 50%:50%; (iii) 75%:25%; and (iv) 92%:8%. Results show differences in (iii) 75%:25% only when comparing the conflict effect scores of bilinguals and monolinguals. Hernandez et al. (2007; cf Martin-Rhee & Bialystok, 2008) suggest this result occurred because the benefits of bilingualism are applied during moderate levels of conflict and not during low or high levels of conflict as tasks are too easy or difficult, respectively. Accepting that there are cognitive advantages due to bilingualism, this could suggest that EF tests that found no differences between monolinguals and bilinguals is due to systematic variation, i.e., some tests might need to be modified or "fine-tuned" to give an accurate reading of participants abilities because the advantage is subtle and occurs at certain points of time in a task and under specific conditions.

Also, research suggests that those who perform better on visuo-spatial memory tasks perform better on tasks of controlled attention, e.g., the Simon task, (Namazi & Thordardottir, 2008). Namazi and Thordardottir (2008) investigated the link between controlled attention and memory of French-English bilingual and French and English monolingual children (N = 45; Mean age in months: BLs = 58; English MLs = 58.5; French MLs = 59.4). Specifically, they looked at (i) verbal working memory, measured by Competing Language Processing task (Gaulin & Campbell, 1994), (ii) verbal short term memory, measured using the non-word repetition task (Gathercole & Baddeley, 1994), and (iii) visuo-spatial memory, measured by the pattern recall task (Jarrold, Baddeley, & Hughes, 1999).

Groups were matched, *a priori*, on age and nonverbal IQ, and analyses found no differences between groups in their scores on tasks testing forward digit span in English, forward digit span in French, and on visuo-spatial memory. As such, groups were also matched, *post hoc*, on verbal working memory, verbal short term memory, and visuo-spatial memory. Interestingly, unlike other researchers (e.g., Bialystok, 2006; Bialystok, Craik, Klein, & Viswanathan 2004; Martin-Rhee & Bialystok, 2008) Namazi and Thordardottir (2008) found no differences between bilingual and monolingual groups on controlled attention as tested by the Simon task. Further analyses, when accounting for maternal education, which favoured bilinguals, and receptive English vocabulary, which favoured English monolinguals, again, found no differences between monolingual and bilinguals on the Simon task.

However, differences were found when correlational analyses were performed on visuo-spatial memory and controlled attention. Specifically, Namazi and Thordardottir (2008) found that performance on the visuo-spatial tests correlated with performance on all four parts of the Simon task: reaction times on congruent trials, reaction times on incongruent trials, accuracy on congruent trials, and accuracy on incongruent trials. This suggests that visuo-spatial memory enhances controlled attention and supports the argument that EF development is contingent upon growth in working memory. Bilingualism alone cannot account for enhanced performance; it is one of many integrative variables that help the individual perform well on these tasks.

Finally, Bunge et al. (2002) distinguish two types of inhibitory control that use different areas of the prefrontal cortex: (i) "interference suppression" which can be seen on tasks with bivalent trials containing stimuli with two features that diverge (incongruent trials) onto one response or converge (congruent trials) onto another response, (e.g., Simon or Flanker tasks, see above, which mostly demonstrates a bilingual advantage) and (ii) "response inhibition" which can be seen on tasks with univalent trials containing one stimulus that creates a conflict between an automatic or habitual response that must be overridden by an arbitrary response (e.g., SART or Stroop task, see above, and Single Arrow task, see below, all of which show no bilingual advantage). Martin-Rhee and Bialystok (2008) state "[t]his distinction between interference suppression and response inhibition is useful for identifying potential processing differences in inhibitory control between monolingual and bilingual children" (p. 85).

They state a bilingual's two linguistic systems operate as bivalent representations, creating different linguistic options that might also present a conflict in choice of response. To overcome this conflict, a bilingual must focus on the relevant language system and ignore the irrelevant language system. This runs certain parallels to the Simon task [and the Flanker task] in which a participant has to focus on the relevant feature and ignore the irrelevant feature of a bivalent display. Therefore, bilinguals should perform better on this type of task than monolinguals because both the Simon task and language selection both require interference suppression which is employed more frequently by bilinguals than monolinguals.

Regarding response inhibition (as seen on univalent tasks) however, a bilingual advantage should be less likely to occur than on interference suppression tasks. Response inhibition in tasks like SART or Stroop requires the overriding of an automatic response with a contrary response implementing motor responses to stimuli rather than attentional control to stimuli which is less relevant to the bilingual experience (Martin-Rhee, 2008).

In their study, Martin-Rhee and Bialystok (2008) compared two types of inhibitory control of monolingual and bilingual children on a range of tests (including the Simon and Stroop tasks). They found that whereas bilinguals outperformed their monolingual peers on tests of interference suppression as measured on the Simon task, there was no difference between groups of children on response inhibition as measured on the Day/Night Stroop task. This, they state, shows how the bilingual experience of controlling attention to two language systems and the cognitive advantages that accrue from this experience can be measured by tasks that are replicable to their attentional controlling experience—the Simon task [and Flanker task] replicates this experience, the Stroop task [and SART] does not.

However, bilinguals' performance could be negatively affected on the Stroop task by their lower lexical retrieval rate. To further investigate this point Martin-Rhee and Bialystok (2008) compared the inhibitory control of monolingual and bilingual children on univalent and bivalent arrow tasks. In both of these tasks, participants were required to press a response key (left or right) on the presentation of a single arrow to indicate the direction in which the arrow pointed. Within the univalent arrow task, arrows appeared on the centre of the screen. There were two separate blocks of trials with one unique condition each, i.e., same direction condition, press response key to correspond with direction in which the arrow was pointing or reverse direction condition, press response key so that it does not correspond with direction in which the arrow was pointing. This is a univalent task as it focuses on one feature of the stimuli—direction—as such, requires response inhibition.

Within the bivalent arrow task (or Simon task), a single arrow appeared on one side of a screen (i.e., either left side or right side of screen). There was one block of trials with two separate conditions, i.e., congruent, direction and position of arrow did correspond, and incongruent direction and position of arrow did not correspond. This is a bivalent task as it focuses on two features of the stimuli—direction and position—and requires interference suppression.

Results showed that bilingual children performed significantly better than monolingual children on the bivalent task but not on the univalent task. The bivalent task, state Martin-Rhee and Bialystok (2008), replicates the bilingual experience, the univalent task does not.

Irish Immersion Education and Executive Functioning

To my knowledge, there is no research available that pertains to the effects of Irish immersion education on children's EF skills. However, considering that immersion children (i) acquire an L2 in a naturalistic setting whereby they mostly inhibit their dominant language and occasionally switch between use of their L1 and L2 depending on their classroom activity, (ii) can acquire high levels of competence in bilingualism and biliteracy (Baker, 2007), and (iii) can display cognitive advantages when compared to their monolingual peers (e.g., Bialystok, 1987), it is conceivable that similar EF advantages might be demonstrated in immersion children in Ireland when compared to their mainstream peers. An aim of this study is to explore whether or not successive bilinguals in immersion education in Ireland exhibit EF advantages that is often reported with simultaneous bilinguals.

Summary

The findings outlined in this chapter are important as they give an indication of the current understanding of EF in monolinguals and bilinguals, whilst showing a variety of explanations as to how it develops and how it can be tested with monolinguals and bilinguals. Although much of this still needs to be resolved, it is a continuous process which has provided illumination into the costs and benefits of bilingualism regarding their EF, and generally, showing that bilingualism has positive effects upon a person's EF.

Additionally, such positive effects that occur with simultaneous bilinguals could also occur with successive bilinguals. Specifically, due to the intensity of the L2 teaching within immersion programmes, a rational assumption could be that the successive bilinguals acquire at least some of the cognitive benefits that simultaneous bilinguals do, regardless of any potential difference in fluency between both groups (Bialystok, Craik, Green, & Gollan, 2009). One could go one step further and argue that given the dominant nature of English in the Irish situation, inhibiting English for the purpose of using Irish at school may require advanced levels of cognitive functioning. Whether this additional effort supports or suppresses a potential EF advantage among these bilinguals is worthy of exploration. Should the Irish bilinguals (the immersion children) and/or the

L2 children outperform the monolinguals on these tasks, one can easily appreciate the added-value of learning a second language. Should the immersion children outperform the L2 children, such results could help satisfy parents' (and others') concerns about the potential effects of Irish–medium education on children's non-linguistic abilities. Finally, if all children perform on par, the fact that the bilinguals (and the L2 children) who are having to deal with a more difficult cognitive state than the monolinguals due to the greater cognitive load that results from having two complex linguistic systems in their minds and are not negatively affected by it, would be all the more impressive.

Chapter 5

Research Aims, Test Development, and Method

This section outlines the aims of this research, and discusses the development of tasks used, ethical considerations, and methods of the investigation.

Foreword

Data collection was performed in three areas in Ireland, two areas in the Republic of Ireland (ROI) and one area in Northern Ireland (NI), and in three types of schooling systems—Irish medium education in ROI (immersion), English medium education in ROI (EM(south)), and English medium education in NI (EM(north)). Area 1 and 2 were two neighbouring counties in South East ROI and Area 3 was one county in NI.

All children in ROI, to some degree, learn Irish in school. However, the extent to which many of the ROI children attending English medium education attain fluency in their second language (L2; Irish) is debateable (see above, Harris et al., 2006, pp. 34-36); likewise whether or not immersion children can be called bilingual. There is a range of terms and definitions of bilingualism that can vary in interpretation between different authors, researchers, and research fields (Baker, 2007, pp. 2-19). For instance, bilinguals can be defined and measured in many ways, including by frequency of exposure and/or use (e.g., home language exposure vs. school language exposure; limited or extensive use of one language and/or another), age of onset (e.g., both language from birth—which is often termed “simultaneous”, but also “bilingual first language acquisition” or “2L1” if both languages are heard within the first month of birth (De Houwer, 1995)—or an early/late introduction of a second language, often termed “successive” bilingualism, “late” bilinguals, or “bilingual second language acquisition” depending on the age of exposure to the L2, or simply "L2"), proficiency (e.g., fluent in both languages or dominant proficiency in one language over the other), and culture (e.g., the effects of a monocultural society or bicultural society on one's ability to use and hear a given language). These differences have led to the development of a number of different terms for bilinguals in the literature, totalling 37 according to Wei (2000). Indeed, much of the research relating to bilingual advantages involve groups of "balanced" bilinguals—people who are deemed to be equally proficient (and appropriately competent) in both languages, or who use both languages almost equally on a daily basis. However, although a useful term in categorising subjects by competence, "balanced" bilingualism is a problematic term as people with equal competence in both of their languages are rare (Baker, 2007; Fishman, 1971), and, strictly speaking, could include people with low levels of competency in both of their languages (Baker, 2007).

In line with other research, this study considers the (i) EM(north) children to be monolingual as they do not learn a second language, (ii) EM(south) children to be L2 learners as they learn Irish for up to 3.5 hours per week, and (iii) immersion children to be "successive" bilinguals as they acquire their L2 in a naturalistic setting of immersion education which, typically, can be highly effective in developing bilingualism and biliteracy in children (Baker, 2007; for the efficacy of such programmes see also Cummins, 1998; Johnson & Swain, 1997; Swain & Lapkin, 1982). Furthermore, the EF literature focuses on switching (and suppressing) between languages on a regular basis: common experiences shared by "balanced" and successive bilinguals.

As all children in ROI learn Irish, the NI group was included to represent a more genuine monolingual sample than could possibly be represented in ROI. However, the inclusion of the NI group raises the possibility that this investigation contains some fundamental confounds (i.e., curricula, parental financial, and parental educational differences between regions). This is addressed forthwith.

Although, ROI and NI are two separate jurisdictions with two separate curricula, research has shown that by 15YO children from these areas have attained statistical parity on overall reading scales (e.g., accessing, retrieving, interpreting, evaluating), mathematical scales, and science scales (see Programme for International Student Assessment, 2009, for a comprehensive international review). Additionally, although both jurisdictions used in this study differ in their legislation pertaining to compulsory school age—NI's children must attend school between the ages of 4 and 16 Years (Department of Education, Northern Ireland, 2011), the ROI's children must attend school between the ages of 6 and 16 Years (Department of Education and Skills, Republic of Ireland, 2011)—most children in both areas begin school in the September following their fourth birthday (Department of Education, Northern Ireland, 2011; Department of Education and Skills, Republic of Ireland, 2011). Therefore, any concerns of potential confounds between groups based upon onset of education and general efficacy of education systems should be somewhat allayed.

However, ROI and NI do vary on a socio-economic level (see CSO, 2010 and Office for National Statistics, U.K., 2001, for more of specific regional differences between the two jurisdictions). Specifically, when adjusted to reflect currency differences, censuses data show that the overall average wage in ROI is higher than that in NI—as is the case in the areas in which data collection was performed for this study. Such financial differences could impact differently between groups in regards to their general lifestyle and overall educational achievements and could be reflected in children's performances on the tests used in this investigation. Therefore, questionnaires (see Appendix 1 and 2) were designed to seek information pertaining to participants' annual household income and parental educational achievements in an attempt to (i) match participants on their socio-economic status, (ii) include any differences as covariates when performing data analyses to eliminate/minimise any bias that might favour any particular group, and (iii) to reflect regional differences between ROI and NI.

Although implementation of statistical procedures are discussed in the appropriate results section below, it is important to note that appropriate analytical methods were used throughout analyses particularly when any variables were known to have had an influence the dependent variable (DV) being measured. (This was revealed by use of a series of preliminary correlational analyses of effects of participants' background variables upon the DV being analysed.) In such incidences, according to Field (2009) "[analyses of covariance] ANCOVA is ideally suited to remove the bias of these variables. Once a possible confounding variable has been identified, it can be measured and entered into the analyses as a covariate" (p. 397).

Finally, NI differs from ROI in their delivery of education and classification of children per age group. Specifically, whereas, (i) in ROI, 8-9-Year-Old children are in 2nd Class, in NI 8-9-Year-Old children are in P4, and (ii) in ROI, children progress into final stage of education (post primary school) upon completion of 6th Class, in NI, such a transition occurs a year earlier upon completion of P7 (5th Class in terms of ROI classification) when they progress to Year 1. This could suggest that whereas the performance of the older NI children could have been negatively affected by a "disturbance" of changing schools, no such "disturbance" would have affected their ROI peers. As such, ROI could have had an advantage over their NI peers. However, data collection in NI occurred in April, towards the end of the school year, thereby minimising any potential disturbance felt by some children as they had had a lot of time to "settle in" to their new school.

As such, the legitimacy of the comparisons between the ROI and NI groups, as used in this investigation, is statistically justifiable.

Research Aims

The primary aims of this project were twofold. First, I wished to investigate the effects of Irish immersion education upon children's first language (L1; English) skills in the educational setting. Second, due to the daily switching and inhibition of attention to one language that children attending Irish immersion schools experience, I wished to examine potential differences between immersion children and their L2 counterparts in comparison to monolingual age-matched peers on measures of EF skills. Two age groups were recruited: 12YO who have availed of up to 8 years of their educational experience and are coming to the end of their primary education in ROI; and 8YO who have less experience of using both languages on a daily basis. In addition, ROI children's and parents' attitudes towards Irish in Ireland (within the educational sector, homes, and society), towards bilingualism in general, and towards immersion education were also taken into consideration. However, although important, informative, and given proper consideration in test development, administration, and analyses, the attitudinal investigation was supplementary to the primary aims of this investigation and, as presented here, should be treated as such.

Test Development I

The literature review emphasised the enormity of scope of potential investigation into various aspects of children's L1, metalinguistic, and EF skills and accentuated the importance of focussing on principal aspects of each of these sets of skills. Additionally, the robust and broad ranging literature review also highlighted certain actualities of performing a large investigation such as this whereby one can move from a state of idealism to realism as one reflects upon one's own limitations and becomes aware of the magnitude of requirements of in-depth research.

For instance, this study contained one data collector and analyser (the author) and a small budget. As such, this constrained selection of subjects per age group and the amount and type of tests that could be used and how children's performance could be measured and analysed. Therefore, choice of tests needed to reflect the limitations of a sole researcher, in terms of time constraints, finances, and skill sets, whilst understanding potential ethical and practical concerns of (i) schools, in terms of child protection and minimum disruption of education provision, and (ii) children, in terms of test fatigue and minimum disruption to their education. Such concerns as these displays the necessity to integrate, balance, and/or address various issues in order to perform ethically robust research that could contribute to field of science. (Ethical considerations and procedures follow this section on pp. 111-112.)

Regarding the selected age groups used in this study, 8YOs and 12YOs were chosen for the following reasons: (i) in ROI, as 12YO children have availed of up to 8 years of their educational experience and are coming to the end of their primary education, therefore this investigation aimed to ascertain some evidence of prolonged effects of immersion education in a primary setting; and (ii) although it might have been more informative to also include younger age groups, 8YO children were chosen since it was important that the children had some degree of competence in Irish to warrant their inclusion as successive bilinguals in the study, and because of logistical challenges faced by the researcher. Specifically, as several of the ROI schools who agreed to partake in this research contained children from the age range of 8YO to 12YO (2nd to 6th class) only, it was felt necessary to use 8YOs as the younger population sample to minimise disrupting many schools and to maximise the time and resources of the sole researcher who was limited to the amount of schools that he could visit.

The tests that were used in this study were chosen/designed in an attempt to provide a battery of assessments that (i) minimised classroom/school disruption, (ii) minimised children's test fatigue, (iii) maximised novelty and enjoyment for children, (iv) permitted testing children concurrently, i.e., each child worked one-on-one with researcher or/then independently whilst wearing headphones to minimise disruption from any noise emanating from the other on-going testing, (v) worked within the author's tight time frame, which reduced the amount of children that could be tested, (vi) worked within the author's tight financial budget, which restrained the amount and types of tests that could be chosen or designed and on where data collection could take place, and (vii) an overall view of the effects of immersion education upon children's linguistic and cognitive skills, yet specific enough to focus on various linguistic and cognitive skill sets. In addition, although educated in the ROI, the author has only a moderate level of skill in Irish thereby limiting choice of tests using the Irish language and prohibiting any inter-language comparisons.

Furthermore, versions of the assessments used herein have been used internationally to provide more illumination upon the effects of simultaneous bilingualism. Using similar assessments, this investigation sought to further illuminate the effects of successive bilingualism as it pertains to immersion education in Ireland.

Therefore, tests were chosen in attempts to match conventional tests and methods that investigated the effects of bilingualism and/or immersion education.

Standardised tests were used when possible, i.e., available, affordable, and feasible in terms of time constraints. Such tests were Raven's Standard Progressive Matrices (1998), which provided norms for non-verbal reasoning ability as a control measure, the Neale's Analysis of Reading Ability—Revised, and the British Picture Vocabulary Scale (II), which provided standardised norms of children's L1 reading and vocabulary skills. However, several tests needed to be created specifically for this study. Such non-standardised tests were created in coherence to the guidelines, test descriptions, and/or conclusions of various research that have preceded this investigation. A description of test development specific to each aspect of the study follows; however, this is preceded by an explanation of some ethical considerations and the ethical approval procedure that influenced test design and choice.

Ethical Approval

It is important to reiterate that test development was performed with ethical considerations in mind. As such, every attempt was made to design tests that would minimise the disruption in children's education and the school's delivery of education. Additionally, tests were designed to provide the children an element of fun in performing the tasks and to reduce any potential "stranger anxiety" when performing the tests with the researcher with whom they had not met previously. It was decided, therefore, to run tests concurrently, thereby having two children and the researcher in a test room at any one time. This also had the additional benefit of reducing the demands of testing time upon the sole researcher.

Ethical considerations. Although the ethical approval was not sought until the tests were finalised, ethical approval procedures were implemented during the test development stage. For instance, it was first necessary to become aware of the ethical requirements as laid out by the Ethics Task Group of Bangor University (see Appendix 3). As outlined, consent needed to be acquired from proposed schools where data collection would take place. As such, principals of various schools were contacted, given a brief description of the research aims and procedures, and asked for participation in this study.

In addition, for reasons of child protection, it was necessary acquire documentation that ensured the researcher was of suitable character to work with children. This was provided by documentation from the Criminal Records Bureau in the U.K. and from the *Garda* Vetting Unit, *An Garda Síochána* (the police) in Ireland.

Ethical approval. Ethical approval was sought and granted after test development was finalised. Application for approval required the thorough explanation of the following: aims and objectives of the study; data collection dates, times, and locations; time frame of performing tasks with children; proposed tests/materials and reasons for using them (based on conventional methodologies; examples of tests were provided); procedures of confidentiality, e.g., storage and coding of data; and future dissemination of results. The ethical approval procedure also required school contacts, consent from principals involved, and examples of consent forms (see Appendix 1, 2, and 3) that would be given to parents—these forms followed a standard layout as used in previous research conducted in Bangor University and were modified to suit this investigation.

Test Development II

The following sections describe (i) the procedures used in developing the test materials used in this study, (ii) the research studies that originally used these tests in exploring the bilingual advantage which will justify the inclusion and use of each test, and (iii) expected findings based on conclusions of other research. Examples of the tests are provided in Appendix 4. The use of the tests whilst collecting data and the general procedure of the data collection are described in the Materials and Procedures sections (pp. 130-138).

Irish Language Skills

The Irish language tests were created to measure children's Irish proficiency. Specifically, because both ROI school groups learn Irish in school but vary as to their levels of exposure to the language, it was necessary to perform analyses to ascertain/demonstrate a distinction between these groups as to their L2 skills. It was expected that when compared to their ROI peers, immersion children would perform better on these tests because of their greater exposure to Irish.

However, it is important to note that the Irish language tests were created for this study. They are therefore not standardised and cannot be reliably used to compare children's performance in Irish to their performance on the English language tests—some of which were standardised.

Irish vocabulary test 1 and 2 (IVT1 and IVT2). The IVT1 for 8YOs and the IVT1 for 12YOs were devised based on the work of the *Prawf Geirfa Cymraeg, Fersiwn 7-11* (Welsh Vocabulary Test, Version 7-11; Gathercole & Thomas, 2007) and *An Liostaí Bhreacadh* (The Frequency Lists; Ní Ghrádaigh Rafferty, 2007). First, some age appropriate commonly used tangible words were randomly selected from *An Liostaí Bhreacadh*, which lists the most frequent words (approximately 300) in various age groups and categories in Irish Language reading material. Second, some appropriate pictures were selected from the database of the *Prawf Geirfa Cymraeg* to use in conjunction with Irish words as stimuli. A *Microsoft PowerPoint* document was created to display each of the chosen words in picture format. Each of these target pictures were grouped with 3 distracter pictures, making a set of 4 pictures for each test word. Two *Microsoft PowerPoint* documents were created, one for each age group: there were a total of 65 sets for the 8YO participants (taken from 0-6 YO[9] word frequency list) and 120 sets for the 12YO participants (taken from 11-12 YO word frequency list). Finally, each document was then saved as an *Adobe Reader* file which prohibits the alteration of the file and hugely reduces the file size. As such, the *Adobe Reader* files were used in test administration as the smaller file sizes were easier to operate than the larger *Microsoft PowerPoint* files.

Although piloting (see pp. 125-126) revealed no significant problems with the IVT1 for 8YOs and IVT1 for 12YOs, after the first cohort of responses to the IVT1 were analysed, results suggested that the tests were in parts too easy or too difficult for the participants. As such, in attempts to improve the internal validity, the IVT1 was fine tuned to IVT2 to include less salient and less obscure stimuli. The same test creation procedures, as outlined above, were followed for IVT2 for 8YOs and IVT2 for 12YOs.

Irish cloze tests. The cloze tests were devised based on the work of Raatz and Klein-Braley (1983, 1998) who state that cloze tests are strong predictors of L2 reading, writing, and oral proficiency. Two passages were extracted from some age related reading materials and were manipulated thus: the passage was recreated verbatim but

[9] In addition to *An Liostaí Bhreacadh* (2007) not containing an 8YO word frequency list, the author was unsuccessful in obtaining one from another source. Hence the 0-6YO word frequency was used as this was the best word frequency list available.

some of the words had some letters omitted (omissions ranged from one to four letters). Omitted letters occurred either at the start or the end of some nouns, adjectives, and verbs that had to be mutated, conjugated, or pluralised. The omissions were indicated by a line attached to the word part, e.g., "*mo _____eomra"* [my room] to be filled in as "*mo sheomra"*.

Regarding 8YOs, the age related reading passage came from *Cá bhfuil Aoibheann?* (Ní Shiordaín, 2006, pp. 3-8) and consisted of 24 omissions. Regarding 12YOs, the age related reading pasage came from *Ar Aghaidh Linn: Leabhar Saothair* (Ní Chéilleachair, 1993, p. 31) and consisted of 25 omissions.

L1 Writing Skills

Research has shown that advantages of bilingualism, often afforded to simultaneous bilinguals, can also be found in successive bilinguals, e.g., creativity (Lasagabaster, 2000) and descriptive abilities of formulating scientific hypotheses (Kessler & Quinn, 1987). As such, it was expected that when compared to their peers, immersion children would perform better on tasks measuring L1 creativity and descriptive skills because of their knowledge of two languages would promote those skills.

During the development stages of each of these tasks, it was decided that a second marker would assess at least 10% of children's responses from which an inter-rater reliability score could also be obtained. This would help to minimise the subjectivity and improve reliability of the assessment procedures used here.

Creativity task. The Creativity task was devised based on the work of Foster (1971) to assess children's creativity skills in writing a story. In effect, a marking scheme, that measures fluency (many ideas), flexibility (various references), and originality (unique elements) of a written piece, and several story titles were borrowed from Foster (1971), and several other similar story titles were created to assess children's creativity. According to Foster (1971) the mean score of fluency, originality, and flexibility provides an overall creativity score.

Descriptive task. The Descriptive task was designed to assess children's descriptive skills in writing an explanation of a novel item and experience in a controlled environment, i.e., describe the Raven's task and how to perform it. The marking scheme of this task was designed to follow the basic principles as laid out by Foster's (1971) assessment of creativity. Therefore, and in addition to ensuring consistency in scoring across participants, a list of 6 correct responses was constructed. This list was designed to assist marking a comprehensive explanation of the test description whilst ignoring any superfluous information. In essence, various aspects of children's written pieces could be evaluated in terms of accuracy, quality, and completeness of expression.

Metalinguistic Skills

The Grammatical Judgement and Fluency tasks were devised based on the work of Bialystok (1988, 2009) whereby she outlined tasks that (i) can assess children's ability to understand and manipulate the components of a language and (ii) require higher levels of control and analyses than that required on linguistic tasks that assess, say, reading or vocabulary.

Bialystok's work was performed with simultaneous bilinguals, whereas the present investigation involved successive bilinguals, as mentioned above. Nevertheless, it was expected that similar patterns of results would emerge. Specifically, because of their larger exposure to an L2, immersion children would perform better on the

Grammatical Judgement task due to their higher levels of analysis and control acquired through their continual bilingual experiences and worse on the Fluency task due to lexical competition between their two languages when compared to their peers. This is explained further below.

Grammatical Judgement task. The Grammatical Judgement task was designed to assess children's knowledge of grammatical form, specifically, their ability to judge a sentence for correctness, detect errors, and correct sentences. It was also designed to assess children's awareness of the arbitrariness of language. Following the work of Bialystok (1988), 28 written sentence structures were created especially for this study. Twenty-one of the sentences contained violations in which participants were to assess for correctness in terms of grammar, morphology, and word order. Semantic violations, if any, were to be ignored.

In essence, four sentence types were used (i) grammatically and semantically correct, e.g., The girl is smart, (ii) grammatically incorrect and semantically correct, e.g., The dag barked, (iii) grammatically correct and semantically incorrect, e.g., My cat barks, and (iv) grammatically and semantically incorrect, e.g., I rided my bicycle on the treetops[10].

According to Bialystok (2005), judging a sentence for correctness and detecting errors requires low levels of control and analysis, however correcting errors and ignoring semantic violations (as found in grammatical judgement tasks) requires low levels of control too, but high levels of analysis (Bialystok, 2005). Such processes, she states, can be interpreted as a hierarchical form metalinguistic awareness that can be hastened by being bilingual.

[10] These four examples were created and used in the current study for teaching purposes.

Lexical Fluency task. The Lexical Fluency task, as described by Bialystok (2009), is easily replicated, and needed very little in regards to preparation and materials, i.e., pen, paper, and stopwatch. The task requires a participant to name as many words as possible in a minute. Specifically, participants name words, based on their (i) linguistic, (ii) semantic, and (iii) linguistic and semantic features, which begin with a specific letter and/or belong to a specific category. As such, this assesses participant's ability to access and retrieve lexical representations and can be considered a metalinguistic task because it requires the cognitive processing and/or filtering of language selection and production using several arbitrary constraints, linguistic, semantic, or linguistic and semantic (Bialystok, 2009). Because of the conflict that arises from knowing two languages, bilinguals, states Bialystok (2009), should perform worse on this task than do their monolingual peers (see p. 44 above).

EF Skills

The EF tasks were by far the most time consuming in test development. Regarding the Flanker tasks and the Sustained Attention to Response Task (SART), these required the assistance of a professional program design company, Xavier Software, which created three executable programs fitting the specifications as laid out by the researcher and his supervisor. These specifications were based upon the research of others as outlined below.

Each of these programs was designed to measure accuracy and speed of response under specific conditions as appropriate to each task. The programs save each participant's performance in a separate *Notepad* file which can be transferred to another data file for analyses—*Statistical Package for the Social Sciences* (SPSS) was used for all analyses in this investigation.

Regarding the Stroop tasks, these were created by the researcher and were based on the commonly used Colour-Word Matching Stroop tasks.

The three EF tasks used in this study were chosen to explore potential costs and/or benefits of EF of successive bilinguals who attend immersion education in Ireland. The EF tasks were also selected to further examine Bunge et al.'s (2002) distinction between two different aspects of EF: "response inhibition" and "interference suppression". It has been suggested (Martin-Rhee & Bialystok, 2008) that tasks measuring interference suppression (choosing target stimulus over distractor stimuli) are more likely to highlight a bilingual advantage than tasks measuring response inhibition (avoiding automatic response when presented with sporadic stimuli) because the bilingual experience relies significantly more on interference suppression skills than on response inhibition skills as a bilingual's two languages are continually activated (see p. 44 above). As such, it was expected that when compared to their peers, immersion children would perform better on Flanker tasks, measuring interference suppression, but there would be no difference between groups on the Stroop tasks or on the SART which measure response inhibition.

Flanker tasks. The Flanker task, as described by Yang and Lust (2005), was replicated for this study as Flanker Task-Original. The Flanker Task-Original is a computer program that presents a series (48 trials) of stimuli—one green target fish, and four blue distracter fish—and was designed to test participants' alerting, orienting, and executive control skills. Participants are required to assess the direction in which the target fish, is pointing, whilst ignoring the distracter fish that points in a direction that is congruent or incongruent with the direction of the target fish. Participants respond by pressing a response key on the left hand side of a keyboard if the target fish is pointing left, and press a response key on the right hand side of the keyboard if the target fish is pointing right. The program was also designed to create a unique *Notepad* file for each participant whereby his/her responses would be measured in specific terms of accuracy and speed of response on congruent and incongruent trials.

According to Martin-Rhee and Bialystok (2008), when bilinguals are using one of their language systems, they must overcome the conflict of focusing on their relevant language system whilst ignoring the competition that ensues with the irrelevant language system. Such experiences are analogous to experiences of conflict whilst performing flanker tasks whereby one must focus on the position and direction of the relevant/target stimulus whilst ignoring the position and direction of the irrelevant/distracter stimuli (Martin-Rhee & Bialystok, 2008). As such, bilinguals should perform better on this task than their monolingual peers.

However, research (e.g., Hernandez et al., 2007) has shown that finding reliable differences between language groups can be contingent upon the conflict difficulty of the test. As such, Flanker Task-Modified was designed to enhance the difficulty for participants to effectively use their alerting, orienting, and exert executive control skills.

The Flanker Task-Original and -Modified were designed to be identical in all aspects (style, procedure, analyses, stimuli) except the modified version contains target and distracter stimuli in one colour only (i.e., green fish). It was felt, therefore, that participants would find the modified version more difficult to perform than the original version. This bore true in piloting and can be seen in the main analyses in the EF results sections (Chapter 8 and Chapter 12).

SART. The SART, as described by Bialystok et al. (2008), was replicated for this study. A computer program that presents a series of independent numbers (1 to 9 inclusive) as stimuli was designed to test participants' controlled attention skills. The program was designed to require participants to assess the feature of each number stimulus insofar as no response is required when the presented stimulus is the number "3", however, hitting the response key as quickly as possible is required when the presented stimulus is any other number. The program was also designed to create a unique *Notepad* file for each participant whereby his/her responses would be measured in specific terms of accuracy and speed of response on all trials combined and on all trials combined excluding the number 3.

It was expected (as per Martin-Rhee & Bialystok, 2008) that there would be no differences between language groups as this task does not replicate a bilingual experience of inhibiting conflict between two languages as the stimuli contains one feature only—number—unlike flanker tasks which contains stimuli with two features—position and direction. Although the SART tests EF skills of response inhibition, advantages do not necessarily accrue by the continual experience of being bilingual (Martin-Rhee & Bialystok, 2008).

Stroop tasks. The Stroop tasks, based on Stroop (1935), were designed for this study. There were several stages to the design of the tasks. First, as per the Stroop Task-English, the words/colours red, blue, green, and white were chosen as these were considered to be commonly known, of similar ease/difficulty to articulate, and easily represented on a standard laptop with limited colour resolution. (Moreover, considerations of common usage and ease/difficulty of articulation of the words/colours also apply to the stimuli when translated to Irish ("*Gorm*" [blue], "*Dearg*" [red], "*Glas*" [green], and "*Bán*" [white]) for the Stroop Task-Irish (see below).)

Second, it was felt necessary to present each target stimulus (i) an equal amount of times and (ii) without direct repetition to avoid any confusion or bias towards any particular word/colour. As such, a matrix of all possible colour combinations (see Table 8) was designed to aid the creation of the order of presentation of stimuli per each stage of the task. Specifically, when the stimuli “Red”, “Blue”, “White”, and “Green” are considered as a set, there is a maximum of 24 unique colour combinations. From these combinations, when the stimuli “Red”, “Blue”, “White”, and “Green” are considered individually, there is a maximum of 96 stimuli. This is more clearly seen in Table 8.

Table 8. Matrix of all possible combinations of colour sets used for developing the Stroop tasks.

Colour combinations for the Stroop Tasks			
Red	White	Blue	Green
Red	White	Green	Blue
Red	Green	Blue	White
Red	Green	White	Blue
Red	Blue	Green	White
Red	Blue	White	Green
White	Blue	Green	Red
White	Blue	Red	Green
White	Red	Blue	Green
White	Red	Green	Blue
White	Green	Blue	Red
White	Green	Red	Blue
Blue	White	Green	Red
Blue	White	Red	Green
Blue	Green	Red	White
Blue	Green	White	Red
Blue	Red	White	Green
Blue	Red	Green	White
Green	Red	Blue	White
Green	Red	White	Blue
Green	Blue	Red	White
Green	Blue	White	Red
Green	White	Red	Blue
Green	White	Blue	Red

From this matrix, each set of colours were selected to create a unique presentation order for each test condition: (i) Word-Match condition, read the words; (ii) Colour-Match condition, name the colours; and (iii) Stroop condition, name the colours not the words. In each of these cases, the target stimuli never directly repeat and are presented an equal amount of times. (See Appendix 4 which clearly outlines the presentation order of stimuli per each test condition.)

Third, a *Microsoft PowerPoint* document was created for each test condition which reflected each of the aforementioned order of presentation of stimuli. Additionally, a further 12 stimuli (3 X Red, Blue, White, and Green) were chosen at random and placed at the start of each document. This provides a practice session and also aids teaching of the task. Each file was then saved as an *Adobe Reader* file which hugely reduces the file size. As such, the *Adobe Reader* files were used in test administration as the smaller file sizes were easier to operate than the larger *Microsoft PowerPoint* files.

Finally, an answer sheet (see Appendix 4) was created to aid test administration. The design of this task was such that participants were in control of the program. Specifically, subsequent to participants' response to each stimulus, they had to then press the space bar to elicit the next stimulus. Simultaneously, the test administrator tabulated each of the participants' responses. 60 seconds were provided to perform each condition.

The Stroop Task-Irish was designed by copying the *Microsoft PowerPoint* files of each condition of the Stroop Task-English and shuffling segments thereof. Further care was taken so that the target stimuli never directly repeated and were presented an equal amount of times. Each of the stimuli was translated to Irish as appropriate, and an Irish answer sheet was also created (see Appendix 4). Finally, each new test condition was saved as an *Adobe Reader* file.

The tasks were designed to require participants to assess the appropriate feature of each stimulus insofar as (i) read each word stimulus or name the colour of each stimulus “XXXX, both an automatic response, or (ii) name the colour of each colour-word stimulus, a rule which requires inhibiting an automatic response for a somewhat arbitrary response (Spreen & Strauss, 1998).

It was expected (as per Martin-Rhee & Bialystok, 2008) that there would be no differences between language groups as this task does not replicate a bilingual experience of inhibiting conflict between two languages. Rather, the Stroop task requires the overriding of an automatic response with a contrary response implementing motor responses to stimuli rather than attentional control to stimuli which is less relevant to the bilingual experience (Martin-Rhee, 2008).

Questionnaires

Whereas the family background questionnaires were designed for parents from ROI to NI and varied to reflect regional differences (e.g., currency), only parents’ in ROI received questionnaires relating to their attitudes towards and use of Irish in schools and the society (cf Appendix 1 and 2). In addition to the questionnaires, parents also received a brief outline of the study and a consent form.

Family background. The family background questionnaire (see Appendix 1 and 2) was designed to elicit information to match children on as many variables as possible. These included the following: (i) child’s date of birth, gender, and language use in home; (ii) whether or not the child has a disability, attended a pre-school, attended a previous school to the one currently enrolled, and/or had lived in a different community than the one in which he/she currently lives; and (iii) parents' time per-week spent with children helping them with their homework, maternal/paternal education, and household annual financial income.

Attitudes towards and use of Irish language. The attitudes towards and use of Irish language questionnaires (see Appendix 1 and 2) were designed to explore parents' attitudes towards the Irish language and parents' and children's use of the Irish language. There were four questionnaires: (i) the Irish Language use questionnaire, containing language targets and domains taken from Baker (2007, p. 5), measured parents' and children's Irish language use with a range of people (e.g., immediate and extended family, friends, and in the community) and in a range of areas (e.g., shopping, media, clubs, and hobbies); (ii) the attitudes towards bilingualism questionnaire, modified from Baker and Prys-Jones (1998, p. 177), measured parents' attitudes towards bilingualism and use of Irish and English in Ireland in various settings (e.g., school and community) and how bilingualism can be problematic or not; (iii) the attitudes towards the Irish language questionnaire, modified from Ó Riagáin (1997) except questions 23 and 24 which were designed for this study, measured parents' attitudes towards the use of Irish in Ireland in various settings (e.g., school, government, society); and (iv) the attitudes towards Irish and English medium education questionnaire, modified from Ó Riagáin (1997) except question 9, measured parents' attitudes towards the inclusiveness of such schooling and their efficacy in keeping the Irish language alive in Ireland.

Assessment of Tests and Piloting

First, all non-standardised tests were run by the researcher to check for internal accuracy. For instance, whereas the computerised tests were ran and assessed as per their precision in measuring accuracy and speed of response on tasks, the Grammatical Judgement task was assessed for efficiency and consistency in assessing grammar, morphology, and word order. Corrections were made where appropriate.

Additionally, the majority of tests were run with colleagues in the research hub of the Education Department, Bangor University. This provided the researcher an opportunity (i) to familiarise himself with the test scripts and the tests and (ii) to run a mini-pilot to (further) assess tests as per their accuracy in measuring appropriate skill sets of participants. This provided the researcher a valuable opportunity to improve his test delivery; however, no other amendments to tests were found to be necessary.

A pilot study was run in one of the research areas used in the study. Several children were involved in various aspects of all the tests. Again, although this provided the researcher a valuable opportunity to improve his test delivery, no other amendments to tests were found to be necessary.

Background

Data were collected in three areas (as mentioned above), in seven schools, two of which were Irish medium and five of which were English medium (see Table 9 below).

For simplicity sake, comparative groups of children will be referred to in this study as "8YO" (7-9 Year-Olds) for 2nd Class/P4 or "12YO" (11-12 Year-Olds) for 6th Class/Year 1 as these are near approximations of average ages of groups.

All children in Area 1 and 2 participated in all of the tests. However, during the first round of data collection in Area 1, children showed a greater than expected awareness of Irish as measured on *the Irish Vocabulary Test* created for this project. This test was in part considered too elementary and did not give an accurate indication of differences in receptive vocabulary between children from immersion and EM(south). The difficulty of this test was therefore increased for the second round of data collection performed in Area 2 (and performed in Area 1 for one cohort of children from EM(south)). Also, for the second round of data collection, a cloze test in Irish was created for this project and added to the battery of tests to give a better indication of children's Irish language ability. Permission for the use of the Cloze test was sought and granted from the Ethics Task Group of Bangor University.

All children in Area 3 were excluded from the Irish language tests because they were monolingual, but they performed all of the remaining tests.

Area 1. There were two English medium schools—where the curriculum is delivered through English, except for Irish language lessons—and one Irish medium school—where the curriculum is delivered through Irish, except for English language lessons. One English medium school had one group of 12YOs (who had hitherto received 8 Years of education) and one group of 8YOs (who had hitherto received 4 Years of education). The remaining two schools had two groups of 12YOs and two groups of 8YOs.

Area 2. There was one English medium school which had one group of 8YOs and one group of 12YOs, and one Irish medium school which had two groups of 8YOs and two groups of 12YOs.

Area 3. There were two English medium schools. One school had one group of 8YOs. The other School had seven groups of 12YOs and were classified in order of academic ability, i.e., higher, medium, lower. Consent for participation was sought from five of these classes—two from higher, two from medium, and one from lower.

Table 9. Number of participants in terms of within and between school groups, and area in which they were obtained. * Represents schools which contained one classroom of 8YOs and 12YOs and applies to two EM(south) schools in Area 1 and 2. † Represents school classification of children as per academic ability and applies to the 12YO EM(north) children only. There were two groups of children in the Higher Stream and in the Middle Stream and one group of children in the Lower Stream.

	Participant Pool					
School	8YO			12YO		
	Area 1	Area 2	Area 3	Area 1	Area 2	Area 3
Immersion						
Classroom A	6	17	n/a	10	16	n/a
Classroom B	7	11	n/a	17	6	n/a
EM(south)/EM(north)						
Classroom A*/ Higher Stream†	16	12	12	12	10	24
Classroom B/ Middle Stream†	7	n/a	n/a	7	n/a	14
Classroom C/ Lower Stream†	7	n/a	n/a	7	n/a	7

Participants

The children who participated brought back a consent form signed by his/her parent. The majority of those who consented to their children participating in the research also filled out the questionnaires entirely.

Approximately 700 questionnaires were sent to parents who had a child enrolled in either one of the 7 schools that partook in this study. A total of 225 children participated in this study. Here follows a break down per age, educational group, gender, and home language use (see Table 10 and 11).

8YOs. A total of 95 8YO children participated in this study, of whom 41 (20M: 21F) came from immersion and had an average age of 8;1 (SD = 6.3; age range = 7;2—9;0), 42 (19M: 23F) came from EM(south) and had an average age of 8;5 (SD = 4.5; age range = 7;3—9;1), and 12 (7M: 5F) came from EM(north) and had an average age of 8;3 (SD = 3.8; age range = 7;10—8;9). As reported in questionnaires, no children had a disability and children came from “English Only” speaking homes (immersion = 25%; EM(south) = 86%; and EM(north) = 100%), “Mostly English and some Irish” speaking homes (immersion = 72.5% and EM(south) = 14%), or “English and Irish Equally” speaking homes (immersion = 2.50%).

12YOs. A total of 130 12YO children participated in this study, of whom 49 (29M: 20F) came from immersion and had an average age of 12;3 (SD = 5.0; age range = 11;3—13;1), 36 (23M: 13F) came from EM(south) and had an average age of 12;6 (SD = 4.5; age range = 11;10—13;3), and 45 (16M: 29F)[11] came from EM(north) and had an average age of 12;3 (SD = 3.8; age range = 11;9—12;9). As reported in questionnaires, no children had a disability[12] and children came from “English Only” speaking homes (immersion = 43%; EM(south) = 64%; and EM(north) = 100%) or “Mostly English and some Irish” speaking homes (immersion = 57% and EM(south) = 36%).

Table 10. Average age and age range of children.

	Age					
	8YO			12YO		
	Immersion	EM(south)	EM(north)	Immersion	EM(south)	EM(north)
Age (SD)	8;1 (6.26)	8;5 (5.10)	8;3 (3.57)	12;4 (4.96)	8;5 (5.10)	8;3 (3.57)
Age Range	7;2-9;0	7;3-9;1	7;10-8;9	11;3-13;0	7;3-9;1	7;10-8;9

[11]Although concerns arose during participant recruitment over the disproportionate representation of female participants in the 12YO EM(north) group when compared to their ROI peers, attempts to rectify this imbalanced male:female ratio proved unsuccessful. It was decided to include the excessive amount of EM(north) female participants to improve, what was otherwise, a low N score.

[12] Teachers provided this information when parents omitted it.

Table 11. Number of children as per gender and language used in the home as reported by the majority of parents. M:F = Male:Female. Home language use is defined as follows: EO = English Only, MESI = Mostly English and Some Irish, and EIE = English and Irish spoken in equal amounts. Note: some parents omitted home language use information.

	Gender and Home Language Use					
		8YO			12YO	
	Immersion	EM(south)	EM(north)	Immersion	EM(south)	EM(north)
M:F	20: 21	19:23	7:5	29:20	23:13	16: 29
EO	10	31	12	19	21	43
MESI	29	5	0	25	12	0
EIE	1	0	0	0	0	0

Materials

Raven's Progressive Matrices (Raven's). The Raven's was used to measure the children's non-verbal reasoning ability as a control to ensure selection of participants of similar intellectual ability. Specifically, the Raven's measures a child's ability to problem-solve, perceive relationships, and complete visual analogies without testing his/her language skills. Children were presented with an incomplete pattern—i.e., a picture or abstract design—and then asked to identify the missing piece from an array, thereby completing the pattern. Each set of items got increasingly harder, needing greater cognitive capacity to evaluate. There was a total of 60 items including two simple starter questions for teaching purposes. All children performed the task simultaneously and took no longer than 20 minutes to complete the test. Children's scores were compared against standardised norms.

Irish Language Abilities Task

(These tests were performed by children from ROI only. Children from NI were excluded because they were an English monolingual group.)

Because both ROI school groups learn Irish in school but vary as to their levels of exposure to the language, it was necessary to perform analyses to ascertain/demonstrate a distinction between these groups as to their L2 skills. Analyses revealed that immersion children of both age groups performed better than their English medium peers on all three Irish language tests (see Appendix 5 for specific details of analyses).

IVT1 and IVT2. Children were seated 12'' to 16'' away from a Dell Inspiron laptop with a 15" colour screen. Four pictures were displayed and children were asked to say which picture matched the word spoken by the researcher. Children were given two practice trials for teaching purposes after which the test proper commenced and the items became increasingly difficult.

The test was designed so that younger children were given no time constraints in completing the task as this might decrease children's performance and reduce the accuracy of the test measurements. However, due to time constraints, older children were to be given a time limit of 5 minutes to name as many words as they could. Children's scores were compared across groups.

Irish cloze test (ICT). Children were presented with an individual paper print out of the test. Each test was an extraction of some age related reading material that contained several words with some missing letters. Answers were given for the first two omissions to demonstrate how to proceed and to get a measurement of children's understanding of the task. Children were given 15 minutes to complete the task.

Scores were compared across groups.

English Language Abilities Tasks

Neale's Analysis of Reading Ability-Revised (NARA). The NARA was used to measure children's reading accuracy, reading rate, and comprehension. This tests one's basic skills of reading, speech, and knowledge of letter-sound correspondences in oral reading, as well as awareness of the structure of language. Each child read several short stories, including a practice story which clarified what was involved in the test and gave the researcher an impression of the child's reading ability and, thereby, a starting point. Children were aware that his/her errors and reading rate were being recorded. Prompting took place when a child had difficulty in responding, but did not occur too quickly or too late, as comprehension might have been lost. Likewise, when a child gave an incorrect word, the correct word was prompted. At the end of each story, the researcher asked questions to measure the child's comprehension. Testing stopped if the child produced 16 errors in Stories 1 to 5, 20 errors in Story 6, or 25 errors in Story 7, were obviously struggling with reading as demonstrated by the amount of time taken to read a given story, or successfully read all passages. There were 7 stories in total. Children's scores for the first 6 stories were compared against standardised norms. Children's scores for the final extended passage were compared across groups.

British Picture Vocabulary Scale (BPVS). The BPVS was used to measure children's English proficiency. Children were given a brief description of the task, and, together with four practice sessions gained full understanding of their role in the test. Children were then shown 12 sets of four pictures and asked to verbally indicate the picture that matched the word spoken by the researcher. The testing start point was determined by age as stated by BPVS guidelines, and progressed upwards to the next level if the child got 1 or less items incorrect. Testing start point was dropped a level if the child got two or more items incorrect. This was repeated if necessary until the child started on a level where he/she got 1 or less items incorrect. The procedure continued in sets of 12; the content of which became increasingly difficult. Testing was stopped when a child gave eight or more errors in a set. Children's scores were compared against standardised norms.

Writing tests—Creativity. The creative writing task was used to measure children's creativity. Children were shown a list of 10 titles (see Appendix 4) from which they chose one and wrote a story based on their title choice. These stories were assessed on creativity following Foster (1971; cf Torrance, 1988), whereby creativity was assessed as a tripartite system containing fluency (many ideas), flexibility (various references), and originality (unique elements). Children were given 20 minutes to perform the task. Scores were compared across groups.

Writing tests—Descriptive. This descriptive writing task was used to measure children's understanding and clarity of expression. Specifically, children were asked to explain, in writing, the Raven's test and their part in it. This provided a measure of children's comprehension and expression of a novel experience presented in a controlled environment. Children were given 20 minutes to perform the task. Scores were compared across groups.

Metalinguistic Tasks

Grammatical Judgement task. First, children were presented with four example sentences which typified the sentences in the test. These examples served as a teaching tool to demonstrate to the children what they had to do on the test. Children were asked to read each of the sentences, to ignore any semantic violations as this was the researcher being "silly", to find any grammatical errors, and to judge each sentence as correct or incorrect. Where a sentence was grammatically incorrect the children were asked to rewrite that sentence correcting the grammatical violation only and leaving the semantic violation, if any, intact. This requires the use of linguistic skills to correct the grammar violation and the use of EF skills to inhibit correcting any semantic violations. There were four conditions in this test which are the following: (i) grammatically correct and semantically correct; (ii) grammatically incorrect and semantically correct; (iii) grammatically correct and semantically incorrect; and (iv) grammatically incorrect and semantically incorrect. The grammatical errors consist of violations of tense, word order, and number.

Upon completion of the example session, when children demonstrated their understanding of the test, they were then given the 24 test sentences which contained the same criteria as in the example piece. Children's scores were compared across groups.

Lexical Fluency test. First, linguistic category, children were given the letter F, A, or S and were asked to say as many words as possible that start with that letter. Then, semantic category, children were given the category "clothing" and asked to name as many items of clothing as possible. Finally, linguistic and semantic category, children were given the letter F, A, or S and the category "animals" and asked to name as many animals as possible that start with the given letter. Trials were always delivered in the same order, but delivery of the letters F, A, and S were counterbalanced and no child got the same letter twice. Children's scores were compared across groups.

Executive Function Tasks

Flanker tasks. The Flanker tasks were used to "probe developmental differences in attentional networks of alerting, orienting, and executive control" (Yang & Lust, 2005, p. 4.) in terms of correct scores and mean reaction time. Children were seated 12'' to 16'' away from a Dell Inspiron laptop with a 15” colour screen. Using a program created with an *exe* (executable) file written in Adobe (formerly Macromedia) Director, stimuli were presented to children who were asked to respond using either one of two input keys, for congruent or incongruent trials. The stimuli were an array of fish with the target fish presented as “swimming” in the same direction as the rest of the array (congruent), or presented as “swimming” in the opposite direction of the rest of the array (incongruent). Children received reinforcing feedback for their answers as they proceeded, i.e., for correct answers the fish said “woohoo”, wagged its tail and blew bubbles from its mouth and for incorrect answers the fish said “aww”. All children received a practice trial where they demonstrated understanding of the task by getting three responses in a row correct before they could proceed to the test. Also, all children received the same amount of trials—2 blocks of 24 trials separated by a short break. Finally, there were 2 types of Flanker task: Flanker Task-Original, where the target fish was blue and the remaining fish were green and Flanker Task-Modified, where all fish were green. Children’s accuracy scores and response times were compared across groups. Additionally, a score was calculated to attain a measurement of the effect of congruency, i.e., for accuracy and MRT responses, incongruent scores were subtracted from congruent scores. Scores were compared across groups.

Sustained Attention to Response Task (SART). SART was used to measure the children’s sustained attention to stimuli. Children were seated 12’’ to 16’’ away from a Dell Inspiron laptop with a 15” colour screen. Using a program created with an *exe* (executable) file written in Adobe (formerly Macromedia) Director, stimuli were presented to children. The stimuli were presented in three stage circuits. First, a blue square focal point, followed by a blank display, and then the presentation of the numbers

1 to 9 inclusive and independently. Blue square focal points that appeared on the screen lasted 500ms and were followed by a blank display which lasted 250ms. The blank display preceded the presentation of each number. Each time a number appeared children were required to press the response key as quickly as possible, which was the onset of the immediate presentation of the next blue square focal point. The exception was when the number 3 appeared. At such point, children were required to give no response and wait until the next number (preceded by blue square focal point followed by a blank display) was presented which occurred 2750ms later.

Each child had a practice session of 2 blocks of numbers 1-9 where all showed understanding of the task. There were 225 trials in total, arranged in 25 blocks of 9 trials each. Children's scores and reaction times were compared across groups.

Stroop tasks. The Stroop tasks were used to measure the children's executive control and conflict resolution. Children were seated 12'' to 16'' away from a Dell Inspiron laptop with a 15" colour screen. Using an *Adobe* file, stimuli were presented to children who were asked to respond by naming each stimulus as it appeared and then to press a keyboard button to bring up the next stimulus. However, there were three stages in this test and the rules changed throughout stages. The first two stages are considered baseline scores and were counterbalanced.

Each stage was preceded with 12 practice trials that served as a teaching tool to demonstrate to the children what they had to do on the test, and for the children to display their understanding of the test. At the start of each test stage, children were told to (i) respond to each target stimulus in accordance to the rules of each stage, (ii) then press spacebar immediately for the onset of the next stimulus, and (ii) name as many target stimuli as possible within a minute; their accuracy of response was recorded on an answer sheet by the researcher. Additionally, a score was calculated to attain a measurement of the effect of interference produced on the Stroop condition, i.e., Stroop scores subtracted from the mean of Word-Match and Colour-Match conditions. Scores were compared across groups.

Stroop Task-English. In the Word-Match Condition, children were shown the words blue, green, red, and white and were asked to read as many words as possible. In the Colour-Match Condition, children were shown the letter sequence “XXXX” which was coloured blue, green, red, or white, and were asked to identify the colour of as many “XXXX” sequences as possible. Delivery of Word-Match Condition and Colour-Match Condition was counterbalanced.

Finally, in the Stroop Condition, children were shown colour-word stimuli—i.e., colour-words “blue”, “green”, “red”, and “white” but presented in colours that were incongruent to word meaning (e.g., “red” written in the colour blue). Children were asked to name the colour of the word and avoid reading the word aloud, which requires more executive control and conflict resolution than merely reading the word.

Stroop Task-Irish. Similar to the Stroop Task-English, the Stroop Task-Irish was used to measure the children’s executive control and conflict resolution. It was also used to give a measure of children’s productive Irish language ability. This test was not used with children from NI.

This task was virtually identical to the Stroop Task-English above, except the order and language (Word-Match Condition and Stroop Condition) of which the target stimuli and the target stimuli were presented. As opposed to reading “Blue”, “Red”, “Green” and “White”, stimuli read “*Gorm”* [blue], “*Dearg”* [red], “*Glas”* [green], and “*Bán”* [white].

Questionnaire—Use, Ability, and Attitudes

This questionnaire, designed specifically for this study, was used to measure children's (i) use of and ability in Irish language (and any other language he/she might know) and (ii) attitudes towards Irish language use in their life, school, and society. They were performed towards the end of the battery of tests as this provided time for the researcher and each child to build a rapport and develop trust thus increasing the likelihood of children answering questions with more candour. Children were asked to answer the questions as best and honestly as they could and were told that he/she was "the only person who knows all the answers. These questions are about what you do and what you think." Children from NI were excluded from this part of the test because they were English speaking monolinguals.

Procedure

All tests were explained through English and followed the scripts outlined in Appendix 6. Where language was used, tests were conducted through English, except for the Irish Vocabulary Tests and the Irish Cloze test. The Raven's Progressive Matrices Test was always delivered first and delivered in a group setting. This test lasted 20 minutes. The remainder of the tests were conducted in a quiet setting with the researcher present at all times. Tests were delivered in a counter-balanced order. Testing lasted approximately 2.5 hours with school scheduled breaks taken between tests. This eased any testing fatigue that might have occurred. See Appendix 4 for examples of test materials.

Foreword

Introduction to Results Chapters

This foreword to the result chapters outlines the specific hypotheses that were tested in this study. Table 12 provides a point of reference and overview of all tested hypotheses. Although the current research field investigating the effects of bilingualism reveals several areas where bilingual "advantages" and "disadvantages" can be found, typically, such results pertain to "balanced" or simultaneous bilinguals. The immersion children in this study however, are experiencing childhood bilingualism insofar as they have been exposed to Irish on a daily basis from age 4. (This is typical in immersion education in Ireland whereby children are immersed in their L2 from their first day at school (e.g., Ní Bhaoill & Ó Duibhir, 2004). Although the extent to which one can identify these children as fluent in both English and Irish is debatable, for the purpose of the present study, these children's experiences with their two languages are explored in the same way as others have investigated similar bilingual populations in the field (see, e.g. Gathercole et al., 2010, for a similar study including bilingual children from English-speaking homes learning Welsh at school and Bialystok (1987) who investigated metalinguistic development of bilinguals, which included immersion children from English-speaking homes learning French in school).

Presentation of results. Chapters 6 to 11 show the results of data analyses that explored the impact of bilingualism on children's linguistic and cognitive skills as measured by a battery of tests. Results from several sets of analyses are presented comparing the performance of children from Irish medium education in the Republic of Ireland (immersion), English medium education in the Republic of Ireland (EM(south), and

English medium education in Northern Ireland (EM(north)). Chapters 6 to 8 present data from the 8 and 9-year-olds and Chapters 9 to 11 present the data from the 11 and 12-year-olds. For both age groups, analyses of background information pertaining to the children—including measures of socio-economic status and non-verbal reasoning ability—is discussed first, since they influence the analysis of children's performance on the other measures. Analyses of children's L1 linguistic and metalinguistic skills are then presented, followed by analyses of data from measures of their non-linguistic EF skills.

Table 12. List of hypotheses pertaining to each test.

List of Hypotheses	
Tests	Hypotheses
English Language	
Neale's Analysis of Reading-Revised	There would be no difference between children's performance per language group. Any potential "lag" in immersion children's reading skills will have disappeared as they will have acquired equivalency with their peers in reading through their increased exposure to their L1.
British Picture Vocabulary Scale	Immersion children would have a lower vocabulary score than their peers because of their lower exposure to academic English vocabulary in school.
Creative Writing	Immersion children would have a larger creativity score than their peers because of their knowledge of a second language and their knowledge of the arbitrariness of language.
Descriptive Writing	Immersion children would perform better than their peers because their knowledge of a second language would help them focus attention onto expressive skills in their L1.
Metalinguistic	
Grammatical Judgement	Immersion children would perform better than their peers because their knowledge of a second language would help them focus attention onto linguistic structures of their L1.
Lexical Fluency	Immersion children would have a lower fluency score than their peers on each condition of the test because their lower exposure to L1 and increased exposure to L2 would hinder their lexical access.
Executive Function	
Flanker Task Original and Modified	Immersion children would perform better than peers because of their experience of interference suppression which they employ when choosing to speak one of their languages whilst suppressing their other language.
Sustained Attention to Response Task	There would be no difference between children's performance per language group because this tests response inhibition which does not replicate a bilingual experience.
Stroop Tests	There would be no difference between children's performance per language group on the Stroop Condition of the test because this tests response inhibition which does not replicate a bilingual experience. Also, there would be no differences between groups on Word-Match Condition and Colour-Match Condition because these require low levels of attention and control.

Foreword on correlational analyses. Preliminary correlational analyses were performed to ascertain the appropriate use of covariates for the main analyses, i.e., whether or not measures correlated with background variables thus actively predicting an effect on the measures.

Correlations were also performed to ascertain whether or not variables were superfluous. For example, within the Socio-economic status measures of both age groups of children, Parental Education and Household Income Combined correlated significantly with Parental University Education ($r(85) = .976$, $p < .001$ for 8-Year-Old Children; $r(105) = .938$, $p < .001$ for 12-Year-Old Children) and Household Income ($r(75) = .673$, $p < .001$ for 8-Year-Old Children; $r(92) = .506$, $p < .001$ for 12-Year-Old Children). Such correlations were expected as there is a great deal of overlap within these measurements. Therefore, although Parental University Education and Household Income were included in background analyses of children, these variables were excluded from all main analyses of children's L1 and Cognitive measures. Instead, the combined variable of Parental University Education and Household Income was used as the sole SES measure when investigating children's performance on tests.

The background variables for all correlational analyses were gender, homework help time from parents, parental education and income combined, and children's percentile scores on Raven's non-verbal reasoning test.

Analyses. Several statistical models were used for data analyses. One non-parametric model of analysis, chi square, was used to investigate categorical background information of parents' education and children's L2 use in the home. A further set of four parametric models of analyses was used to analyse the main dataset, including Pearson's Bivariate Correlations, t-tests, one-way between-groups analysis of variance, and one-way between-groups analysis of covariates. Pearson's bivariate correlations were used to investigate internal validity of Creative and Descriptive writing tests and for looking at relationships between background measures and test measures. The remaining three parametric tests were used to investigate group differences between children's background details and responses on tests.

The independent variable (IV) for all analyses was school type. Whereas the IV for Irish-Stroop test has two levels—immersion and EM(south)—all other tests has three—immersion, EM(south), and EM(north). Children's responses were adjusted for effects of covariates when performing one-way between-groups analyses of covariance. As mentioned above, ANCOVAs are "ideally suited to remove the bias of these variables. Once a possible confounding variable has been identified, it can be measured and entered into the analyses as a covariate" (Field, 2009, p. 397). Where used, effect size was measured using eta squared. All statistical analyses reported are one tailed with $\alpha = p < .05$, as it is commonly considered the standard level of significance used to justify a claim of a statistically significant effect (Wall, Johnson, Kardon, & Crabb, 2009).

Overview of results. The following four tables (Tables 13 to 16) present an overview of children's performances on all of the tests. The purpose of this is to provide a synopsis of group differences as measured by several tests measuring linguistic, metalinguistic, and EF skills.

Regarding the Reading, Extended Passage (EP) of reading was performed by the 12-Year-Old children only. As such, the "Completed All Readings" measurement is 7 passages of reading for the 12-Year-Olds and 6 passages of reading for the 8-Year-Olds.

Regarding the Irish Stroop, only the Republic of Ireland children participated in this test, as EM(north) children were monolingual English.

Table 13. Overview of statistical analyses on the L1 Reading, Vocabulary, and Creative Writing tasks.

Overview of L1 Reading, Vocabulary, and Creative Writing Test Results		
Measures	8-Year-Olds	12-Year-Olds
Reading		
NARA Accuracy	No group differences	Immersion and EM(south) scored better than EM(north)
NARA Comp’	No group differences	Immersion and EM(south) scored better than EM(north)
NARA Rate	No group differences	No group differences
EP Accuracy	n/a	No group differences
EP Comp’	n/a	No group differences
EP Rate	n/a	Immersion and EM(north) scored better than EM(south)
Completed All Readings	No group differences	Immersion and EM(south) scored better than EM(north)
BPVS	No group differences	EM(south) scored better than EM(north)
Writing		
Creative Score	Immersion and EM(south) scored better than EM(north)	Immersion and EM(south) scored better than EM(north)
Word Count	No group differences	No group differences
MLU	No group differences	No group differences
EWCR	No group differences	No group differences
Word Frequency	No group differences	No group differences
Noun Frequency	No group differences	No group differences
Verb Frequency	No group differences	No group differences
Adjective Frequency	No group differences	No group differences

Table 14. Overview of statistical analyses on the L1 Descriptive Writing and Metalinguistic tasks.

Overview of L1 Descriptive Writing and Metalinguistic Test Results		
Measures	8-Year-Olds	12-Year-Olds
Writing		
Descriptive Score	Immersion scored better than EM(south) and EM(north)	Immersion scored better than EM(north)
Word Count	Immersion scored better than EM(south) and EM(north)	Immersion scored better than EM(south) and EM(north)
MLU	No group differences	No group differences
EWCR	No group differences	No group differences
Word Frequency	No group differences	Immersion scored better than did EM(north)
Noun Frequency	No group differences	Immersion scored better than did EM(north)
Verb Frequency	No group differences	No group differences
Adjective Frequency	No group differences	No group differences
Gram' Judgement		
Detection	No group differences	Immersion and EM(south) scored better than EM(north)
Correction	No group differences	Immersion and EM(south) scored better than EM(north)
GS	No group differences	No group differences
gS	No group differences	Immersion and EM(south) scored better than EM(north)
Gs	No group differences	Immersion and EM(south) scored better than EM(north)
gs	No group differences	Immersion scored better than EM(north)
Lexical Fluency		
Linguistic	Immersion and EM(south) scored better than EM(north)	No group differences
Semantic	No group differences	Immersion and EM(south) scored better than EM(north)
Linguistic and Semantic	No group differences	No group differences

Table 15. Overview of statistical analyses on the Flanker tasks and on the SART. Difference scores are the results of congruent trials subtracted from incongruent trials.

Overview of Flanker and SART Test Results		
Measures	8-Year-Olds	12-Year-Olds
Flanker Task-Original		
Correct Congruent	No group differences	No group differences
Correct Incongruent	No group differences	Immersion and EM(south) scored better than EM(north)
Difference Score	No group differences	EM(south) scored better than EM(north)
Correct Congruent MRT	No group differences	No group differences
Correct Incongruent MRT	No group differences	No group differences
Difference MRT	No group differences	No group differences
Flanker Task-Modified		
Correct Congruent	No group differences	No group differences
Correct Incongruent	No group differences	No group differences
Difference Score	No group differences	No group differences
Correct Congruent MRT	EM(north) scored better than immersion and EM(south)	No group differences
Correct Incongruent MRT	No group differences	EM(south) scored better than EM(north)
Difference MRT	No group differences	No group differences
SART		
Correct Score	No group differences	No group differences
Correct Press	No group differences	No group differences
Correct Pass	No group differences	Immersion and EM(south) scored better than EM(north)
MRT +No.3	EM(north) scored better than immersion	No group differences
MRT –No.3	EM(north) scored better than immersion	No group differences

Table 16. Overview of statistical analyses on the Stroop tasks. Interference scores are the result of Stroop scores subtracted from the mean of Word-Match and Colour-Match conditions.

Overview of Stroop Test Results

Measures	8-Year-Olds	12-Year-Olds
Stroop-English		
Word-Match	No group differences	No group differences
Colour-Match	No group differences	No group differences
Stroop	No group differences	No group differences
Interference Score	No group differences	Immersion and EM(south) scored better than EM(north)
Stroop-Irish		
Word-Match	No group differences	No group differences
Colour-Match	Immersion scored better than EM(south)	No group differences
Stroop	No group differences	No group differences
Interference Score	No group differences	No group differences

The overview of all analyses as presented in Tables 13-16 reveal a mixed picture of the effects of school type. Overall, there were few differences between immersion and EM(south) groups; rather, group differences were mostly found between EM(north) and their ROI peers. Analyses are further explored in the next 6 chapters.

Chapter 6

8-Year-Olds: Basic Profile, SES, and Raven's

This chapter discusses the results of analyses performed on data from several control measures gathered from parents' responses on the Family Background Questionnaires and on children's performance on the Raven's Progressive Matrices task. However, it is necessary to first address the population size of the EM(north) sample before discussion of the results proceeds.

Despite contacting more than 20 schools for this age group, only one school agreed to partake in the study. Various reasons were given by several principals as to why they declined to permit their children to partake in the study. Such concerns mainly focussed on time constraints due to their own testing being in progress, school inspections, and, mostly, religious ceremonies (First Holy Communion) that clashed with the proposed time of data collection. Due to this small N size (12), certain results could represent a cohort effect; therefore, a certain degree of caution must be adhered to when interpreting results, particularly any significant effects that are not below .01. This small N size also constrained certain analyses that could be performed (see below).

Questionnaires—Family Background

The Family Background Questionnaires were designed to elicit information to match children on as many variables as possible, including age, gender, whether or not the child had a disability, amount of L2 use, parents' time per-week spent with children helping them with their homework, home language use, maternal/paternal education, and household annual financial income.

The children who participated brought back a consent form signed by his/her parent. Whereas the majority of those who consented to their children participating in the research filled in the questionnaires entirely, some parents filled in the questionnaire partially, or solely as it pertains to themselves and omitted information as it pertains to their child's other parent, and some parents gave consent without providing any background information. As such, (i) one could assume that these are single parent households, which could affect children's performance, but there is no way to verify this issue as measured here, and (ii) various omissions on the questionnaires reduced the N size in some of the analyses as is reflected in the appropriate results sections below. Analyses were performed using two models: one-way between groups analysis of variance and chi square analyses. Descriptive statistics for all background information are shown in Tables 17, 18, and 19.

Age, gender, disability, and homework help. Analyses found one significant difference between groups of children—Age, showing that the EM(south) children were older than their immersion peers. There were no other differences between groups of children on these variables and no child was reported to have had a disability (see Table 17).

Table 17. Range, Raw Scores, and Means (SD) of background information—Age, Gender, Disability, and Homework Help Time in hours—as reported by parents. *<.05 level (2-tailed).

Background Information					
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2
Age (41, 42, 12)	8;1 (6.26)	8;5 (5.10)	8;3 (3.57)	4.03*	.080
Age Range (41, 42, 12)	7;2—9;0	7;3—9;1	7;10—8;9	-	-
Sex (41, 42, 12)	20M: 21F	19M: 23F	7M: 5F	0.31	.007
Disability					
Parents' Report (39, 38, 12)	0	0	0	-	-
Teachers' Report (2, 4, 0)	0	0	-	-	-
Homework Time per week (35, 35, 11)	2.83 (2.34)	3.46 (2.28)	3.70 (1.45)	1.00	.025

L2 use. Overall, immersion children were more likely than their peers to use an L2 in their homes. This was supported by chi square analysis. Similarly, there was a significant difference between groups in the amount of time each child spoke an L2, as reported by parents. Planned comparisons showed that immersion children used their L2 more than their peers. There was no difference between EM(south) and EM(north)[13] children (see Table 18).

Additionally, analyses of official/school guidelines of mean amount of hours per day of L2 use in school showed that immersion children used their L2 more than EM(south) and EM(north) children, and EM(south) children used an L2 more than EM(north) children (see Table 18).

[13] The monolingual EM(north) samples were included into L2 analyses to provide a statistical comparison to the EM(south) samples who received a minimal amount of L2 education.

Table 18. Raw Score/Means (SD) of language use information as reported by parents (SD). ***<.001 (2-tailed).

Language Use					
Measures (N)	Immersion	EM(south)	EM(north)	χ^2/F	ηp^2
Home Language Use (44, 33, 43)					
English Only	10	31	12	37.7***	-
English Mostly/Some L2	29	5	0		
L2 use in hours per day					
Parental report (42, 28, 33)	5.87 (2.43)	0.14 (0.26)	0.00 (0.00)	114***	.755
Official Guidelines (49, 36, 44)	5.50 (0.00)	0.70 (0.00)	0.00 (0.00)	1E+034***	1

Parental education. Of the various stages of education, chi square analyses of parents' academic qualifications found a difference between schools. Results suggest that immersion children's parents progressed further than EM(north) and EM(south) children's parents in the education system. However, this analysis violated the assumption of minimum expected cell frequency because 8 (53.3%) cells had an expected count of less than 5 (see Table 19.)

Further analyses found a significant difference between groups regarding whether or not parents attended university. Planned comparisons showed that immersion children's parents were more likely to have attended university than were EM(north) and EM(south) children's parents. There was no significant difference between EM(north) and EM(south) children's parents' education (see Table 19).

Household income. There was a significant difference in parents' financial status based on regional averages (CSO, 2010, for immersion and EM(south) children and Office for National Statistics, U.K., 2001, for EM(north) children). Data showed that the immersion and EM(south) parents were more likely to earn above the regional average than were the EM(north) parents. There was no significant difference between immersion and EM(south) children's household income (see Table 19).

Parental education and household income combined. There was a significant difference between groups. Planned comparisons showed that more immersion children's parents achieved a higher financial and educational level than EM(north) and EM(south) children's parents. There was no significant difference between EM(north) and EM(south) groups (see Table 19).

Table 19. Raw Score (SD) of SES information as reported by parents (SD). **<.01 (2-tailed).

Education and Financial Status					
Measures (N)	Immersion	EM(south)	EM(north)	χ^2/F	ηp^2
Parental Academic Qualification (40, 36, 12)					
No Exams Taken	0	2	2	22.9**	-
State Exams 15/16YO	1	6	5		
State Exams 17/18 YO	9	10	2		
Graduate	18	12	3		
Postgraduate	12	6	0		
Parents University Educated (40, 36, 12)	30 (0.43)	18 (0.51)	3 (0.45)	6.11**	.126
Above Average Household Income (35, 33, 5)	31 (0.60)	22 (0.68)	3 (0.55)	6.02**	.147
Parental Education and Household Income Combined (38, 35, 12)	28 (0.45)	16 (0.51)	3 (0.45)	6.07**	.129

Non-verbal Reasoning Ability

Raven's Progressive Matrices. Analyses revealed no significant difference between language groups (see Table 20) which suggests that children had similar non-verbal reasoning skills.

Table 20. Mean (SD) Raven's scores of children per school. ***<.001 (2-tailed).

Non-Verbal Intelligence					
Measure (N)	Immersion	EM(south)	EM(north)	F	ηp^2
Percentile (49, 36, 44)	52.2 (26.1)	50.7 (26.4)	51.2 (31.0)	0.32	.001

Summary of Analyses of Background Variables

8YOs Basic Profile, SES, and Raven's

Overall, analyses found several differences between groups of children based on background measures. As expected, there were differences in daily use of L2 due to the curriculum provided to each language group. This language use was transmitted somewhat into the home environment where immersion children used their L2 more in their home than EM(south) children.

However, there were interesting differences regarding parental education and financial income. Data showed that more immersion parents had gained a university education and earned above regional average than EM(north) and EM(south) parents. Similar patterns were found when looking at parents who gained both a university education and earned above regional average as measured as a combined variable.

No other significant differences were found between groups on homework help time and, more importantly, Raven's scores which suggests that children had similar non-verbal reasoning skills. Whilst these differences should be sufficiently controlled via their entry as co-variates in the proceeding analysis, one should, nevertheless, remain cautious when interpreting data, particularly those suggesting a significant advantage for children in the ROI.

* * *

The next chapter presents results of analyses of children's performances on several linguistic tests. The subsequent chapter presents results of analyses of children's performances on several EF tests.

Preliminary correlational analyses were performed before main analyses of all the tests to investigate the relationship between test variables and background variables. As such the Gender, Homework Help Time, Parental Education and Household Income Combined, and Raven's variables were used in the correlational analyses, and (iii) Parental Education and Household Income Combined variable was the sole SES measurement used in the correlational analyses as it strongly correlated with Parental University Education, $r(85) = .976$, $p < .001$, and Household Income, $r(75) = .673$, $p < .001$.

Chapter 7

8-Year-Olds: Linguistic and Metalinguistic Skills

This chapter discusses the results of analyses performed on data gathered from the younger children's performances on several English language tasks which measure children's L1 reading, vocabulary, and writing skills and their L1 metalinguistic skills.

Several tasks were used to acquire a measurement of children's L1 reading, vocabulary, and writing skills and on their L1 metalinguistic skills. It was expected that, whereas immersion children might be weaker on the test of L1 vocabulary and lexical fluency, they would be on par or outperform their peers on the remaining language tests (see Table 12, Chapter 6, p. 141).

Each of the following five sections—(i) reading and vocabulary, (ii) creative writing, (iii) descriptive writing, (iv) grammatical judgement, and (v) lexical fluency—commences with correlational analyses between background variable measures and the relevant language measures to determine the co-variables to include in the main analysis.

L1 Reading and Vocabulary Skills

Two standardised English language tests that were used to ascertain the percentile scores of children's English language abilities: Neale's Analysis of Reading-Revised (NARA), which measured accuracy, comprehension, and rate of reading abilities, and the British Picture Vocabulary Scale (BPVS), which measured children's vocabulary ability.

A further measurement was taken as to whether or not children successfully read all six passages of the standardised test. This measure differs from the older children's analyses above as there were too few younger children who successfully read the extended passage due to the complexity of the material. Scores were compared across groups.

Correlational analyses of background variables. Analyses revealed that (i) Gender correlated with Reading Comprehension, $r(95) = -.241$, $p = .019$, and BPVS, $r(95) = -.322$, $p = .001$, (ii) Homework Help Time correlated with all reading measures, $r(81) = -.397$ to $.274$, $ps = .000$ to $.013$, and (iii) SES and Raven's correlated with Reading Accuracy, Reading Comprehension, and BPVS, $r(85, 95) = -.270$ to $.393$, $ps = .000$ to $.031$ (see Table 21).

In line with this pattern of results, in the main analyses, Gender, Homework Help Time, SES, and Raven's were used as covariates on the aforementioned variables in which they significantly correlated.

Main analyses. Analyses revealed no significant effect of school type on any of the measures (see Table 22). In consideration of the covariates, (i) Raven's was significantly related to vocabulary, (ii) Homework Help Time was significantly related to reading accuracy, $F(1, 73) = 9.54$, $p = .003$, $\eta p^2 = .116$, reading comprehension, $F(1, 72) = 4.60$, $p = .035$, $\eta p^2 = .060$, and reading rate, $F(1, 77) = 11.2$, $p = .001$, $\eta p^2 = .127$, and (iii) Gender was significantly related to BPVS, $F(1, 79) = 11.9$, $p = .001$, $\eta p^2 = .131$. There were no other significant effects of the covariates (accounting for <5% of the variance).

These results suggest that all children (regardless of medium of Education) performed similarly on these English language measures.

Table 21. Correlations among background variable and L1 reading and vocabulary scores. ***<.001, **<.01, *<.05 level (2-tailed). EP = Extended Passage of reading for children who completed all standardised reading passages.

L1 Skills									
Measures	1	2	3	4	5	6	7	8	9
1.Gender	-								
2.Homework Help Time	.053	-							
3.SES	-.016	-.055	-						
4.Raven's	-.127	-.322**	.303**	-					
5.NARA Accuracy	-.163	-.397***	.277**	.305**	-				
6.NARA Comprehension	-.241*	-.330**	.288**	.345***	.861***	-			
7.NARA Rate	-.163	-.343**	-.062	.202	.554***	.506***	-		
8.Completed all Readings	.120	.274*	-.234*	-.270**	-.672***	-.672***	-.520***	-	
9.BPVS	-.322***	-.023	.252*	.393***	.526***	.612***	.371***	-.545***	-

Table 22. Adjusted means (Std Error) and statistical analyses of children's L1 reading and vocabulary scores. ***<.001, **<.01 level (2-tailed).

L1 Skills							
				Schools		Raven's	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
NARA Accuracy (34, 34, 11)	55.6 (4.31)	53.5 (4.18)	55.9 (7.50)	0.08	.002	3.03	.040
NARA Comprehension (34, 34, 11)	52.9 (4.30)	52.3 (4.18)	51.0 (7.53)	0.02	.978	6.31	.081
NARA Rate (35, 35, 11)	55.7 (4.13)	63.5 (4.11)	56.6 (7.32)	0.98	.025	-	-
Completed all Readings (34, 34, 11)	23.5 (0.07)	20.5 (0.07)	9.09 (0.12)	022	.006	2.44	.032
BPVS (38, 35, 12)	50.6 (3.49)	50.9 (3.55)	50.0 (6.19)	0.16	.004	7.57**	.087

L1 Creative Writing Skills and L1 Descriptive Writing Skills

Two non-standardised English language tests were used to measure children's creative skills and descriptive skills. (The inter-rater reliability measurement, using Pearson's bivariate correlation showed a strong correlation between the two raters, Creativity, $r(15) = .798$, $p < .001$, and Descriptive, $r(17) = .854$, $p < .001$.) Additionally, each test also included basic analyses of children's writing looking at (i) word frequency, (ii) noun frequency, (iii) verb frequency, (iv) adjective frequency, (v) word count, (vi) mean length of utterance (MLU), and (vii) error: word count ratio (EWCR)[14].

L1 Creative Writing Skills

Correlational analyses of background variables. Correlational analyses (see Table 23) showed that Homework Help Time did not yield correlations on measurements of creativity or writing skills. Similarly, SES and Raven's did not correlate with any of the writing measurements but did correlate with Creativity, $r(85) = .245$, $p = .024$ and $r(95) = .227$, $p = .027$ respectively. Gender did not correlate with Creativity but did correlate with several writing measures: MLU, $r(95) = -.298$, $p = .003$, Word Frequency, $r(95) = -.243$, $p = .018$, and Verb Frequency, $r(129) = -.233$, $p = .023$.

In line with this pattern of results, the covariates used in the main analyses included Gender when analysing MLU, Word Frequency, and Verb Frequency, and SES and Raven's when analysing Creativity.

Main analyses. Results from main analyses (see Table 24) revealed one significant difference between groups—Creativity. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion and EM(south) children were significantly

[14] Note: A lower score on the variable EWCR indicates a better performance than a higher score.

more creative in their written stories. However, the analyses of the remaining seven conditions revealed no significant effects of school type.

In consideration of the covariates, (i) Raven's was significantly related to creativity, $F(1, 84) = 5.39$, $p = .023$, $\eta_p^2 = .063$, and (ii) Gender was significantly related to MLU, Word Frequency, and Verb Frequency. SES did not significantly affect creativity, accounting for 0.8% of the variance.

Table 23. Correlations among background variable and L1 creative and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

	L1 Creative Writing Skills											
Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.053	-										
3.SES	-.016	-.055	-									
4.Raven's	-.127	-.322**	.303**	-								
5.Creative Score	-.194	-.211	.245*	.227*	-							
6.Word Count	.190	-.182	.131	.044	.450***	-						
7.MLU	-.298**	-.159	.066	.077	.136	.003						
8.EWCR	.067	.100	.012	-.100	.058	-.178	-.058	-				
9.Word Frequency	-.243*	.081	-.030	.028	.113	.059	.056	-.130	-			
10.Noun Frequency	-.130	.083	-.034	.038	.247*	.105	-.114	.034	.719***	-		
11.Verb Frequency	-.233*	-.010	-.142	-.003	-.063	-.109	.224*	-.189	.520***	.014	-	
12.Adjective Frequency	-.144	.117	-.046	-.020	-.023	.055	.087	-.210*	.307**	.110	-.053	-

Table 24. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's L1 creative and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

	L1 Creative Writing Skills						
				Schools		Gender	
Measures (N)	Immersion	EM(south)	EM(north)	F	ηp^2	F	ηp^2
Creative Score (38, 35, 12)	2.21 (0.15)	2.27 (0.15)	1.27 (0.26)	6.20**	.050	-	-
Word Count (41, 42, 12)†	99.0 (45.1)	89.3 (35.6)	70.3 (38.3)	2.44	.008	-	-
MLU (41, 42, 12)	3.69 (0.05)	3.71 (0.53)	3.75 (0.10)	0.12	.003	8.72**	.087
EWCR (41, 42, 12)†	22.0 (12.1)	19.3 (13.2)	20.2 (20.0)	0.39	.023	-	-
Word Frequency (41, 42, 12)	1142 (90.5)	1001 (89.5)	1083 (168)	0.61	.013	5.56*	.058
Noun Frequency (41, 42, 12)†	2779 (1850)	2360 (1349)	2136 (1589)	1.07	.015	-	-
Verb Frequency (41, 42, 12)	956 (230)	1261 (227)	1461 (426)	0.74	.016	5.14*	.053
Adjective Frequency (41, 42, 12)†	1348 (2246)	1045 (1663)	653 (679)	0.72	.018	-	-

L1 Descriptive Writing Skills

Correlational analyses of background variables. Analyses of Homework Help Time and Raven's revealed no significant correlations with measurements of L1 descriptive and writing skills. However, analyses of SES revealed a significant correlation on Descriptive skills only, $r(85) = .217$, $p = .046$, and analyses of Homework Help Time revealed correlations on Word Count, $r(81) = -.224$, $p = .044$, and MLU, $r(81) = -.226$, $p = .042$ (see Table 25).

In line with this pattern of results, the covariates used in the main analyses included SES when analysing Descriptive Score, and Homework Help Time when analysing Word Count and MLU.

Main analyses. Results from main analyses (see Table 26) revealed two significant differences between groups. Contrasts and *post hoc* comparisons showed that immersion children had better descriptive skills and a higher word count, than their peers. In consideration of the covariates, Homework Help Time was significantly related to MLU. No other covariate effect was found.

Table 25. Correlations among background variable and L1 descriptive and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and L1 Descriptive Writing Skills

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.053	-										
3.SES	-.016	-.055	-									
4.Raven's	-.127	-.322**	.303**	-								
5. Descriptive Score	.111	-.088	.217*	.188	-							
6.Word Count	.178	-.224*	.059	-.021	.453**	-						
7.MLU	-.183	-.226*	-.059	.081	.118	-.014						
8.EWCR	-.044	.072	.076	-.028	-.005	-.216*	-.042	-				
9.Word Frequency	.077	-.048	.106	.083	.086	.133	.044	-.217*	-			
10.Noun Frequency	.004	-.041	.185	.130	.014	.099	.057	-.237*	.693***	-		
11.Verb Frequency	.102	.194	.104	-.096	-.012	-.030	.110	-.111	.129	-.098	-	
12.Adjective Frequency	.005	-.162	.041	.161	.073	.028	.047	.046	.191	.142	-.070	-

Table 26. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's L1 descriptive and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed). HHT = Homework Help Time.

L1 Descriptive Writing Skills

				Schools		SES/HHT	
Measures (N)	Immersion	EM(south)	EM(north)	F	ηp^2	F	ηp^2
Descriptive Score (38, 35, 12)	3.10 (0.36)	1.44 (0.37)	1.30 (0.64)	5.74**	.124	0.73	.009
Word Count (35, 35, 11)	50.2 (3.34)	35.0(3.32)	29.4 (5.93)	7.27***	.159	2.46	.031
MLU (35, 35, 11)	3.52 (0.09)	3.56 (0.09)	3.78 (0.15)	1.16	.029	4.94*	.060
EWCR (41, 42, 12)†	23.6 (12.2)	21.8 (13.4)	24.3 (18.0)	0.24	.005	-	-
Word Frequency (41, 42, 12)†	782 (517)	759 (598)	803 (562)	0.04	.001	-	-
Noun Frequency (41, 42, 12)†	2403 (2159)	2378 (1778)	1654 (1083)	0.80	.017	-	-
Verb Frequency (41, 42, 12)†	390 (386)	532 (1204)	413 (597)	0.29	.006	-	-
Adjective Frequency (41, 42, 12)†	684 (1227)	592 (852)	716 (1229)	0.10	.002	-	-

L1 Metalinguistic Skills

The metalinguistic tests were performed to measure children's abilities to attend to, control, and manipulate their first language, English. Analyses were performed on children's metalinguistic skills as measured by two tasks: a Grammaticality Judgement task and a Lexical Fluency task. The Grammatical Judgement task measured children's detection of grammatical errors and correction of grammatical errors, as applied to four sentence types: (i) GS, Grammatically and Semantically Correct, (ii) gS, Grammatically Incorrect and Semantically Correct, (iii) Gs, Grammatically Correct and Semantically Incorrect, and (iv) gs, Grammatically and Semantically Incorrect. The Lexical Fluency task involved three measures: (i) Linguistic, name words that begin with the letter F, A, or S, (ii) Semantic, name items of clothing, and (iii) Linguistic and Semantic, name animals that begin with the letter F, A, or S. Whereas the Grammatical Judgement task assessed children's ability to access their knowledge of grammatical form of English and their knowledge of the arbitrariness of language, the Lexical Fluency task assessed children's ability to verbally retrieve lexical representations of English.

Correlational analyses of background variables. Analyses of SES and Raven's revealed no correlations on measurements of L1 metalinguistic skills. However, there were correlations found on the Grammatical Judgement task between Gender and gS, $r(95) = -.245$, $p = .017$, and Homework Help Time and Detection, $r(81) = -.219$, $p = .049$, and gs, $r(81) = -.290$, $p = .009$. No correlations were found between variables on the Fluency task. In line with this pattern of results, in the main analyses, the Gender and Homework Help Time measures were used as covariates on the aforementioned variables in which they significantly correlated (see Table 27).

Table 27. Correlations among background variable and L1 metalinguistic skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and L1 Metalinguistic Skills

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Gender	-												
2.Homework Help Time	.053	-											
3.SES	-.016	-.055	-										
4.Raven's	-.127	-.322**	.303**	-									
5. Detection	-.152	-.219*	.069	.121	-								
6. Correction	-.181	-.205	.048	.116	.895***	-							
7.GS	-.085	.040	.065	.104	.521***	.655***	-						
8.gS	-.245*	-.196	.012	.069	.739***	.781***	.239*	-					
9.Gs	.022	-.064	.078	.102	.655**	.713***	.618***	.321***	-				
10.gs	-.164	-.290**	-.043	.088	.713***	.755***	.162	.756***	.407***	-			
11. Linguistic	.149	.123	.109	.013	-.012	-.061	.053	-.069	.024	-.167	-		
12. Semantic	-.035	-.213	.128	.117	.269**	.290**	.084	.294**	.168	.327***	-.249*	-	
13. Linguistic and Semantic	-.072	-.042	.027	.086	-.069	-.063	-.115	-.066	-.016	.074	.024	.219*	-

Main analyses of the Grammatical Judgement task. Three one-way between-groups analysis of covariance (DVs: Detection, gS, gs) and three one-way between-groups analysis of variance (DVs: Correction, GS, Gs) were conducted to compare children's L1 metalinguistic abilities.

Results from main analyses (see Table 28) revealed no significant difference between groups. In consideration of the covariates, whereas Homework Help Time did not relate to children's overall ability to detect errors (accounting for 4% of the variance), it did relate to children's ability on the gs condition. Also, Gender was related to children's performance on the gS condition.

Table 28. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's L1 grammatical judgement skills scores. *<.05 level (2-tailed). HHT = Homework Help Time.

Grammatical Judgement							
				Schools		Gender/HHT	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Detection (39, 26, 41)	18.1 (0.76)	17.8 (0.76)	15.0 (1.35)	2.08	.051	3.22	.040
Correction (39, 26, 41)†	16.5 (4.75)	15.0 (5.45)	12.7 (3.94)	2.92	.060	-	-
GS (49, 36, 44)†	5.27 (1.10)	4.71 (1.54)	4.67 (1.37)	2.07	.043	-	-
gS (39, 26, 41)	3.29 (0.23)	3.03 (0.23)	2.34 (0.42)	1.96	.041	6.57*	.067
Gs (49, 36, 44)†	5.02 (1.70)	4.86 (1.75)	3.83 (1.90)	2.21	.046	-	-
gs (49, 36, 44)	2.93 (0.33)	2.86 (0.32)	1.94 (0.58)	1.20	.030	6.31*	.076

Main analyses of the Lexical Fluency task. Three one-way between-groups analysis of variance (DVs: Linguistic, Semantic, Linguistic and Semantic) were conducted to compare Children's lexical fluency abilities.

Results from main analyses (see Table 29) revealed that one condition—Linguistic—yielded a significant difference between groups. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion children and EM(south) children were significantly more able to name more words that started with the letter F, A, or S.

Table 29. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's L1 lexical fluency skills scores. *<.05 level (2-tailed).

Lexical Fluency

				Schools	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2
Linguistic (49, 36, 43)	9.68 (5.03)	9.86 (4.08)	6.27 (2.45)	3.10*	.064
Semantic (49, 36, 43)	10.2 (3.15)	10.5 (3.08)	10.1 (2.81)	0.11	.002
Linguistic and Semantic (49, 36, 43)	1.71 (1.50)	1.52 (1.25)	1.64 (1.36)	0.18	.004

Summary for Language Tests

Of the various measurements used in this part of the analyses, most revealed no differences between groups. Regarding the linguistic tasks, no differences were found between groups on their reading and vocabulary skills. However, four group differences were found on the writing tests mostly in favour of immersion children—who showed superior descriptive skills and had a larger word count than their peers. Also, immersion and EM(south) children had a larger creativity score than their EM(north) peers.

Regarding the metalinguistic tasks, only one group difference was found on the Linguistic condition of the Lexical Fluency task showing immersion along with their EM(south) peers performed better than the EM(north) children. This was an unexpected finding insofar as immersion children performed well on this linguistic aspect of the task despite their considerably less exposure to their L1.

As measured here, these results suggest that when compared to their English medium educated peers in the Republic and Northern Ireland, the children from Irish immersion education in the Republic of Ireland are not negatively affected in terms of their reading and vocabulary skills in English. Similarly, immersion children are not negatively affected in terms of their writing skills or on their metalinguistic skills. In fact, these results suggest that exposure to an L2 could promote creative and descriptive L1 writing skills. However, it is important to note that (i) with the exception of descriptive skills and word count on the descriptive task whereby immersion performed better than their EM(south) peers, there were no other differences between these two groups, and (ii) low numbers in the EM(north) group could represent cohort effects on various L1 tasks as measured here.

Chapter 8

8-Year-Olds: Executive Function Skills

This chapter discusses the results of analyses performed on data gathered from children's performances on several EF tasks.

Several tasks were used to ascertain a measurement of children's EF skills. The Flanker tasks (Original and Modified) were used to measure interference suppression, and the Stroop tasks (English and Irish) and the SART were used to measure response inhibition. It was expected that, whereas immersion children would perform better than their peers on the Flanker tasks, there would be no difference between groups on the remaining tasks (see Table 12, Chapter 6, p. 141).

The following four sections—(i) Flanker Task-Original, (ii) Flanker Task-Modified, (iii) Stroop Task-English and Stroop Task-Irish, and (iv) SART—are presented in a similar layout as the language sections above. Each section commences with a presentation of correlational analyses of background variable measures and the relevant EF measures, followed by a presentation of comparative analyses of the three school groups' performance per task.

Flanker Task-Original

Correlational analyses of background variables. Analyses of the Flanker Task-Original skills (see Table 30) showed that Homework Help Time and SES revealed no correlations on interference suppression skills. However, there were correlations between Gender and (i) Correct Congruent MRT, $r(95) = .310$, $p = .002$, and (ii) Correct Incongruent MRT, $r(95) = .203$, $p = .048$, and Raven's and Correct Congruent, $r(95) = .216$, $p = .036$. In the main analyses therefore, Gender and Raven's were used as covariates on the aforementioned variables in which they significantly correlated.

Main analyses. Three one-way between-groups analysis of variance (DVs: Correct Incongruent, Difference Score, Difference MRT) and three one-way between-groups analysis of covariance (DVs: Correct Congruent, Correct Congruent MRT, Correct Incongruent MRT) were conducted to compare children's interference suppression skills.

Results from main analyses (see Table 31) revealed no significant differences between groups. In consideration of the covariates, Raven's was significantly related to children's accuracy of response on congruent trials, and Gender was significantly related to speed of responses on congruent trials. However, Gender was not related to speed of response on Correct Incongruent trials.

Table 30. Correlations among background variable and Flanker Task-Original scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Flanker Task-Original

Measures	1	2	3	4	5	6	7	8	9	10
1.Gender	-									
2.Homework Help Time	.053	-								
3.SES	-.016	-.055	-							
4.Raven's	-.127	-.322**	.303**	-						
5.Correct Congruent	-.037	-.146	.111	.216*	-					
6.Correct Incongruent	.091	-.154	.100	.127	.744***	-				
7.Difference Score	-.177	.053	-.015	.052	.008	-.662***	-			
8.Correct Congruent MRT	.310**	.111	-.027	-.159	-.243*	.003	-.278**	-		
9.Correct Incongruent MRT	.203*	.045	-.040	-.041	-.223*	-.011	-.234*	.732***	-	
10. Difference MRT	-.049	-.058	-.029	.118	-.055	-.020	-.032	-.045	.648***	-

Table 31. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's Flanker Task-Original scores. ***<.001, *<.05 level (2-tailed).

Flanker Task-Original

				Schools		Raven's/Gender	
Measure (N = 40, 42, 12)	Immersion	EM(south)	EM(north)	F	ηp^2	F	ηp^2
Correct Congruent	22.4 (0.33)	23.2 (0.33)	23.3 (0.61)	1.87	0.39	4.84*	.050
Correct Incongruent†	21.8 (3.82)	22.2 (2.02)	22.3 (1.66)	0.26	.006	-	-
Difference Score†	0.59 (2.10)	0.93 (1.94)	1.08 (1.24)	0.47	.010	-	-
Correct Congruent MRT	1188 (47.4)	1201 (46.9)	996 (87.8)	2.24	.047	9.07*	.091
Correct Incongruent MR	2322 (64.1)	1345 (63.4)	1072 (119)	2.15	.045	3.44	.036
Difference MRT†	134 (315)	143 (293)	78.5 (158)	0.23	.005	-	-

Flanker Task-Modified

Correlational analyses of background variables. Analyses of the Flanker Task-Modified skills (see Table 32) showed that Homework Help Time and SES revealed no correlations on EF skills. However, there were correlations between Gender and Correct Incongruent MRT, $r(95) = .234$, $p = .023$, and Raven's and Correct Congruent score, $r(95) = .311$, $p = .002$. In the main analyses therefore, Gender and Raven's were used as covariates on the aforementioned variables in which they significantly correlated.

Main analyses. Two one-way between-groups analysis of covariance (DVs: Correct Congruent, Correct Congruent MRT) and four one-way between-groups analysis of variance (DVs: Correct Incongruent, Difference Score, Correct Incongruent MRT, Difference MRT) were conducted to compare children's interference suppression skills.

Results from main analyses (see Table 33) revealed a significant difference between groups on one condition—Correct Congruent MRT. *Post hoc* comparisons showed that EM(north) children were significantly faster than ROI peers.

In consideration of the covariates, Raven's was significantly related to children's accuracy on congruent trials, but Gender was not related to children's speed on congruent trials.

Table 32. Correlations among background variable and Flanker Task-Modified scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Flanker Task-Modified

Measures	1	2	3	4	5	6	7	8	9	10
1.Gender	-									
2.Homework Help Time	.053	-								
3.SES	-.016	-.055	-							
4.Raven's	-.127	-.322**	.303**	-						
5.Correct Congruent	-.071	-.135	.132	.311**	-					
6.Correct Incongruent	-.154	-.074	-.043	.184	.548***	-				
7.Difference Score	.114	-.032	.165	.067	.267***	-.660***	-			
8.Correct Congruent MRT	.234*	.039	.047	-.125	-.182	.015	-.180	-		
9.Correct Incongruent MRT	.163	.091	-.059	-.167	.036	.188	-.185	.623***	-	
10. Difference MRT	.026	.086	-.114	-.115	.187	.229*	-.096	.017	.793***	-

Table 33. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's Flanker Task-Modified scores. ***<.001, **<.01, *<.05 level (2-tailed).

Flanker Task-Modified

				Schools		Raven's/Gender	
Measure (N = 40, 42, 12)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Correct Congruent	22.3 (0.40)	22.8 (0.40)	23.0 (0.74)	0.58	.013	10.0**	.099
Correct Incongruent†	19.4 (3.66)	20.1 (2.77)	18.3 (4.43)	1.51	.032	-	-
Difference Score†	2.93 (3.21)	2.67 (2.50)	4.75 (3.31)	2.42	.050	-	-
Correct Congruent MRT	1961 (104)	1928 (103)	1258 (192)	5.61**	.042	1.66	.018
Correct Incongruent MRT†	3082 (934)	3371 (1286)	2571 (1168)	2.44	.050	-	-
Difference MRT†	1123 (763)	1441 (976)	1313 (1021)	1.31	.028	-	-

SART

Correlational analyses of background variables. Analyses of the SART scores (see Table 34) revealed no correlations on measurements.

Main analyses. Five one-way between-groups analysis of variance (DVs: Correct Score, Correct Press, Correct Pass, MRT +No.3, MRT -No.3) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 35) revealed a significant difference between groups on speed of response. *Post hoc* comparisons revealed that EM(north) children were significantly faster than immersion children on MRT +No.3 and MRT -No.3 trials.

Table 34. Correlations among background variable and the SART scores. ***<.001, **<.01, *<.05 level (2-tailed). HH Time = Homework Help Time.

Correlations Among Background and SART									
Measures	1	2	3	4	5	6	7	8	9
1.Gender	-								
2.HH Time	.053	-							
3.SES	-.016	-.055	-						
4.Raven's	-.127	-.322**	.303**	-					
5.Correct Score	.038	.060	.076	.009	-				
6.Correct Press	.029	.069	.096	.010	.892**	-			
7.Correct Pass	.028	-.020	-.016	-.003	.412***	-.043	-		
8. MRT +No.3	-.033	-.182	-.020	.069	-.153	-.499***	.671***	-	
9. MRT – No.3	-.048	-.196	-.004	.068	-.282**	-.573***	.535***	.980***	-

Table 35. Means (SD) and statistical analyses of children's SART scores. ***<.001, **<.01, *<.05 level (2-tailed).

SART					
Measure (N = 40, 42, 12)	Immersion	EM(south)	EM(north)	*F*	ηp^2
Correct Score	211 (11.7)	210 (7.95)	215 (3.77)	1.08	.023
Correct Press	195 (11.1)	195 (6.99)	199 (1.44)	1.40	.030
Correct Pass	16.5 (4.12)	15.2 (4.62)	15.6 (3.68)	0.97	.021
MRT +No.3	708 (121)	670 (149)	602 (89.0)	3.14*	.064
MRT –No.3	611 (119)	582 (137)	511 (76.1)	3.09*	.063

Stroop Tasks

Correlational analyses of background variables. Analyses of the Stroop tasks scores (see Table 36) showed that Raven's revealed no correlations on measurements. However, there were correlations between Homework Help Time and (i) English-Stroop, $r(80) = -.397$, $p < .001$, (ii) Irish Colour-Match, $r(51) = -.295$, $p = .035$, and (iii) Irish Stroop, $r(51) = -.442$, $p = .001$. Other correlations were found with Gender and Irish Word-Match, $r(56) = -.276$, $p = .039$, and SES and English Interference Score, $r(84) = .221$, $p = .044$.

In the main analyses therefore, regarding Stroop Task-English, Homework Help Time and SES were used as covariates, and regarding Stroop Task-Irish, Gender and Homework Help Time were used as covariates in the aforementioned variables with which they correlated.

Main analyses of the Stroop Task-English. Two one-way between-groups analysis of covariance (DVs: Stroop, Interference Score) and two one-way between-groups analysis of variance (DVs: Word-Match, Colour-Match) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 37) revealed no significant differences between groups. In consideration of the covariates, Homework Help Time was significantly related to children's accuracy on the Stroop condition and SES was significantly related to children's Interference Score.

Table 36. Correlations among background variable and Stroop tasks scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Stroop Tasks												
Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.053	-										
3.SES	-.016	-.055	-									
4.Raven's	-.127	-.322**	.303**	-								
5.English Word-Match	-.107	-.039	.131	-.080	-							
6.English Colour-Match	-.138	-.103	.093	.051	.392**	-						
7.English Stroop	-.050	-.397***	-.114	.111	.239*	.381***	-					
8.English Interference Score	-.112	.198	.221*	-.103	.729***	.538***	-.317**	-				
9.Irish Word-Match	-.276*	-.130	.154	.099	.706***	.387**	.299*	.468***	-			
10.Irish Colour-Match	-.134	-.295*	.265	.135	.084	.305*	.388**	-.106	.294*	-		
11.Irish Stroop	-.166	-.442***	.057	-.005	.181	.317*	.529***	-.141	.345**	.724***	-	
12.Irish Interference Score	-.156	.137	.260	.185	.467***	.208	-.032	.471***	.700***	.198	-.246	-

Table 37. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's Stroop Task-English scores. ***<.001, *<.05 level (2-tailed). Lower scores on Interference Score indicate better performance than higher scores.

Stroop Task-English							
				Schools		HHT/SES	
Measure (N)	Immersion	EM(south)	EM(north)	*F*	*ηp*^{2}	*F*	*ηp*^{2}
Word-Match(40, 42, 12)†	59.4 (11.1)	63.0 (12.9)	58.5 (9.69)	1.24	.027	-	-
Colour-Match(40, 42, 12)†	44.7 (8.38)	47.0 (8.41)	39.2 (11.9)	3.62	.074	-	.-
Stroop(34, 35, 11)	30.3 (0.96)	31.9 (0.94)	31.5 (1.68)	0.72	.019	15.4***	.169
Interference Score(37, 35, 12)	20.3 (1.42)	23.6 (1.42)	19.3 (2.47)	1.99	.047	4.53*	.054

Main analyses of the Stroop Task-Irish. Three one-way between-groups analysis of covariance (DVs: Word-Match, Colour-Match, Stroop) and one Independent-samples t-test (DV: Interference Score) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 38) revealed one significant difference between groups—Colour-Match. *Post hoc* comparisons revealed immersion children performed better than EM(south) children. The covariate, Gender, was significantly related to children's accuracy on the Word-Match condition, and the Homework Help was significantly related to the Stroop condition but not the Colour-Match condition.

Table 38. Descriptive statistics and statistical analyses of children's Stroop Task-Irish scores. ***<.001, *<.05 level (2-tailed). Lower scores on Interference Score indicate better performance than higher scores.

Stroop Task-Irish			Schools		Gender/HHT	
Measure (N)	Immersion	EM(south)	*F/t*	*ηp²*	*F*	*ηp²*
Word-Match (28, 28)	55.3 (2.21)	60.3 (2.21)	2.63	.047	4.59*	.080
Colour-Match (26, 25)	37.2 (1.86)	29.9 (1.89)	7.58**	.136	3.02	.059
Stroop (26, 25)	25.2 (1.34)	22.4 (1.36)	2.08	.041	9.93**	.171
Interference Score (28, 28)†	20.9 (6.50)	23.0 (7.73)	-1.09	.021	-	-

Summary for Executive Function Tasks

Overall, analyses revealed four significant differences between groups. However, for the most part, these differences were unexpected. Regarding the Flanker tasks which measured interference suppression, it was expected that immersion children would perform better than their peers because of their larger exposure to an L2. However, it was the EM(north) children who performed best of all, significantly outperforming their ROI peers on Correct Congruent MRT scores on the Flanker Task-Modified. This is despite

EM(north) receiving no exposure to an L2. There were no group differences on the Flanker Task-Original.

Regarding the SART and Stroop Task-English, which measured response inhibition, it was expected that no group differences would emerge from analyses. However, although there were no group differences on the Stroop Task-English, there were differences on the SART. Again these were unexpected differences that showed EM(north) children performed better than immersion children.

Expected differences were found on the Stroop Task-Irish that showed immersion children performed better than EM(south) children.

Overall, these results do not support the argument that knowledge of an L2 might assist in EF tasks, specifically, response inhibition and interference suppression as measured here. However, this sentiment is not supported by the current research field into this area, and it could suggest that is another influential factor affecting children's performance. Results could suggest that the Flanker tasks and SART used in this study were not sensitive enough to provide an accurate or appropriate level of challenge specific to the language skills of each test group. However, the fact that the EM(north) group contained 12 children from one school and one classroom could allude to a cohort effect, and significance at .05 level is not a sensitive enough result to assume significance among such a small sample. These factors are further elaborated in the discussion section.

Chapter 9

12-Year-Olds: Basic Profile, SES, and Raven’s

It is necessary to first state that unlike the 8 YO data, the 12 YO EM(north) sample is represented by 45 children from 5 different classes (who were streamed in relation to their academic skills), results found herein could, nevertheless, be prone to a school effect, and so caution should be adhered to when interpreting the results. This is further discussed in results chapters below and in the discussion section. .

Similar to the information presented in Chapters 6 to 8, Chapters 9 to 11 present data from the 12-year-olds, beginning with an analysis of background variables (Chapter 9), then analyses of language measures (Chapter 10), and finally the analyses of the non-linguistic measures (Chapter 11). Information regarding the exact measures used in Chapters 6 to 11 can be seen in Chapter 5.

The same hypotheses, test procedures, test materials, and analyses apply to this age group as to the older age group that has proceeded in the previous chapters. As such, the presentation of information is streamlined for the sake of brevity.

Questionnaires—Family Background

The family background questionnaires were used to match children on as many background variables as possible (e.g., home language use and homework help time). Analyses were performed using two models: one-way between groups analysis of variance and chi square analyses. Descriptive statistics for all background information are shown in Tables 39, 40, and 41.

Age, gender, disability, and homework help. There were several significant differences between groups of children on these variables. Specifically, analyses looking at (i) Age[15], revealed that the EM(south) children were older than their peers, (ii) Gender, revealed that there were more females in the EM(north) group than in the immersion and EM(south) groups, and (iii) Homework Help, revealed that immersion children received more help than EM(south) and EM(north) children, and EM(north) children received more help than EM(south) children. There were no other differences between groups of children on these variables and no child was reported to have had a disability (see Table 39).

Table 39. Range, Raw Scores, and Means (SD) of background information—Age, Gender, Disability, and Homework Help Time in hours—as reported by parents. *<.05 level (2-tailed). ***<.001, *<.05 level (2-tailed).

	Background Information				
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2
Age (49, 36, 45)	12;4 (4.96)	12;6 (4.48)	12;2 (3.84)	4.64*	.069
Age Range (49, 36, 45)	11;3—13;0	11;10—13;3	11;9—12;9	-	-
Sex (49, 36, 45)	29M: 20F	23M: 13F	16: 29F	4.56*	.067
Disability					
Parents' Report (42, 33, 43)	0	0	0	-	-
Teachers' Report (7, 3, 2)	0	0	0	-	-
Homework Time (42, 31, 31)	6.54 (3.90)	2.44 (2.15)	4.34 (3.86)	12.6***	.200

L2 use. Overall, immersion children were more likely to use their L2 in their homes than were their peers. This was supported by chi square analysis. Similarly, there was a significant difference between groups in the amount of time each child spoke their L2, as reported by parents. Planned comparisons showed that immersion children used their L2 more than their peers. There was no difference between EM(south) and EM(north) children.

Additionally, analyses of official/school guidelines of mean amount of hours per

[15] Analyses of Age has been presented to demonstrate due consideration has been given to this variable. However, although analysis revealed a significant group difference in age, this is not explored further as the nature of the age difference between children is not indicative of any developmental differences between groups. Such age differences would not account for differences in performances on tests as measured here.

day of L2 use in school showed that immersion children used their L2 more than EM(south) and EM(north) children, and EM(south) children used an L2 more than EM(north) children (see Table 40).

Table 40. Raw Score/Means (SD) of language use information as reported by parents. ***<.001 (2-tailed).

	Language Use				
Measures (N)	Immersion	EM(south)	EM(north)	χ^2/F	ηp^2
Home Lang' Use (44, 33, 43)					
English Only	19	21	43	33.6***	-
English Mostly/Some L2	25	12	0		
L2 use in hours per day					
Parental report (42, 28, 33)	6.09 (1.07)	0.28 (0.44)	0.00 (0.00)	850***	.944
Official Guidelines (49, 36, 44)	5.50 (0.00)	0.70 (0.00)	0.00 (0.00)	4E+034***	1

Parental education. Of the various stages of education, chi square analyses of parents' academic qualifications found a difference between schools. Results suggest that EM(north) children's parents did not progress as far as immersion and EM(south) children's parents in the education system (see Table 41).

Further analyses found a significant difference between groups regarding whether or not parents attended university. Planned comparisons showed that immersion and EM(south) children's parents were more likely to have attended university than were EM(north) children's parents. There was no significant difference between immersion and EM(south) children's parents' education (see Table 41).

Household income. There was a significant difference on parents' self-reported financial status in comparison to regional averages (CSO, 2010, for immersion and EM(south) children and Office for National Statistics, U.K., 2001, for EM(north) children). Data showed that the immersion and EM(south) parents were more likely to earn above the regional average than were the EM(north) parents. There was no significant difference between immersion and EM(south) children's household income (see Table

41).

Parental education and household income combined. There was a significant difference between groups. Planned comparisons showed that more immersion and EM(south) children's parents achieved a higher financial and educational level than EM(north) children's parents. There was no significant difference between immersion and EM(south) groups (see Table 41). Based on these analyses, Gender, Homework Help Time, and Parental Education and Income (combined) were included as covariates in the analyses of the main dataset.

Table 41. Raw Score (SD) of SES information as reported by parents (SD). ***<.001 (2-tailed).

Education and Financial Status					
Measures (N)	Immersion	EM(south)	EM(north)	χ^2/F	ηp^2
Parental Academic Qualification (43, 32, 41)					
No Exams Taken	1	1	16	47.8***	-
State Exams 15/16YO	5	3	15		
State Exams 17/18 YO	14	10	4		
Graduate	13	11	3		
Postgraduate	10	7	3		
Parents University Educated (42, 32, 41)	23 (0.51)	18 (0.51)	6 (0.26)	10.5***	.160
Above Average Household Income (35, 24, 33)	30 (0.35)	21 (0.34)	13 (0.49)	14.1***	.241
Parental Education and Household Income Combined (39, 26, 41)	19 (0.51)	12 (0.51)	3 (0.26)	11.1***	.178

Non-verbal Reasoning Ability

Raven's Progressive Matrices (Raven's). Children's non-verbal intelligence was measured by the Raven's. Analysis was performed using a one-way ANOVA with the IV as School (immersion, EM(south), and EM(north)) and the DV was percentile scored. There was a significant difference between groups, showing that immersion and EM(south) children scored higher than EM(north) children (see Table 42). As such, caution must be adhered to when interpreting results.

These results suggest that non-verbal IQ should be a covariate in the analyses of the main dataset.

Table 42. Mean Raven's scores (SD) of children per school. ***<.001 (2-tailed).

Non-Verbal Intelligence					
Measure (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2
Percentile (49, 36, 44)	53.4 (29.7)	47.8 (26.4)	27.7 (27.0)	10.5***	.143

Summary of Analyses of Background Variables

Overall, analyses found many differences between groups of children based on background measures. As expected, there were differences in daily use of L2 due to the curriculum provided to each language group. This language use was transmitted somewhat into the home environment where immersion children used their L2 more in the home than did the EM(south) children.

However, there were interesting differences regarding parental education and financial income. Data showed that more immersion and EM(south) parents had gained a university education and earned above regional average than EM(north) parents. Similar patterns were found when looking at parents who gained both a university education and earned above regional average as measured as a combined variable. Some further differences were seen in gender, homework help time, and Raven's scores. Analyses found that there were more females in the EM(north) group than in the immersion group and EM(south) group, EM(south) children received less help than their peers, and immersion and EM(south) children scored higher than EM(north) children on the Raven's test of non-verbal reasoning ability.

Therefore, based on these analyses, Gender, Homework Help Time, Parental Education and Income (combined), and Raven's were included in preliminary correlational analyses to decide upon their appropriate use as covariates in the analyses of the main dataset.

*　　　*　　　*

The next chapter presents results of analyses of children's performances on several linguistic tests. The subsequent chapter presents results of analyses of children's performances on several EF tests.

Similar to the 8-Year-Old section above, (i) preliminary correlational analyses were performed before main analyses of all the tests to investigate the relationship between test variables and background variables, (ii) the Gender, Homework Help Time, Parental Education and Household Income Combined, and Raven's variables were used in the correlational analyses, and (iii) Parental Education and Household Income Combined variable was the sole SES measurement used in the correlational analyses as it strongly correlated with Parental University Education, $r(105) = .938$, $p < .001$, and Household Income, $r(92) = .506$, $p < .001$.

Chapter 10

12-Year-Olds: Linguistic and Metalinguistic Skills

This chapter discusses the results of analyses performed on data gathered from children's performances on several English language tasks. The same tests, and similar layout and analyses, have been used in this chapter as in Chapter 7, 8-Year-Olds: Linguistic and Metalinguistic Skills, above.

L1 Reading and Vocabulary Skills

Two standardised English language tests were used to ascertain the percentile scores of children's English language abilities: Neale's Analysis of Reading-Revised (NARA), which measured accuracy, comprehension, and rate of reading abilities, and the British Picture Vocabulary Scale (BPVS), which measured children's vocabulary ability. A further non-standardised aspect of the NARA was administered to children who successfully navigated through all of the standardised readings, by use of an Extended Passage (EP), whereby children's reading was measured for accuracy, comprehension and rate and compared across groups. Whether or not children completed all seven reading passages was also compared across groups.

Correlational analyses of background variables. Correlational analyses showed that several of the background measures correlated with each other and L1 ability skills (see Table 43).

Regarding the standardised aspects of the NARA and BPVS measures, although Homework Help Time did not yield significant correlations, there were significant correlations between Gender and Reading Rate, $r(126) = -.210$, $p = .018$, and Gender and BPVS, $r(127) = -.176$, $p = .048$. Also, Raven's correlated significantly with all of the L1 standardised measures, $r(127) = .402$ to $.511$, all $ps = .000$, and SES correlated significantly with Reading Accuracy, $r(104) = .296$, $p = .002$, and Reading Comprehension, $r(104) = .258$, $p = .008$.

Regarding the non-standardised aspects of the NARA, all background measures affected at least one of the measures: Gender and Reading Rate, $r(78) = -.224$, $p = .048$; Homework Help Time and Reading Accuracy, $r(67) = -.243$, $p = .048$, and Reading Rate, $r(65) = -.272$, $p = .028$; SES and Reading Completion, $r(103) = -.276$, $p = .005$; and Raven's and Reading Comprehension, $r(79) = -.230$, $p = .041$, and Reading Completion, $r(127) = -.445$, $p < .001$.

In line with this pattern of results, the covariates used in the main analyses included Raven's when analysing all L1 variables except for EP Accuracy and EP Rate, Gender when analysing Reading Rates and BPVS, SES when analysing Reading Accuracy, Reading Comprehension, and Completion of Readings, and Homework Help Time when analysing EP Accuracy and EP Rate.

Table 43. Correlations among background variable and L1 reading and vocabulary scores.
***<.001, **<.01, *<.05 level (2-tailed). EP = Extended Passage of reading for children who completed all standardised reading passages.

Correlations Among Background and L1 Reading and Vocabulary

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.173	-										
3.SES	-.167	-.058	-									
4.Raven's	-.063	-.152	.275**	-								
5.NARA Accuracy	-.103	-.067	.296**	.511***	-							
6.NARA Comprehension	-.063	-.033	.258**	.471***	.713***	-						
7.NARA Rate	-.215*	-.166	.161	.402***	.658***	.484***	-					
8.EP Accuracy	-.166	-.243*	-.119	.165	.631***	.338***	.313**	-				
9 EP Comprehension	-.032	-.095	.111	.230*	.261*	.408***	.201	.138	-			
10.EP Rate	-.224*	-.272*	.100	.157	.011	.221	.372***	.002	-.048	-		
11.Completed all Readings	.152	-.008	-.269**	-.445***	-.773***	-.542***	-.581***	-.199	-.052	-.032	-	
12.BPVS	-.181*	-.170	.137	.459***	.614***	.583***	.534***	.321**	.185	.295***	-.524***	-

Main analyses. Eight one-way between-groups analysis of covariance were conducted to compare children's L1 abilities (DVs: Reading Accuracy, Reading Comprehension, Reading Rate, EP Accuracy, EP Comprehension, EP Rate, Completion of Reading, BPVS). Statistical scores and descriptive statistics of children's performances on NARA and BPVS are shown in Table 44.

NARA. Analyses revealed a significant effect of school type on reading accuracy, comprehension, and ability to complete all readings after controlling for the effects of SES and Raven's score. *Post hoc* comparisons revealed that immersion children and EM(south) children were more accurate readers, understood more of the reading material, and were more likely to complete all stories than were the EM(north) children.

Analyses also revealed a significant effect of school type on EP Rate of reading after controlling for the effect of Gender and Homework Help Time. *Post hoc* comparisons revealed that immersion and EM(north) children were faster readers than EM(south) children.

Additionally, in consideration of the covariates, whereas Raven's was significantly related to the majority of measures of children's L1 skills, Gender was not related to children's reading rate in standardised measures (accounting for 3.1% of the variance) but was related to reading rate in non-standardised measures, $F(1, 64) = 4.24$ $p = .044$, $\eta p^2 = .066$. Additionally, SES was not related to children's reading accuracy, comprehension, and ability to complete all readings and accounted for 0% of the variance; similarly, Homework Help Time was not related to children's EP Accuracy or EP Rate and accounted for 5.2% and 0.6% of the variance, respectively.

Table 44. Adjusted Means (Std Error) and statistical analyses of children's L1 reading and vocabulary scores. ***<.001, **<.01, *<.05 level (2-tailed).

L1 Skills							
				Schools		Raven's	
Measure (N)	Immersion	EM(south)	EM(north)	*F*	*ηp²*	*F*	*ηp²*
NARA Accuracy (39, 26, 39)	70.2 (3.53)	61.5 (4.19)	45.0 (3.74)	10.6***	.177	13.2***	.118
NARA Comprehension (39, 26, 39)	70.8 (3.73)	72.9 (4.06)	56.2 (3.58)	5.36**	.098	10.6**	.097
NARA Rate (49, 36, 42)	60.0 (3.19)	61.4 (3.64)	55.5 (3.60)	0.66	.011	15.3***	.111
EP Accuracy (38, 22, 7)	56.5 (3.88)	54.8 (5.28)	43.4 (8.66)	0.96	.030	-	-
EP Comp' (44, 26, 9)	73.2 (2.76)	71.9 (3.57)	58.2 (6.42)	2.27	.057	1.49	.020
EP Rate (36, 21, 8)	93.7 (5.61)	143.8 (7.67)	96.6 (11.3)	13.1***	.303	-	-
Completed All (39, 26, 39)	92.3 (0.27)	69.2 (0.47)	23.1 (0.43)	18.0***	.267	5.36*	.051
BPVS (49, 36, 43)	48.6 (3.57)	58.4 (4.08)	40.5 (3.99)	4.72*	.071	20.4***	.142

BPVS. Analyses found a significant effect of school type on vocabulary after controlling for the effects of Gender and Raven's. *Post hoc* comparisons revealed EM(south) children had a larger vocabulary than the EM(north) children. Immersion children did not significantly differ from their peers.

Additionally, whereas the covariate, Raven's, was significantly related to children's vocabulary, the covariate Gender was not related to children's vocabulary and accounted for 1.2% of the variance.

Summary of Analyses of L1 Reading and Vocabulary Skills

Of the various measurements used in this part of the analyses, none found immersion children to have performed statistically worse than their peers. Rather, results, as measured by NARA, showed that immersion children along with EM(south) peers performed better than EM(north) children on reading accuracy and comprehension and completion of all readings. Additionally immersion and EM(north) children performed better than EM(south) children on the extended passage reading rate. There was no significant difference between immersion children and the other two language groups as measured by BPVS.

As measured here by NARA and BPVS, these results suggest that when compared to their English medium educated peers in the Republic of and Northern Ireland, the children from Irish immersion education in the Republic of Ireland are not negatively affected in terms of their reading and vocabulary skills as they performed similar to their EM(south) peers on various aspects of reading and on vocabulary, and outperformed their EM(north) peers on various aspects of reading.

L1 Creative Writing Skills and L1 Descriptive Writing Skills

Two non-standardised English language tests were used to measure children's creative skills and descriptive skills. (The latter was used to measure children's comprehension and expression of a novel experience presented in a controlled environment.) The robustness of these two subjective measures was enhanced by obtaining an inter-rater reliability measurement. This was achieved by taking a random selection of 5 responses per test and per school group of children (at a minimum 11%) which were scored separately by another rater. These scores were analysed with Pearson's bivariate correlation which showed a strong correlation between the two raters, Creativity, $r(19) = .715$, $p = .001$, and Descriptive, $r(21) = .988$, $p < .001$. This increases the reliability of the (subjective) scores awarded for the creative and descriptive writing tasks.

Additionally, each test included further analyses of children's writing skills looking at (i) word frequency, (ii) noun frequency, (iii) verb frequency, (iv) adjective frequency, (v) word count, (vi) mean length of utterance (MLU), and (vii) error: word count ratio (EWCR)[16].

L1 Creative Writing Skills

Correlational analyses of background variables. Analyses of the L1 creative and writing skills (see Table 45) showed that Homework Help Time did not yield correlations on measurements of L1 writing skills. However, there were correlations between Creativity scores and (i) Gender, $r(129) = -.227$, $p = .010$, (ii) SES, $r(106) = .414$, $p < .001$, and (iii) Raven's, $r(129) = .495$, $p < .001$.

[16] Note: A lower score on the variable EWCR indicates a better performance than a higher score.

Additionally, significant effects were found on the variables Word Count, Word Frequency, and Verb Frequency when correlated with (i) SES, $r(106) = .232$ to $.378$, $p < .001$ to $.017$, and (ii) Raven's, $r(129) = .282$ to $.335$, $p < .001$ to $.001$. Raven's also correlated significantly with EWCR, $r(129) = -.368$, $p < .001$.

In line with this pattern of results, the covariates used in the main analyses included Gender when analysing Creative Score, SES and Raven's when analysing Creative Score, Word Count, Word Frequency, and Verb Frequency, and Raven's when analysing EWCR. Homework Help Time was not used as a covariate in main analyses because it was not significantly related to L1 variables.

Main analyses. Five one-way between-groups analysis of covariance (DVs: Creativity, Word Count, EWCR, Word Frequency, Verb Frequency) and three one-way between-groups analysis of variance (DVs: MLU, Noun Frequency, Adjective Frequency) were conducted to compare children's L1 creative and writing skills.

Results from main analyses (see Table 46) revealed that one condition—Creativity—revealed a significant difference between groups. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion and EM(south) children were significantly more creative in their written stories. However, the analyses of the remaining seven conditions revealed no significant effects of school type.

In consideration of the covariates, Raven's was significantly related to Creative Score, Word Count, EWCR, and Word Frequency scores, and SES was related to Verb Frequency only, $F(1, 101) = 9.02$ $p = .003$, $\eta p^2 = .082$, and accounted for less than 3% of the variance in the remaining three variables.

Table 45. Correlations among background variable and L1 creative and writing skills. . ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and L1 Creative Writing Skills

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.173	-										
3.SES	-.167	-.058	-									
4.Raven's	-.063	-.152	.275**	-								
5.Creative Score	-.227**	.009	.414***	.495***	-							
6.Word Count	.002	-.081	.232*	.335***	.425***	-						
7.MLU	.030	-.065	.151	.141	.053	-.207*	-					
8.EWCR	-.138	-.018	-.098	-.368***	-.246**	-.334***	-.181*	-				
9.Word Frequency	-.072	-.058	.308***	.332***	.413***	.174*	.210*	-.127	-			
10.Noun Frequency	.018	.107	.037	.119	.224*	-.058	.059	.106	.683***	-		
11.Verb Frequency	.001	-.141	.378***	.282***	.254**	.227**	.192*	-.251**	.549***	-.046	-	
12.Adjective Frequency	-.093	-.118	.002	.135	.051	.001	.135	-.096	.349***	-.014	.122	-

Table 46. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's L1 creative and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

L1 Creative Writing Skills

				Schools		Raven's	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	*ηp²*	*F*	*ηp²*
Creative Score (39, 26, 41)	3.25 (.127)	3.06 (.151)	1.99 (.131)	22.8***	.313	15.2***	.132
Word Count (39, 26, 41)	211 (13.6)	221 (16.2)	185 (14.0)	1.38	.027	8.95**	.081
MLU (49, 36, 44)†	3.96 (.313)	3.94 (.253)	3.93 (.348)	0.12	.002	-	-
EWCR (49, 36, 44)†	6.83 (.850)	7.97 (.969)	7.59 (.922)	0.43	.007	15.4***	.109
Word Frequency (39, 26, 41)	1764 (103)	1655 (122)	1480 (106)	1.63	.031	4.48*	.042
Noun Frequency (49, 36, 44)†	3828 (1878)	2875 (1783)	3008 (2650)	2.58	.039	-	-
Verb Frequency (39, 26, 41)	1609 (179)	2005 (212)	1506 (184)	1.68	.032	1.57	.015
Adjective Frequency (49, 36, 44)†	1810 (1378)	1473 (1504)	1410 (1171)	1.18	.018	-	-

L1 Descriptive Writing Skills

Correlational analyses of background variables. Analyses of Homework Help Time and Gender revealed no significant correlations with measurements of L1 descriptive and writing skills. However, whereas analyses of SES revealed a significant correlation on Descriptive skills only, $r(106) = .212$, $p = .029$, analyses of Raven's revealed several significant correlations, $r(129) = -.339$ to $.337$, $p < .001$ to $.044$, on several variables: Descriptive Score, Word Count, MLU, EWCR, Word Frequency, and Verb Frequency (see Table 47).

In line with this pattern of results, the covariates used in the main analyses included SES when analysing Descriptive Score, and Raven's when analysing Descriptive Score, Word Count, MLU, EWCR, Word Frequency, and Verb Frequency. Homework Help Time and Gender were not used as covariates in the main analyses because they were not significantly related to L1 variables.

Main analyses. Six one-way between-groups analysis of covariance (DVs: Descriptive Score, Word Count, MLU, EWCR, Word Frequency, Verb Frequency) and two one-way between-groups analysis of variance (DVs: Noun Frequency, Adjective Frequency) were conducted to compare children's L1 descriptive and writing skills.

Results from main analyses (see Table 48) revealed several significant differences between groups. *Post hoc* comparisons showed that immersion children had better descriptive skills and used more less-frequent words and nouns than their EM(north) peers. Additionally, immersion children had a larger word count than their ROI and NI peers.

Table 47. Correlations among background variable and L1 descriptive and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and L1 Descriptive Writing Skills

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.173	-										
3.SES	-.167	-.058	-									
4.Raven’s	-.063	-.152	.275**	-								
5. Descriptive Score	.088	.096	.212*	.337**	-							
6.Word Count	.058	.083	.174	.337**	.475***	-						
7.MLU	-.012	-.007	.183	.313**	.176*	.091	-					
8.EWCR	-.165	-.047	-.177	-.339***	-.214*	-.282***	-.164	-				
9.Word Frequency	-.063	.074	.136	.209*	.134	.196*	.386***	-.115	-			
10.Noun Frequency	.044	-.017	-.010	.122	.055	.195*	.245**	-.032	.747***	-		
11.Verb Frequency	-.010	-.003	.005	.177*	.087	.130	.195*	-.097	.429***	.059	-	
12.Adjective Frequency	-.001	.110	.050	-.078	-.061	-.091	.155	-.053	.324***	-.007	.027	-

Table 48. Adjusted Means (Std Error), means (SD)†, and statistical analyses of children's L1 descriptive and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

L1 Descriptive Writing Skills

				Schools		Raven’s	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Descriptive Score (39, 26, 41)	5.96 (.451)	4.64 (.536)	3.12 (.464)	8.54***	.145	2.92	.028
Word Count (39, 26, 41)	88.2 (4.51)	66.5(5.14)	56.1 (4.90)	11.6***	.157	5.43*	.042
MLU (39, 26, 41)	3.85 (.041)	3.84 (.047)	3.91 (.045)	.573	.009	14.3***	.103
EWCR (39, 26, 41)	6.83 (1.08)	7.27 (1.24)	8.02 (1.18)	0.26	.004	11.8**	.086
Word Frequency (39, 26, 41)	1291 (88.8)	1120 (101)	872 (96.3)	4.76**	.071	1.15	.009
Noun Frequency (49, 36, 44)†	2925 (1519)	2561 (1553)	2156 (1243)	3.30*	.050	-	-
Verb Frequency (39, 26, 41)	978 (167)	727 (191)	876 (182)	0.50	.008	3.22	.025
Adjective Frequency (49, 36, 44)†	1321 (1417)	1810 (3308)	1506 (4831)	0.21	.003	-	-

In consideration of the covariates, Raven's was significantly related to Word Count, MLU, and EWCR, whilst SES was not related to descriptive skills and accounted for 0% of the variance.

Summary of Analyses of L1 Creative Writing Skills and Descriptive Writing Skills

Of the various measurements used in this part of the analyses, group differences showed that immersion children performed (i) better than EM(north) children on Descriptive, Word Frequency, and Noun Frequency, (ii) better than EM(north) and EM(south) on Word Count, and (iii) along with EM(south), better than EM(north) on Creativity. Overall, as measured here by the Creativity and Descriptive tasks, these results suggest that Irish immersion education can have positive effects upon children's L1 writing abilities, and could even promote creative and descriptive L1 writing skills.

L1 Metalinguistic Skills

The metalinguistic tests were performed to measure children's abilities to attend to, control, and manipulate their first language, English. Analyses were performed on children's metalinguistic skills as measured by two tasks: a Grammaticality Judgement task and a Lexical Fluency task. The Grammatical Judgement task measured children's detection of grammatical errors and correction of grammatical errors, as applied to four sentence types: (i) GS, Grammatically and Semantically Correct, (ii) gS, Grammatically Incorrect and Semantically Correct, (iii) Gs, Grammatically Correct and Semantically Incorrect, and (iv) gs, Grammatically and Semantically Incorrect. The Lexical Fluency task involved three measures: (i) Linguistic, name words that begin with the letter F, A, or S, (ii) Semantic, name items of clothing, and (iii) Linguistic and Semantic, name animals that begin with the letter F, A, or S. Whereas the Grammatical Judgement task assessed children's ability to access their knowledge of grammatical form of English and their knowledge of the arbitrariness of language, the Lexical Fluency task assessed children's ability to verbally retrieve lexical representations of English.

Correlational analyses of background variables. Analyses of Homework Help Time and Gender revealed no correlations on measurements of L1 metalinguistic skills. However, there were correlations between SES and the Grammaticality Judgement task on three conditions, (i) Detection, $r(106) = .225$, $p = .021$, (ii) Correction, $r(106) = .199$, $p = .041$, and (iii) gS, $r(106) = .231$, $p = .017$, and on the Lexical Fluency task on one condition, Linguistic and Semantic, $r(105) = .200$, $p = .040$. Raven's correlated significantly with all of the L1 metalinguistic measures, r(129, 128) = .165 to .469, $p < .001$ to .024, except on one condition of each of the tasks—the Gs condition on the Grammaticality Judgement task, and the Linguistic condition on the Lexical Fluency task (see Table 49). In line with this pattern of results, in the main analyses, the SES and Raven's measures were used as covariates on the aforementioned variables in which they significantly correlated.

Main analyses of the Grammatical Judgement task. Five one-way between-groups analysis of covariance (DVs: Detection, Correction, GS, gS, gs) and a one-way between-groups analysis of variance (DV: Gs, since no covariates were identified on this measure in the correlational analyses above) were conducted to compare children's L1 metalinguistic abilities.

Results from main analyses (see Table 50) revealed that one condition—GS—yielded no significant difference between groups, as expected. However, the analyses of the remaining five conditions revealed significant effects of school type. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion children and EM(south) children were significantly more able to (i) detect errors, (ii) correct errors, and (iii) overcome the challenges presented in the gS condition and Gs condition (where previous studies have shown a bilingual advantage—e.g., Bialystok, 1986, 1988). Additionally, although the trend shows the immersion and EM(south) children outperform their NI peers on the gs condition, only the immersion children did so with a statistically significant difference. No differences were found between the EM(south) and immersion children on this task.

Table 49. Correlations among background variable and L1 metalinguistic skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and L1 Metalinguistic Skills

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Gender	-												
2.Homework Help Time	.173	-											
3.SES	-.167	-.058	-										
4.Raven's	-.063	-.152	.275**	-									
5. Detection	-.097	.003	.225*	.407**	-								
6. Correction	-.056	-.013	.199*	.469***	.894***	-							
7.GS	-.086	-.007	.106	.199*	.309***	.445***	-						
8.gS	-.016	.058	.231*	.419***	.786***	.826***	.082	-					
9.Gs	-.140	-.173	.041	.165	.197*	.350**	.341***	.049	-				
10.gs	-.012	-.004	.165	.403***	.845***	.898***	.202*	.714***	.134	-			
11. Linguistic	.113	.062	-.028	.166	.018	.027	-.082	.048	.040	.029	-		
12. Semantic	-.047	-.054	.080	.335***	.237***	.265**	.178*	.187*	.193*	.207*	.156	-	
13. Linguistic and Semantic	-.027	.120	.200*	.242**	.253**	.199*	.042	.178*	-.041	.273**	.110	.096	-

Table 50. Adjusted Means (Std Error), means (SD)†, statistical analyses of children's L1 grammatical judgement skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Grammatical Judgement

				Schools		Raven's	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Detection (39, 26, 41)	22.7 (.374)	22.2 (.444)	20.5 (.385)	7.31***	.126	8.38**	.077
Correction (39, 26, 41)	21.9 (.413)	21.3 (.491)	19.0 (.425)	10.7***	.175	14.3***	.124
GS (49, 36, 44)	5.74 (.102)	5.57 (.117)	5.44 (.111)	1.93	.030	1.96	.015
gS (39, 26, 41)	5.06 (.179)	5.69 (.213)	3.79 (.184)	11.0***	.179	8.81**	.080
Gs (49, 36, 44)†	5.92 (.344)	5.97 (.167)	5.66 (.745)	4.84**	.009	-	-
gs (49, 36, 44)	5.12 (.199)	4.98 (.227)	4.32 (.216)	3.73*	.056	12.7**	.092

In consideration of the covariates, whereas Raven's was significantly related to nearly all measures of children's grammatical judgement skills, SES was not related to children's performance on this task and accounted for less than 1% of the variance on all conditions.

Main analyses of the Lexical Fluency task. Two one-way between-groups analysis of covariance (DVs: Semantic, Linguistic and Semantic) and a one-way between-groups analysis of variance (DV: Linguistic, since no covariates were identified on this measure in the correlational analyses above) were conducted to compare Children's L1 metalinguistic abilities.

Results from main analyses (see Table 51) revealed that one condition—Semantic—yielded a significant difference between groups. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion children and EM(south) children were significantly more able to name more items of clothing.

Additionally, in consideration of the covariates, SES and Raven's were not significantly related to the measures of children's Lexical Fluency skills and accounted for less than 3% of the variance.

Table 51. Adjusted Means (Std Error), means (SD)†, and statistical analyses of children's L1 lexical fluency skills scores. ***<.001, **<.01, *<.05 level (2-tailed).

Lexical Fluency							
				Schools		Raven's	
Measures (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Linguistic (49, 36, 43)†	14.7 (5.28)	14.9 (4.30)	14.2 (3.97)	0.252	.004	-	-
Semantic (49, 36, 43)	15.0 (.647)	13.9 (.736)	10.2 (.713)	11.9***	.161	3.68	.029
Ling' and Semantic (39, 26, 40)	2.41 (.277)	3.23 (.329)	2.20 (.289)	2.96	.056	1.90	.019

Summary of Analyses of L1 Metalinguistic Skills

Accounting for the effects of SES and non-verbal intelligence, the majority of analyses found that immersion and EM(south) children performed better than their EM(north) peers on several measures of metalinguistic abilities in English. Analyses of the gs condition of the Grammatical Judgement task revealed that only immersion children performed better than EM(north) children. This could suggest that immersion children availed of higher degrees of analyses and control that was afforded them through their increased exposure of an L2.

Overall, as measured here by the Grammatical Judgement and Lexical Fluency tasks, these results suggest that Irish immersion education does not negatively affect children's L1 metalinguistic skills, and could even promote children's ability to attend to, control, and manipulate their first language. On all/most measures, immersion children perform the same as English-medium peers, demonstrating that English proficiency continues to develop even though education is delivered to those children through the medium of Irish.

Summary for Language Tests

Overall, as measured here, results for the vast majority of language tests used in this study suggest that immersion children's L1 ability was equivalent to their EM(south) peers, and both ROI groups outperformed their NI peers. This can be seen in results that showed there were positive effects of ROI school type when compared to their NI peers on L1 reading, vocabulary, creative writing, descriptive writing, and metalinguistic skills. Similar results were found when analysing children's writing skills. However, it is possible that results highlighting poorer performance of the EM(north) group could be due to a school effect as only one school participated in this study. I return to this point in the Discussion.

Chapter 11

12-Year-Olds: Executive Function Skills

This chapter discusses the results of analyses performed on data of children's performances on several EF tasks which measure children's interference suppression and response inhibition. The same tests, and similar layout and analyses, have been used in this chapter as in Chapter 8, 8-Year-Olds: EF Skills, above.

Flanker Task-Original

Correlational analyses of background variables. Analyses of the Flanker Task-Original skills (see Table 52) showed that Gender, Homework Help Time, and SES revealed no correlations on interference suppression skills. However, there were correlations between Raven's and (i) Correct Congruent MRT, $r(129) = -.364$, $p < .001$, and (ii) Correct Incongruent MRT, $r(129) = -.369$, $p < .001$. In the main analyses therefore, Raven's was the only covariate used, and was used for the Correct Congruent MRT and Correct Incongruent MRT analyses only.

Main analyses. Four one-way between-groups analysis of variance (DVs: Correct Congruent, Correct Incongruent, Difference Score, and Difference MRT) and two one-way between-groups analysis of covariance (DVs: Correct Congruent MRT, Correct Incongruent MRT) were conducted to compare children's interference suppression skills.

Results from the main analyses (see Table 53) revealed a significant difference between groups on two conditions—Correct Incongruent Score and Difference Score. *Post hoc* comparisons showed that when compared to their EM(north) peers, (i) immersion and EM(south) children were significantly more accurate in their responses to the incongruent trials, and (ii) EM(south) children had a smaller difference score.

However, the analyses of the remaining four conditions revealed no significant effects of school type.

In consideration of the covariate, Raven’s was significantly related to children’s speed of response.

Table 52. Correlations among background variable and Flanker Task-Original scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Flanker Task-Original										
Measures	1	2	3	4	5	6	7	8	9	10
1.Gender	-									
2.Homework Help Time	.173	-								
3.SES	-.167	-.058	-							
4.Raven's	-.063	-.152	.275**	-						
5.Correct Congruent	-.059	.019	-.120	.170	-					
6.Correct Incongruent	-.126	-.066	-.049	.172	.718***	-				
7.Difference Score	.112	.124	-.073	-.050	.126	-.600***	-			
8.Correct Congruent MRT	-.049	.073	-.144	-.364***	-.189*	-.129	-.032	-		
9.Correct Incongruent MRT	.027	.065	-.145	-.369***	-.113	-.177*	.122	.889***	-	
10. Difference MRT	.145	.014	-.064	-.151	.090	-.153	.321**	.151	.587***	-

Table 53. Adjusted Means (Std Error), means (SD)†, and statistical analyses of children's Flanker Task-Original scores. ***<.001, *<.05 level (2-tailed).

Flanker Task-Original							
				Schools		Raven's	
Measure (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Correct Congruent†	23.7 (0.61)	23.8 (1.02)	23.4 (1.88)	1.11	.017	-	-
Correct Incongruent†	23.2 (0.96)	23.5 (0.61)	22.5 (2.39)	4.42*	.066	-	-
Difference Score†	0.51 (1.02)	0.28 (0.91)	0.89 (1.30)	3.17*	.048	-	-
Correct Congruent MRT	851 (32.5)	796 (40.0)	863 (35.2)	0.99	.016	14.6***	.104
Correct Incongruent MRT	940 (39.4)	874 (44.9)	982 (42.8)	1.49	.023	13.7***	.099
Difference MRT†	84.2 (107)	76.1 (81.3)	123 (182)	1.56	.024	-	-

Flanker Task-Modified

Correlational analyses of background variables. Analyses of the Flanker Task-Modified skills (see Table 54) showed that Gender and SES revealed no correlations with EF skills. However, there were correlations between Homework Help Time and (i) Correct Incongruent, $r(104) = -.311$, $p = .001$, and (ii) Difference Score, $r(104) = .324$, $p = .001$. Other correlations were Raven's with all measures (bar Difference MRT), $r(129) = -.234$ to .305, *ps* = .000 to .008. As such, in the main analyses, Homework Help Time and Raven's were used as covariates on the aforementioned variables with which they significantly correlated.

Main analyses. Five one-way between-groups analysis of covariance (DVs: Correct Congruent, Correct Incongruent, Difference Score, Correct Congruent MRT, Correct Incongruent MRT) and one one-way between-groups analysis of variance (DV: Difference MRT) were conducted to compare children's interference suppression skills.

Results from main analyses (see Table 55) revealed a significant difference between groups on one condition—Correct Incongruent MRT. *Post hoc* comparisons showed that EM(south) children were significantly faster than EM(north) children.

In consideration of the covariates, Raven's was significantly related to children's accuracy and speed of response and Homework Help Time was significantly related to Correct Incongruent scores, $F(1, 99) = 6.79$ $p = .011$, $\eta p^2 = .064$, and to Difference Score, $F(1, 99) = 8.19$ $p = .005$, $\eta p^2 = .076$.

Table 54. Correlations among background variable and Flanker Task-Modified scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Flanker Task-Modified

Measures	1	2	3	4	5	6	7	8	9	10
1.Gender	-									
2.Homework Help Time	.173	-								
3.SES	-.167	-.058	-							
4.Raven's	-.063	-.152	.275**	-						
5.Correct Congruent	.000	-.067	.132	.299***	-					
6.Correct Incongruent	-.088	-.311***	.060	.305***	.464***	-				
7.Difference Score	.056	.338***	.011	-.252**	-.164	-.950***	-			
8.Correct Congruent MRT	.051	.050	-.082	-.374***	-.224*	-.070	-.002	-		
9.Correct Incongruent MRT	.161	.085	-.081	-.252**	.116	.095	-.064	.632***	-	
10. Difference MRT	.157	.093	-.046	-.112	.277***	.160	-.018	.215*	.892***	-

Table 55. Adjusted Means (Std Error), means (SD)†, statistics and statistical analyses of children's Flanker Task-Modified scores. ***<.001, **<.05, *<.05 level (2-tailed).

Flanker Task-Modified

				Schools		Raven's	
Measure (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Correct Congruent	23.7 (0.13)	23.9 (0.15)	23.6 (0.14)	0.84	.013	8.59**	.064
Correct Incongruent	20.8 (0.46)	21.0 (0.52)	19.9 (0.52)	1.22	.024	5.40*	.052
Difference Score	2.92 (0.42)	2.84 (0.48)	3.60 (0.48)	0.77	.015	2.06	.020
Correct Congruent MRT	1252 (43.6)	1117 (49.7)	1255 (47.3)	2.73	.042	15.9***	.113
Correct Incongruent MRT	2200 (98.0)	1893 (118)	2266 (106)	3.35*	.051	5.39*	.041
Difference MRT†	934 (399)	770 (276)	1030 (803)	2.24	.034	-	-

Summary of Analyses of Flanker Tasks

Of the three group differences found, all showed that EM(north) children performed worse than their peers. Specifically, immersion and EM(south) children performed better than EM(north) children on the Flanker Task-Original, Correct Incongruent trials, supporting claims that immersion children (and those with at least some amount of an L2) are advantaged on such tasks. However, only EM(south) children performed better than EM(north) on Difference scores of the Original version and Correct Incongruent MRTs on the Modified version of the Flanker task.

SART

Correlational analyses of background variables. Analyses of the SART scores (see Table 56) showed that Gender, Homework Help Time, and SES revealed no correlations on measurements. However, there were correlations between Raven's and all measures (bar MRT +No.3), $r(129) = -.260$ to $.319$ $ps = .000$ to $.021$. As such, Raven's was the only covariate used in the main analyses.

Main analyses. Four one-way between-groups analysis of covariance (DVs: Correct Score, Correct Press, Correct Pass, MRT -No.3) and one one-way between-groups analysis of variance (DV: MRT +No.3) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 57) revealed a significant difference between groups on one condition—Correct Pass. Contrasts revealed that immersion and EM(south) children correctly inhibited response more than EM(north) children. The covariate, Raven's, was significantly related to children's accuracy on the Correct Score and Correct Press and on speed of response.

Table 56. Correlations among background variable and the SART scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and SART

Measures	1	2	3	4	5	6	7	8	9
1.Gender	-								
2.Homework Help Time	.173	-							
3.SES	-.167	-.058	-						
4.Raven's	-.063	-.152	.275**	-					
5.Correct Score	-.098	-.051	.179	.319***	-				
6.Correct Press	-.105	-.019	.119	.297***	.758***	-			
7.Correct Pass	-.049	-.059	.151	.203*	.821***	.254**	-		
8. MRT +No.3	.005	.010	.129	-.139	.269**	-.282***	.647***	-	
9. MRT –No.3	.027	.034	.082	-.260**	.000	-.444***	.395***	.952***	-

Table 57. Adjusted means (Std Error), means (SD)†, and statistical analyses of children's SART scores. ***<.001, **<.01, *<.05 level (2-tailed).

SART

				Schools		Raven's	
Measure (N)	Immersion	EM(south)	EM(north)	*F*	ηp^2	*F*	ηp^2
Correct Score	218 (0.90)	217 (1.02)	214 (0.98)	2.94	.045	6.93**	.052
Correct Press	199 (0.54)	199 (0.62)	198 (0.59)	0.61	.010	8.42**	.063
Correct Pass	18.0 (0.62)	18.0 (0.71)	15.7 (0.67)	3.60*	.054	1.31	.010
MRT +No.3†	573 (78.7)	546 (109)	540 (121)	1.32	.020	-	-
MRT –No.3	459 (13.3)	427 (15.2)	423 (14.5)	2.07	.032	11.7***	.086

Stroop Tasks

Correlational analyses of background variables. Analyses of the Stroop tasks scores (see Table 58) showed that Homework Help Time and SES revealed no correlations on measurements. However, there were correlations between Gender and (i) English Word-Match, $r(128) = .239$, $p = .007$, (ii) Irish Word-Match, $r(44) = .372$, $p = .013$, (iii) Irish Colour-Match, $r(44) = .479$, $p = .001$, and (iv) Irish Stroop, $r(44) = .423$, $p = .004$, showing females performed better than males in all conditions. Other correlations were found with Raven's and (i) English Stroop, $r(128) = .345$, $p < .001$, and (ii) English Interference Score, $r(128) = -.241$, $p = .006$. In the main analyses therefore, regarding Stroop Task-English, Gender and Raven's were used as covariates, and regarding Stroop Task-Irish, Gender was used as a covariate in the aforementioned variables with which they correlated.

Table 58. Correlations among background variable and Stroop tasks scores. ***<.001, **<.01, *<.05 level (2-tailed).

Correlations Among Background and Stroop Tasks

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Gender	-											
2.Homework Help Time	.173	-										
3.SES	-.167	-.058	-									
4.Raven's	-.063	-.152	.275**	-								
5.English Word-Match	.239**	.018	-.128	-.045	-							
6.English Colour-Match	.083	-.016	-.013	.169	.601***	-						
7.English Stroop	.111	-.044	.051	.345***	.354***	.597***	-					
8.English Interference Score	.119	.044	-.139	-.241**	.726***	.436***	-.294***	-				
9.Irish Word-Match	.372*	.005	.048	-.021	.631***	.777***	.617***	.304*	-			
10.Irish Colour-Match	.479***	.097	-.051	.226	.545***	.551***	.654***	.059	.580***	-		
11.Irish Stroop	.423**	-.148	.062	.297	.401***	.516***	.685***	-.113	.448**	.722***	-	
12.Irish Interference Score	.076	.217	-.050	-.231	.346*	.340*	.076	.402**	.611***	.178	-.375*	-

Stroop Task-English

Main analyses. Three one-way between-groups analysis of covariance (DVs: Word-Match, Stroop, Interference Score) and one one-way between-groups analysis of variance (DV: Colour-Match) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 59) revealed a significant difference between groups on one condition—Interference Score. *Post hoc* comparisons showed that when compared to their EM(north) peers, immersion and EM(south) children were less affected by the Stroop effect.

In consideration of the covariates, Raven's was significantly related to children's accuracy on the Stroop condition and Gender was significantly related to children's accuracy on the Word-Match condition.

Stroop Task-Irish

Main analyses. Three one-way between-groups analysis of covariance (DVs: Word-Match, Colour-Match, Stroop) and one Independent-samples t-test (DV: Interference Score) were conducted to compare children's response inhibition skills.

Results from main analyses (see Table 60) revealed no significant differences between groups. The covariate, Gender, was significantly related to children's accuracy on the Word-Match, Colour-Match, and Stroop conditions.

Table 59. Adjusted Means (Std Error), means (SD)†, and statistical analyses of children's Stroop Task-English scores. ***<.001, ***<.01, *<.05 level (2-tailed). Lower scores on Interference Score indicate better performance than higher scores.

Stroop Task-English

				Schools		Gender/Raven's	
Measure (N)	Immersion	EM(south)	EM(north)	F	*ηp²*	F	*ηp²*
Word-Match	80.9 (1.98)	81.7 (2.31)	85.2 (2.14)	1.17	.019	5.58*	.043
Colour-Match†	62.3 (9.64)	63.7 (10.0)	63.0 (10.9)	0.19	.003	-	.-
Stroop	45.1 (1.17)	46.4 (1.33)	43.2 (1.29)	1.42	.022	10.3**	.077
Interference Score	25.8 (1.36)	25.8 (1.55)	32.1 (1.50)	5.56**	.082	1.64	.013

Table 60. Adjusted Means (Std Error), means (SD)†, and statistical analyses of children's Stroop Task-Irish scores. ***<.001, *<.05 level (2-tailed). Lower scores on Interference Score indicate better performance than higher scores.

Stroop Task-Irish

			Schools		Gender	
Measure (N)	Immersion	EM(south)	*F/t*	*ηp²*	*F*	*ηp²*
Word-Match	80.4 (2.70)	82.2 (2.70)	0.21	.005	6.81*	.142
Colour-Match	51.0 (1.57)	50.2 (1.57)	0.11	.003	11.7***	.221
Stroop	37.1 (1.72)	41.6 (1.72)	3.41	.077	11.2**	.214
Interference Score†	28.7 (9.3)	24.6 (6.40)	1.70	.064	-	-

Summary for Executive Function Tasks

Overall, analyses revealed five significant differences between groups. Regarding the Flanker tasks which measured interference suppression, it was expected that immersion children would perform better than their peers because of their larger exposure to an L2. However, it was the EM(south) children who performed best of all, significantly outperforming their EM(north) peers, although the immersion children's performance was also better than EM(north) on some conditions. This is despite EM(south) receiving a considerably less amount of exposure to an L2 than their immersion peers.

Regarding the SART and Stroop tasks, which measured response inhibition, it was expected that no group differences would emerge from analyses. However, both immersion and EM(south) children performed better than their EM(north) peers on two inhibition measures as measured by SART, Correct Pass condition, and Stroop Task-English, Interference Score. This suggests that ROI children were better than their NI peers at controlling their attention and inhibiting their reading automaticity of simple text (i.e., red, blue, green, white, or 3) used in these measures.

Although, bearing in mind that these results could relate to a school effect since low numbers of schools participated in this study, these results could suggest that knowledge of an L2 might assist in EF tasks, especially response inhibition as measured here. However, this sentiment is not supported by results of the interference suppression analyses as measured by the Flanker tasks, and it could suggest that another factor other than background details—children's home life and non-verbal intelligence which were taken into account—is an influential factor, e.g., the curriculum or commencement age of school. However, results could suggest that the Flanker tasks used in this study were not sensitive enough to provide an accurate or appropriate level of challenges specific to the language skills of each test group. Furthermore, results could also suggest that successive bilinguals are not afforded similar interference suppression skills as afforded to simultaneous bilinguals because the conflict resolution experienced by being bilingual is different for successive and simultaneous bilinguals. These factors are further elaborated in the discussion section.

Suffice to say however, at no point were immersion children found to have had performed significantly worse than any of the other two groups on any of the EF tasks. (And at no point were the EM(north) children found to have had performed significantly better than their ROI peers.) These results suggest that Irish medium education can transmit L1 and L2 skills at no cost to children's interference suppression and response inhibition skills as measured here.

*　　　　*　　　　*

The next chapter presents findings of analyses of the questionnaires as reported by children and their parents. Self-reported attitudes in relation to performance on the EF tasks were also explored. The final chapter presents a discussion of the results of analyses of children's performances on the tests in relation to current research into bilingualism and Irish medium education.

Chapter 12

8 Year-Olds and 12 Year-Olds: Analyses of Questionnaires

This chapter shows the results of correlational analyses that explored parents' and children's (i) use of Irish and English languages within their family networks and communities, (ii) attitudes towards the Irish and English languages, and (iii) attitudes towards immersion and English medium education in Ireland, as measured by several questionnaires (see Appendix 1). Parents completed the majority of these questionnaires; however, children completed one questionnaire which is presented in the penultimate section of this chapter. The last section of this chapter investigates (iv) the relationship between children's attitude towards the Irish language and their performance on the EF tasks.

Analyses were performed on the immersion and EM(south) groups only as the EM(north) group were not asked to complete the questionnaires because the northern area where data was collected was predominantly monolingual English and Irish was not on the curriculum.[17] Although the majority of parents completed the questionnaires, some of the questionnaires were left incomplete. For instance, in some cases answers were omitted for certain sections/questions and in other cases answers were provided for one parent only[18]. This can partly explain the variance in N scores throughout this set of analyses.

Unlike the previous chapters whereby the two age groups were analysed

[17] Of course, language use of EM(north) parents were ascertained by use of questionnaire (see Appendix 1), of which all participants reported themselves and their families as monolingual English.

[18] One could assume that these are single parent households, which could affect children's performance, but there is no way to verify this issue as measured here.

separately, this chapter combines participants' responses from both age groups because preliminary analyses suggested that there would be no major differences in parental attitudes across the two age groups. This is confirmed by the analyses below. This combining of participants' responses increased the N size and the robustness of the analyses. However, one exception to such combining of age groups was the effect of children's attitudes towards Irish upon their performance of EF tasks, because Age would have been a confounding variable. These analyses are presented separately according to age.

The analyses reported herein was performed by (i) Spearman's rho correlations model for analyses of the relationship between school type and parents' attitude responses and parents' and children's language use, (ii) chi square analyses for analyses of the relationship between school type and children's attitudes towards the Irish and English languages, and (iii) Pearson's correlations model for analyses of the relationship between school type and the affect of children's attitude towards the Irish language upon their performance on the EF tasks. All analyses were two tailed, with $\alpha = p < .05$.

The presentation of the analyses is given as follows: (i) Mothers' Language Use; (ii) Fathers' Language Use; (iii) Children's Language Use (as reported by parents); (iv) Parents' Attitudes towards English-Irish Bilingualism; (v) Parental Attitudes towards Irish; (vi) Parental Attitudes towards immersion and English medium education; (vii) Children's Self-Reported Use of and Attitudes towards the English and Irish Languages and English-Irish Bilingualism in Ireland, and (viii) the affect of children's attitude towards the Irish language upon their performance on the EF tasks. Each section commences with the appropriate descriptive statistics.

Language Use within the Family as Reported by Parents

The following three sections present analyses of language use of mothers, fathers, and children within their family network and within their community as reported by parents. In what follows, “immersion mothers” and “immersion fathers” refer to mothers or fathers of children attending Immersion school.

Analyses of mothers’ language use. Descriptive statistics of Mothers’ Language Use in various settings per school group seemed to indicate that immersion mothers were more likely to use their Irish in various settings than were their English medium peers (see Table 61). This was supported by correlational analyses (see Table 62) that revealed Type of Schooling correlated positively with all measures of Irish language use except with Neighbours, Bureaucrats and Politicians, and Reading measures. Results also revealed that there were no correlations between Children’s Age and mothers’ use of Irish on any measure but there were positive correlations amongst most of the 18 measures of Irish language use. This suggests that mothers employ similar patterns of language usage in various socio-linguistic domains as measured here.

Table 61. Percentage scores per Mothers' self-reported use of the Irish language within the family and community per school group. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Questions were adapted from Baker (2007).

Mothers' Irish Language Use												
	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
With following people:												
Immediate family	82	1.20	13.4	45.1	20.7	19.5	67	0	6.00	22.4	26.9	44.8
Extended family	82	0	2.40	15.9	30.5	51.2	66	1.50	0	3.00	21.2	74.2
Work colleagues	82	13.4	18.3	20.7	11.0	36.6	64	1.6	12.5	14.1	6.30	65.6
Friends	82	2.40	4.90	19.5	19.5	53.7	65	0	0	7.70	23.1	69.2
Neighbours	82	0	1.20	1.20	14.6	82.9	64	0	0	1.60	10.9	87.5
Teachers	82	25.6	20.7	30.5	11.0	12.2	64	1.60	9.40	10.9	10.9	67.2
People in the community	81	0	4.90	14.8	23.5	56.8	64	0	0	3.10	12.5	84.4
Organisations	82	0	4.90	9.80	20.7	64.6	63	0	1.60	3.20	11.1	84.1
Bureaucrats and politicians	80	0	1.30	5.00	8.80	85.0	63	0	0	0	7.90	92.1
In following areas:												
Shopping	80	0	3.80	11.3	20.0	65.0	65	0	1.50	3.10	12.3	83.1
Newspapers	81	0	2.50	17.3	16.0	64.2	65	0	1.50	7.70	13.8	76.9
Listening to radio or music	79	0	8.90	26.6	19.0	45.6	65	0	3.10	16.9	16.9	63.1
Theatre, TV., movies, etc.	81	0	6.20	33.3	17.3	43.2	65	0	3.10	23.1	12.3	61.5
Work	81	4.90	8.60	11.1	13.6	61.7	65	1.50	6.20	3.10	9.20	80.0
Clubs	79	0	2.50	7.60	15.2	74.7	65	0	0	3.10	4.60	92.3
Leisure, hobbies	81	0	4.90	4.90	18.5	71.6	65	0	0	3.10	10.8	86.2
Church	80	0	8.80	21.3	12.5	57.5	65	1.50	0	4.60	10.8	83.1
Computers, emailing, etc.	81	0	6.20	7.40	12.3	74.1	65	0	0	0	7.70	92.3

Table 62. Mothers' language use with various people in various settings. Immersion mothers = 1, English medium mothers = 2. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. **<.01, *<.05 level.

	Correlations of Mothers' Language Use																			
Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Children's Age	-																			
Type of schooling	.054	-																		
Immediate Family	.033	.325**	-																	
Extended Family	-.055	.252**	.556**	-																
Work Colleagues	.127	.296**	.607**	.514**	-															
Friends	.045	.205*	.548**	.544**	.744**	-														
Neighbours	.136	.064	.287**	.406**	.391**	.491**	-													
Teachers	.132	.577**	.546**	.454**	.726**	.580**	.293**	-												
In Community	-.026	.311**	.343**	.385**	.518**	.600**	.526**	.497**	-											
Organisations	-.034	.222**	.349**	.419**	.534**	.483**	.327**	.555**	.617**	-										
Bureaucrats	-.059	.116	.142	.396**	.296**	.329**	.332**	.313**	.500**	.628**	-									
Shopping	-.023	.210*	.483**	.512**	.390**	.505**	.350**	.353**	.488**	.347**	.239**	-								
Reading	-.101	.148	.509**	.486**	.504**	.571**	.399**	.421**	.589**	.548**	.338**	.474**	-							
Radio, etc.	-.025	.193*	.586**	.535**	.559**	.560**	.399**	.439**	.506**	.434**	.312**	.564**	.635**	-						
T.V., etc.	-.045	.179*	.544**	.451**	.466**	.514**	.279**	.482**	.421**	.414**	.265**	.481**	.591**	.637**	-					
Work	.036	.200*	.486**	.504**	.652**	.561**	.361**	.454**	.489**	.521**	.322**	.449**	.569**	.583**	.442**	-				
Clubs	-.036	.232**	.323**	.406**	.426**	.501**	.434**	.374**	.604**	.627**	.493**	.486**	.495**	.473**	.363**	.511**	-			
Leisure	-.039	.181*	.464**	.427**	.450**	.521**	.348**	.404**	.471**	.488**	.425**	.582**	.471**	.467**	.449**	.598**	.634**	-		
Church	-.018	.295**	.411**	.459**	.377**	.382**	.301**	.362**	.577**	.509**	.253**	.547**	.448**	.504**	.446**	.396**	.479**	.524**	-	
Computers, etc.	-.091	.249**	.429**	.441**	.424**	.476**	.328**	.437**	.501**	.452**	.367**	.503**	.568**	.496**	.477**	.488**	.435**	.635**	.595**	-

Analyses of fathers' language use. Descriptive statistics of Fathers' Language Use in various settings per school group seemed to indicate that immersion fathers were more likely to use their Irish in various settings than were their English medium peers (see Table 63). This was supported by correlational analyses (see Table 64) that revealed Type of Schooling correlated positively with 12 measures of Irish Language Use. Also, there were two correlations between Children's Age and measures of fathers' use of Irish with Friends and with Neighbours suggesting that the fathers of younger children used Irish with their friends and neighbours more frequently than did fathers of the older children. Results also revealed that there were positive correlations amongst all of the 18 measures of Irish language use which suggests that fathers employ similar patterns of language usage in various socio-linguistic domains as measured here.

Table 63. Percentage scores per Fathers' self-reported use of the Irish language within the family and community per school group. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Questions were adapted from Baker (2007).

Fathers' Irish Language Use												
	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
With following people:												
Immediate family	74	0	6.80	27.0	24.3	41.9	60	0	5.00	10.0	15.0	70.0
Extended family	75	0	1.30	8.00	24.0	66.7	58	0	1.70	0	6.90	91.4
Work colleagues	73	4.10	4.10	6.80	23.3	61.6	57	0	1.80	1.80	8.80	87.7
Friends	73	4.10	4.10	6.80	23.3	61.6	57	0	1.80	1.80	8.80	87.7
Neighbours	73	0	0	0	15.1	84.9	58	0	0	0	5.20	94.8
Teachers	72	5.60	8.30	20.8	19.4	45.8	57	0	3.50	0	5.30	91.2
People in the community	73	0	0	6.80	19.2	74.0	57	0	0	0	5.30	94.7
Organisations	73	0	0	2.70	19.2	78.1	57	0	0	0	7.00	93.0
Bureaucrats and politicians	72	0	0	1.40	12.5	86.1	57	0	0	0	5.30	94.7
In following areas:												
Shopping	71	0	0	2.80	8.50	88.7	57	0	0	3.50	7.00	89.5
Newspapers	71	0	0	5.60	12.7	81.7	57	0	0	1.80	5.30	93.0
Listening to radio or music	70	0	7.10	25.7	10.0	57.1	57	0	0	7.00	10.5	82.5
Theatre, TV., movies, etc.	71	0	4.20	16.9	19.7	59.2	57	0	1.80	8.80	5.30	84.2
Work	71	0	0	1.40	16.9	81.7	57	0	0	0	7.00	93.0
Clubs	70	0	0	2.90	15.7	81.4	57	0	0	0	3.50	96.5
Leisure, hobbies	71	0	0	5.60	21.1	73.2	57	0	0	3.50	3.50	93.0
Church	70	0	4.30	14.3	14.3	67.1	57	1.80	0	3.50	5.30	89.5
Computers, emailing, etc.	71	0	1.40	4.20	9.90	84.5	57	0	0	0	5.30	94.7

Table 64. Fathers' language use with various people in various settings. Immersion fathers = 1, English medium fathers = 2. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. **<.01, *<.05 level.

Correlations of Fathers' Language Use																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.Children's Age	-																			
2.Type of schooling	.054	-																		
3.Immediate Family	.086	.274**	-																	
4.Extended Family	.021	.292**	.538**	-																
5.Work Colleagues	.136	.295**	.577**	.604**	-															
6.Friends	.175*	.241**	.458**	.510**	.689**	-														
7.Neighbours	.190*	.159	.366**	.420**	.519**	.713**	-													
8.Teachers	.119	.470**	.638**	.535**	.702**	.654**	.494**	-												
9.People in the Community	.107	.279**	.493**	.577**	.653**	.790**	.737**	.630**	-											
10.Organisations	.059	.207*	.465**	.677**	.652**	.529**	.638**	.493**	.722**	-										
11.Bureaucrats, Politicians	.027	.143	.359**	.546**	.533**	.470**	.567**	.439**	.569**	.709**	-									
12.Shopping	.080	.010	.352**	.314**	.301**	.362**	.368**	.183*	.327**	.394**	.384**	-								
13.Reading	-.009	.166	.502**	.602**	.451**	.535**	.528**	.538**	.660**	.541**	.494**	.317**	-							
14.Radio, Music, etc.	.038	.300**	.572**	.457**	.471**	.570**	.435**	.575**	.499**	.398**	.399**	.359**	.525**	-						
15.T.V., Cinema, etc.	.121	.258**	.505**	.313**	.362**	.410**	.447**	.529**	.489**	.343**	.363**	.420**	.476**	.705**	-					
16.Work	-.070	.167	.405**	.521**	.556**	.399**	.300**	.390**	.505**	.652**	.581**	.453**	.390**	.327**	.270**	-				
17.Clubs	.025	.233**	.395**	.540**	.483**	.467**	.429**	.470**	.635**	.602**	.406**	.276**	.560**	.374**	.403**	.587**	-			
18.Leisure and Hobbies	.018	.248**	.568**	.556**	.567**	.517**	.489**	.496**	.569**	.535**	.481**	.505**	.609**	.464**	.528**	.538**	.537**	-		
19.Church	.015	.263**	.478**	.498**	.395**	.346**	.399**	.459**	.494**	.511**	.343**	.312**	.500**	.489**	.564**	.443**	.515**	.540**	-	
20.Computers, Emailing, etc.	-.063	.167	.437**	.448**	.368**	.484**	.446**	.407**	.545**	.424**	.329**	.371**	.688**	.414**	.471**	.451**	.416**	.631**	.590**	-

Analyses of children's language use. Descriptive statistics of Children's Language Use in various settings per school group seemed to indicate that immersion children were more likely to use their Irish in various settings than were their English medium peers (see Table 65). This was supported by correlational analyses (see Table 66) that revealed Type of Schooling correlated positively with all measures of Irish use. Also, there were correlations between Children's Age and children's use of Irish on two measures only, i.e., Reading and Computers, Emailing, etc. measures, suggesting that the older children used Irish more frequently in these areas than did younger children. Results also revealed that there were positive correlations amongst the vast majority of the 18 measures of Irish language use which suggests that children employ similar patterns of language usage in various socio-linguistic domains as measured here.

Table 65. Percentage scores per Children's use of the Irish language with various people in various settings, as reported by parents. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Questions were adapted from Baker (2007).

Children's Irish Language Use												
	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
With following people:												
Immediate family	74	0	24.3	39.2	21.6	14.9	59	0	10.2	23.7	30.5	35.6
Extended family	72	0	9.70	23.6	33.3	33.3	57	0	0	7.00	14.0	78.9
School friends	72	62.5	25.0	1.40	2.80	8.30	57	1.80	28.1	24.6	3.50	42.1
Friends	73	6.80	45.2	26.0	9.60	12.3	58	0	5.20	10.3	19.0	65.5
Neighbours	73	0	4.10	6.80	17.8	71.2	58	0	0	1.70	6.90	91.4
Teachers	74	90.5	5.40	0	1.40	2.70	55	1.80	25.5	40.0	9.10	23.6
People in the community	73	0	8.20	21.9	24.7	45.2	57	0	0	1.80	10.5	87.7
Organisations	72	0	5.60	15.3	11.1	68.1	56	0	0	0	8.90	91.1
Bureaucrats and politicians	67	4.50	0	6.00	9.00	80.6	56	0	0	0	3.60	96.4
In following areas:												
Shopping	71	0	5.60	22.5	16.9	54.9	59	0	0	10.2	8.50	81.4
Newspapers	69	0	2.90	10.1	26.1	60.9	59	0	0	3.40	10.2	86.4
Listening to radio or music	70	0	5.70	38.6	20.0	35.7	59	0	1.70	11.9	15.3	71.2
Theatre, TV., movies, etc.	69	0	8.70	46.4	23.2	21.7	59	0	6.80	10.2	18.6	64.4
Work	61	18.0	6.60	3.30	8.20	63.9	57	0	1.80	0	1.80	96.5
Clubs	68	0	2.90	20.6	17.6	58.8	59	0	3.40	5.10	3.40	88.1
Leisure, hobbies	70	1.40	5.70	27.1	15.7	50.0	59	0	3.40	3.40	6.80	86.4
Church	69	0	13.0	31.9	15.9	39.1	59	1.70	1.70	1.70	10.2	84.7
Computers, emailing, etc.	68	1.50	2.90	14.7	14.7	66.2	59	0	0	1.70	3.40	94.9

Table 66. Children's language use with various people in various settings, as reported by parents. Immersion children = 1, English medium children = 2. Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. **<.01, *<.05 level.

Correlations of Children's Language Use

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Children's Age	-																			
Type of schooling	.054	-																		
Immediate Family	.077	.308**	-																	
Extended Family	-.023	.460**	.563**	-																
Work Colleagues	.100	.659**	.483**	.555**	-															
Friends	.038	.635**	.573**	.599**	.674**	-														
Neighbours	.088	.256**	.271**	.401**	.195*	.321**	-													
Teachers	.099	.840**	.445**	.479**	.736**	.673**	.220*	-												
People in Community	-.003	.456**	.465**	.601**	.464**	.501**	.458**	.431**	-											
Organisations	-.114	.296**	.363**	.559**	.244**	.375**	.386**	.278**	.576**	-										
Bureaucrats, Politicians	-.017	.246**	.246**	.261**	.168	.233**	.342**	.194*	.486**	.475**	-									
Shopping	-.087	.287**	.444**	.498**	.192*	.400**	.327**	.286**	.447**	.329**	.181*	-								
Reading	-.190*	.289**	.312**	.477**	.280**	.320**	.372**	.311**	.426**	.458**	.276**	.409**	-							
Radio, Music, etc.	-.110	.373**	.453**	.506**	.395**	.474**	.310**	.453**	.440**	.406**	.279**	.474**	.642**	-						
T.V., Cinema, etc.	-.074	.427**	.353**	.457**	.393**	.502**	.384**	.492**	.426**	.320**	.230*	.471**	.468**	.533**	-					
Work	-.081	.409**	.193*	.445**	.376**	.424**	.321**	.355**	.502**	.553**	.360**	.273**	.319**	.357**	.273**	-				
Clubs	.013	.309**	.400**	.436**	.281**	.436**	.444**	.357**	.508**	.552**	.236*	.491**	.336**	.445**	.368**	.535**	-			
Leisure and Hobbies	-.125	.383**	.491**	.576**	.390**	.542**	.390**	.406**	.628**	.652**	.385**	.556**	.461**	.497**	.389**	.535**	.643**	-		
Church	.041	.474**	.346**	.570**	.455**	.465**	.348**	.443**	.527**	.380**	.161	.450**	.441**	.573**	.423**	.461**	.481**	.594**	-	
Computers, Emailing, etc.	-.198*	.358**	.280**	.367**	.226*	.342**	.349**	.363**	.448**	.548**	.347**	.443**	.527**	.495**	.404**	.341**	.444**	.499**	.386**	-

Parental Attitudes towards English-Irish Bilingualism and immersion and English medium education in Ireland

The following seven sections present analyses of parental attitudes towards bilingualism, the Irish language, and immersion and English medium education in Ireland. In an attempt to minimise the amount of correlational analyses to be performed, each of these sections uses a "mean" score of Irish language use. This mean score was calculated by analysing parents' responses to their and their children's Irish language use in various linguistic settings based on a scale of 1 to 5 (see previous section). These scores were collapsed across groups.

Analyses of parental attitudes towards bilingualism. Descriptive statistics of parental attitudes towards English-Irish bilingualism in Ireland per school group seemed to indicate that immersion parents had a more positive attitude towards English-Irish bilingualism in Ireland than did English medium parents (see Table 67). This was supported by correlational analyses (see Table 68) that revealed Type of Schooling correlated positively with 21 out of 24 measures of attitudes towards bilingualism.

Analyses of "mean" use of Irish revealed correlations between Parents and Children's Mean Usage of Irish and Type of Schooling, but there were no correlations between Parents and Children's Mean Usage of Irish and Children's Age. Also, analyses revealed that there were no correlations between Children's Age and parental attitudes towards bilingualism on all measures. This suggests that there were no differences between parents of younger and older children on their mean usage of Irish or on their attitudes towards bilingualism.

Furthermore, results also revealed that there were positive correlations amongst the vast majority of the 24 measures of attitudes towards bilingualism which suggests that parents hold similar patterns of attitudes towards bilingualism within various socio-linguistic domains as measured here.

Table 67. Parents' attitudes towards bilingualism by school group. Questions were adapted from Baker and Prys-Jones (1998). Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5.

Parents' Attitudes Towards Bilingualism

	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
1.It is important to be able to speak English and Irish.	83	44.6	41.0	12.0	1.2	1.2	68	22.1	39.7	27.9	7.40	2.90
2.To speak English is all that is needed.	83	2.40	6.00	9.60	44.6	37.3	67	3.00	20.9	20.9	28.4	26.9
3.Knowing Irish and English makes people smarter.	82	18.3	23.2	25.6	20.7	12.2	68	4.40	13.2	29.4	26.5	26.5
4.Children get confused when learning English and Irish.	82	6.10	1.20	6.10	31.7	54.9	67	6.00	7.50	4.50	47.8	34.3
5.Speaking both Irish and English helps to get a job.	80	15.0	45.0	23.8	12.5	3.80	68	10.3	33.8	27.9	19.1	8.80
6.Being able to write in English and Irish is important.	81	22.2	50.6	19.8	6.20	1.20	68	10.3	44.1	27.9	13.2	4.40
7.Schools should teach children to speak in two languages.	82	45.1	41.5	11.0	2.40	0	68	30.9	45.6	17.6	1.50	4.40
8.School wall displays should be in English and Irish.	82	40.2	45.1	8.50	3.70	2.40	68	16.2	50.0	23.5	5.90	4.40
9.Speaking two languages is not difficult.	83	34.9	38.6	16.9	4.80	4.80	67	17.9	56.7	11.9	13.4	0
10.Knowing both Irish and English gives people problems.	82	0	0	4.90	30.5	64.6	68	0	1.50	2.90	51.5	44.1
11.I feel sorry for people who cannot speak both English and Irish.	78	5.10	3.80	33.3	28.2	29.5	68	2.90	2.90	22.1	35.3	36.8
12.Children should learn to read in two languages.	83	36.1	47.0	12.0	3.60	1.20	67	17.9	49.3	22.4	6.00	4.50
13.People know more if they speak English and Irish.	83	14.5	14.5	33.7	21.7	15.7	66	6.10	15.2	19.7	37.9	21.2
14.People who speak Irish and English can have more friends than those who speak one language.	83	4.80	8.40	30.1	30.1	26.5	68	0	2.90	16.2	39.7	41.2
15.Speaking both English and Irish is more for older than younger people.	83	1.20	1.20	4.80	32.5	60.2	68	1.50	0	10.3	51.5	36.8
16.Speaking both Irish and English can help people get a work promotion.	82	4.90	28.0	37.8	15.9	13.4	68	4.40	16.2	32.4	29.4	17.6
17.Children can easily learn to speak Irish and English at the same time.	83	56.6	39.8	1.20	2.40	0	67	34.3	61.2	4.50	0	0
18.Both English and Irish should be important in the region where I live.	83	26.5	44.6	21.7	7.20	0	68	7.40	38.2	36.8	11.8	5.90
19.People can earn more money if they speak both Irish and English.	83	2.40	14.5	45.8	26.5	10.8	68	1.50	13.2	32.4	30.9	22.1
20.I would like English to be the only language in this area.	81	3.70	0	2.50	32.1	61.7	68	1.50	0	13.2	42.6	42.6
21.I would like to be considered as a speaker of English and Irish.	82	17.1	45.1	25.6	6.10	6.10	65	7.70	18.5	50.8	13.8	9.20
22.I want my children to speak Irish.	82	58.5	36.6	0	3.70	1.20	68	19.1	58.8	19.1	1.50	1.50
23.Both the Irish and English languages can live together in this region.	82	53.7	37.8	3.70	3.70	1.20	68	25.0	58.8	16.2	0	0
24.People only need to know one language.	82	3.70	2.40	8.50	28.0	57.3	67	0	9.00	16.4	35.8	38.8

Table 68. Parents' and children's "mean" usage of Irish across various settings and with various people and parents' attitudes towards bilingualism. Statements 2, 4, 10, 15, 20, and 24 were re-coded for the correlational analyses as these were negative statements to bilingualism whilst the remaining 18 statements were positive. Immersion = 1, English medium = 2. Mean usage ranges from Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

	Correlations of Attitudes towards Bilingualism																												
	Age	Schl	Mum	Dad	Child	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
Age	-																												
School	.054	-																											
Mum Use	.022	.387**	-																										
Dad Use	.087	.350**	.605**	-																									
Child Use	-.014	.661**	.683**	.548**	-																								
Q1	-.124	.302**	.379**	.288**	.443**	-																							
Q2	-.013	.231**	.345**	.212*	.344**	.530**	-																						
Q3	.058	.277**	.293**	.260**	.429**	.348**	.252**	-																					
Q4	-.096	.173*	.127	.105	.154	.205*	.297**	.048	-																				
Q5	-.074	.170*	.136	.117	.260**	.372**	.199*	.278**	.018	-																			
Q6	-.077	.212**	.316**	.277**	.377**	.548**	.481**	.327**	.172*	.554**	-																		
Q7	-.154	.156	.175*	.087	.163	.450**	.312**	.225**	.197*	.272**	.475**	-																	
Q8	-.142	.292**	.148	.037	.269**	.433**	.249**	.226**	.234**	.160	.382**	.615**	-																
Q9	-.057	.113	.245**	.088	.253**	.352**	.265**	.085	.153	.224**	.303**	.370**	.395**	-															

Q10	-.104	.191*	.142	.099	.126	.380**	.469**	.032	.410**	.107	.273**	.385**	.361**	.356**	-														
Q11	-.131	.117	.122	.079	.155	.197*	.144	.274**	-.113	.188*	.138	-.033	.108	.108	.044	-													
Q12	-.111	.238**	.112	.061	.215*	.449**	.272**	.211**	.112	.245**	.381**	.590**	.491**	.431**	.335**	.202*	-												
Q13	-.074	.179*	.160	.227**	.235**	.306**	.214**	.508**	.097	.276**	.258**	.226**	.258**	.046	.019	.421**	.262**	-											
Q14	-.054	.249**	.156	.261**	.288**	.280**	.227**	.406**	-.025	.285**	.228**	.278**	.287**	.134	.117	.371**	.246**	.596**	-										
Q15	-.133	.225**	.121	.013	.097	.236**	.335**	-.089	.310**	.086	.294**	.265**	.275**	.288**	.459**	.021	.334**	-.015	-.159	-									
Q16	-.110	.170*	.089	.154	.234**	.236**	.012	.301**	-.141	.498**	.234**	.186*	.200*	.118	.006	.370**	.125	.438**	.525**	-.179*	-								
Q17	-.142	.212**	.210*	.112	.211*	.322**	.280**	.153	.281**	.044	.231**	.377**	.310**	.420**	.463**	.078	.385**	.192*	.085	.435**	-.032	-							
Q18	-.055	.309**	.321**	.228**	.382**	.498**	.315**	.297**	.183*	.247**	.419**	.494**	.544**	.330**	.317**	.221**	.482**	.263**	.296**	.292**	.207*	.413**	-						
Q19	-.018	.153	.161*	.173*	.324**	.267**	.137	.397**	-.049	.470**	.266**	.210**	.263**	.116	-.032	.357**	.227**	.554**	.608**	-.159	.657**	-.001	.297**	-					
Q20	-.062	.200*	.253**	.232**	.295**	.421**	.487**	.159	.385**	.183*	.372**	.370**	.341**	.252**	.464**	.097	.367**	.200*	.076	.456**	.069	.377**	.483**	.076	-				
Q21	-.071	.317**	.447**	.187*	.452**	.478**	.340**	.382**	.132	.348**	.392**	.344**	.392**	.369**	.214**	.221**	.255**	.385**	.374**	.240**	.255**	.345**	.411**	.287**	.279**	-			
Q22	-.072	.414**	.309**	.222**	.418**	.553**	.423**	.248**	.221**	.361**	.452**	.372**	.409**	.291**	.410**	.190*	.542**	.323**	.283**	.396**	.083	.423**	.573**	.272**	.435**	.424**	-		
Q23	-.159	.275**	.242**	.136	.208*	.406**	.365**	.145	.288**	.205*	.269**	.432**	.338**	.251**	.415**	.098	.498**	.230**	.183*	.399**	.058	.417**	.558**	.203*	.476**	.336**	.689**	-	
Q24	-.059	.185*	.230**	.116	.214*	.408**	.464**	.218**	.306**	.112	.336**	.356**	.391**	.339**	.334**	.095	.447**	.247**	.203*	.335**	.045	.314**	.445**	.120	.408**	.343**	.464**	.487**	-

Parental Attitudes towards the Irish Language

For analytical purposes, this questionnaire was split into three segments: (i) *cultural,* which pertains to a sense of "Irishness"; (ii) *tangible*, which pertains to current affairs and practicalities of usage of Irish today; and (iii) *personal/social*, which pertains to emotionality and effects of Irish on people. As expected, immersion parents had a more positive attitude towards Irish than did their peers.

Cultural statements are Statements 1 to 5 and 11, tangible statements are Statements 6 to 8, 10, 12 to 14, and 19 and 20, and personal/social statements are Statements 9, 15 to 18, and 21 to 23 on the questionnaire presented in Appendix 1.

Cultural. Descriptive statistics of parental attitudes towards Irish from a cultural perspective seemed to indicate that immersion parents had a more positive attitude towards Irish than did English medium parents (see Table 69). This was supported by correlational analyses (see Table 70) that revealed Type of Schooling correlated positively with all measures of attitudes towards Irish except the "Irish will die out if the *Gaeltacht* dies out" statement. These results suggest that immersion parents place a higher cultural significance on the Irish language than do their English medium peers.

Furthermore, analyses revealed no correlations between Children's Age and parents' attitudes towards the Irish language. And results also showed that the mean usage score of mothers, fathers, and children positively correlated with several cultural measures and that all these cultural measures positively correlated with each other—except for the "Most people see all things associated with Irish as too old fashioned" statement. (The majority of immersion and English medium parents tended to disagree with this statement.) This suggests that parents hold similar patterns of attitudes towards a sense of “Irishness” within various socio-linguistic domains as measured here.

Table 69. Parents' Attitudes towards the Irish language from a cultural perspective. Questions were adapted from Ó Riagáin (1997). Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5.

Parental Attitudes towards Irish—Cultural

	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
No real Irish person can be against the revival of Irish.	79	17.7	21.5	34.2	20.3	6.30	62	4.80	25.8	29.0	21.0	19.4
Ireland would not really be Ireland without Irish speaking people.	78	30.8	39.7	16.7	11.5	1.30	64	10.9	43.8	10.9	17.2	17.2
Ireland would lose its identity as a separate culture without the Irish language.	79	46.8	36.0	7.60	6.30	1.30	64	18.8	40.6	17.2	14.1	9.40
One must know Irish to really understand Irish culture.	79	13.9	22.8	30.4	29.1	3.80	64	7.80	9.40	35.9	35.9	10.9
Irish will die out if the Gaeltacht dies out.	79	12.7	36.7	17.7	30.4	2.50	64	14.3	39.7	20.6	20.6	4.80
Most people see all things associated with Irish as too old fashioned.	79	1.30	7.60	22.8	49.4	19.0	64	1.60	14.1	32.8	42.2	9.40

Table 70. Parents' Attitudes towards the Irish language from a cultural perspective. Immersion = 1, English medium = 2. Mean usage ranges from Always =1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

Correlations of Parental Attitudes towards Irish—Cultural

Measures	1	2	3	4	5	6	7	8	9	10	11
1.Children's Age	-										
2.Type of schooling	.054	-									
3.Mother's Mean Usage Score	.022	.387**	-								
4.Father's Mean Usage Score	.087	.350**	.605**	-							
5.Child's Mean Usage Score	-.014	.661**	.683**	.548**	-						
6.No real Irish person can be against the revival of Irish.	-.087	.184*	.160	.208*	.160	-					
7.Ireland would not really be Ireland without Irish speaking people.	-.066	.280**	.236**	.221*	.336**	.504**	-				
8.Ireland would lose its identity as a separate culture without the Irish language.	-.104	.348**	.379**	.295**	.384**	.467**	.693**	-			
9.One must know Irish to really understand Irish culture.	-.102	.208*	.319**	.231**	.276**	.532**	.418**	.467**	-		
10.Irish will die out if the Gaeltacht dies out.	-.078	-.056	.062	.014	-.075	.196*	.173*	.308**	.353**	-	
11.Most people see all things associated with Irish as too old fashioned.	.068	-.191*	-.009	-.107	-.036	.012	-.012	-.048	-.106	.052	-

Tangible. Descriptive statistics of parental attitudes towards Irish from a tangible perspective seemed to indicate that immersion parents had a more positive attitude towards Irish than did English medium parents (see Table 71). This was supported by correlational analyses (see Table 72) that revealed Type of Schooling correlated positively with the majority of measures of attitudes towards Irish. These results suggest that immersion parents have more optimistic and supportive attitudes towards the Irish language than do their English medium peers.

Furthermore, analyses revealed no correlations between Children's Age and parental attitudes towards the Irish language. And results also showed that the mean usage score of mothers, fathers, and children positively correlated with several tangible measures and that the majority of these tangible measures positively correlated with each other. This suggests that parents hold similar patterns of attitudes towards the current affairs and practicalities of usage of Irish today within various socio-linguistic domains as measured here.

Table 71. Parents' Attitudes towards the Irish language from a tangible perspective. Questions were adapted from Ó Riagáin (1997). Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5.

Parental Attitudes towards Irish—Tangible

	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
The Gaeltacht is dying out.	79	3.80	21.5	29.1	34.2	11.4	64	7.80	25.0	34.4	29.7	3.10
Irish is a dead language.	79	3.80	5.10	6.30	38.0	46.8	64	3.10	6.30	32.8	40.6	17.2
Irish can be revived as a common means of communication.	78	10.3	46.2	28.2	11.5	3.80	63	4.80	33.3	39.7	20.6	1.60
Attempts to revive Irish are bound to fail no matter what the Government does.	79	1.30	3.80	15.2	51.9	27.8	64	1.60	6.30	39.1	35.9	17.2
Irish will disappear in a generation or two if nothing is done about it.	79	12.8	30.8	10.3	33.3	12.8	64	10.9	51.6	17.2	17.2	3.10
The Irish language cannot be made suitable for business.	78	1.30	17.9	29.5	35.9	15.4	64	1.60	10.9	43.8	37.5	6.30
Far less money should be spent reviving Irish.	77	1.30	3.90	19.5	46.8	28.6	63	1.60	6.30	39.7	41.3	11.1
The Government should support Irish language organisations.	79	34.6	52.6	9.00	2.60	1.30	62	16.1	53.2	25.8	3.20	1.60
Voluntary organisation should support Irish, not the Government.	74	2.70	10.8	40.5	31.1	14.9	61	3.30	14.8	49.2	29.5	3.30

Table 72. Parents' Attitudes towards the Irish language from a tangible perspective. Immersion = 1, English medium = 2. Mean usage ranges from Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

Correlations of Parental Attitudes towards Irish—Tangible

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age at test in months	-													
2.Type of schooling	.054	-												
3.Mother's Mean Usage Score	.022	.387**	-											
4.Father's Mean Usage Score	.087	.350**	.605**	-										
5.Child's Mean Usage Score	-.014	.661**	.683**	.548**	-									
6.The Gaeltacht is dying out.	.013	-.149	-.077	-.146	-.134	-								
7.Irish is a dead language.	.026	-.338**	-.297**	-.224*	-.346**	.420**	-							
8.Irish can be revived as a common means of communication.	-.083	.174*	.259**	.200*	.322**	-.083	-.344**	-						
9.Attempts to revive Irish are bound to fail no matter what the Government does.	.057	-.247**	-.123	-.157	-.220*	.348**	.605**	-.283**	-					
10.Irish will disappear in a generation or two if nothing is done about it.	.003	-.205*	-.014	-.178*	-.098	.344**	.183*	.133	.177*	-				
11.The Irish language cannot be made suitable for business.	.061	-.059	-.304**	-.142	-.308**	.123	.287**	-.383**	.342**	.023	-			
12.Far less money should be spent reviving Irish.	.129	-.266**	-.310**	-.232**	-.315**	.255**	.495**	-.346**	.460**	-.010	.389**	-		
13.The Government should support Irish language organisations.	-.134	.257**	.317**	.225*	.324**	-.138	-.435**	.290**	-.366**	.123	-.264**	-.570**	-	
14.Voluntary organisation should support Irish, not the Government.	.028	-.157	-.210*	-.164	-.132	.230**	.276**	-.188*	.219*	.156	.047	.315**	-.158	-

Personal/Social. Descriptive statistics of parental attitudes towards Irish from a personal/social perspective seemed to indicate that immersion parents had a more positive attitude towards Irish than did English medium parents (see Table 73). This was supported by correlational analyses (see Table 74) that revealed Type of Schooling correlated positively with the majority of measures of attitudes towards Irish. These results suggest that immersion parents rate the Irish language higher on a personal and social level than do their peers.

Furthermore, analyses revealed no correlations between Children's Age and parents' attitudes towards the Irish language except on the "Irish speakers have a right to expect civil servants to be able to speak to Irish to them" measure which showed a negative correlation. Results also showed that the mean usage score of mothers, fathers, and children positively correlated with several personal/social measures and that the majority of these personal/social measures positively correlated with each other. This suggests that parents hold similar patterns of attitudes towards effects of Irish on people within various socio-linguistic domains as measured here.

Table 73. Parents' Attitudes towards Irish from a personal/social perspective. Questions were adapted from Ó Riagáin (1997), except the last question. Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5.

Parental Attitudes of Irish—Personal/Social

	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
Most people do not care about Irish.	79	2.50	24.1	29.1	29.1	15.2	62	4.80	50.0	25.8	16.1	3.20
What the Government does about the Irish language is not important to me.	79	0	2.80	10.1	54.4	32.9	63	0	7.90	34.9	39.7	17.5
Public leaders should set a good example by using Irish in the Dáil and public life.	79	21.5	38.0	24.1	15.2	1.30	62	12.9	37.1	37.1	9.70	3.20
Irish speakers have a right to expect civil servants to be able to speak to Irish to them.	79	16.5	30.4	21.5	25.3	6.30	63	9.50	15.9	30.2	34.9	9.50
It is better for people to speak Irish badly than not at all.	79	25.3	54.4	12.7	5.10	2.50	62	12.9	48.4	27.4	11.3	0
I would be very upset if Irish were not spoken on the national radio and television.	79	21.5	41.8	21.5	12.7	2.50	63	7.90	20.6	39.7	27.0	4.80
Most children resent having to learn Irish in school.	79	3.80	22.8	24.1	29.1	20.3	63	3.20	36.5	19.0	34.9	6.30
Teaching Irish in schools is enough to keep the language alive.	79	1.30	10.4	13.0	50.6	24.7	62	1.60	9.70	24.2	58.1	6.50

Table 74. Parents' Attitudes towards the Irish language from a personal/social perspective. Immersion = 1, English medium = 2. Mean usage ranges from Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

Correlations of Parental Attitudes of Irish—Personal/Social

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Age at test in months	-												
2.Type of schooling	.054	-											
3.Mother's Mean Usage Score	.022	.387**	-										
4.Father's Mean Usage Score	.087	.350**	.605**	-									
5.Child's Mean Usage Score	-.014	.661**	.683**	.548**	-								
6.Most people do not care about Irish.	.082	-.318**	-.259**	-.267**	-.279**	-							
7.What the Government does about the Irish language is not important to me.	.004	-.312**	-.316**	-.227*	-.351**	.221**	-						
8.Public leaders should set a good example by using Irish in the Dáil and public life.	-.156	.089	.275**	.131	.284**	-.018	-.442**	-					
9.Irish speakers have a right to expect civil servants to be able to speak to Irish to them.	-.199*	.190*	.376**	.207*	.334**	.084	-.287**	.602**	-				
10.It is better for people to speak Irish badly than not at all.	.021	.213*	.355**	.226*	.260**	.035	-.338**	.484**	.498**	-			
11.I would be very upset if Irish were not spoken on the national radio and television.	-.164	.326**	.445**	.406**	.470**	-.176*	-.457**	.443**	.502**	.443**	-		
12.Most children resent having to learn Irish in school.	-.090	-.153	-.230**	-.275**	-.254**	.372**	.206*	-.112	-.001	-.124	-.099	-	
13.Teaching Irish in schools is enough to keep the language alive.	-.042	-.194*	-.238**	-.203*	-.329**	.020	.021	-.172*	-.093	-.166	-.274**	.017	-

Parental Attitudes towards Irish Medium and English Medium Education

To aid analyses, this questionnaire was split into two segments: (i) Parental attitudes towards Irish and school types in Ireland, and (ii) personal motivational factors that affected school choice for their children.

Analyses of parents' attitudes towards Irish immersion and English medium education. Descriptive statistics of parental attitudes towards Irish immersion education seemed to indicate that immersion parents had a more positive attitude towards Irish immersion education than did English medium parents (see Table 75). This was supported by correlational analyses (see Table 76) that revealed Type of Schooling correlated positively with the majority of measures of attitudes towards Irish immersion education. These results suggest that immersion parents have more optimistic and supportive attitudes towards the Irish immersion education than do their peers.

Furthermore, analyses revealed no correlations between Children's Age and parental attitudes towards immersion and English medium education on all measures except for the re-coded "Those attending Irish medium education learn a different curriculum from those in mainstream education" statement which revealed that parents of younger children agreed more with this statement than parents of older children.

Results also showed that the mean usage score of mothers, fathers, and children positively correlated with the majority of the measures and that the majority of these measures positively correlated with each other. This suggests that parents hold similar patterns of attitudes towards Irish and school types in Ireland.

Table 75. Parents' attitudes towards immersion and English medium education. Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5.

Parental Attitudes Towards Immersion and English Medium Education

	Immersion						English Medium					
Measure	N	1	2	3	4	5	N	1	2	3	4	5
Irish medium education is keeping the Irish language alive.	79	34.2	51.9	11.4	2.50	0	63	4.80	54.0	31.7	9.50	0
Speaking Irish at school and English at home will ultimately benefit a child's education.	78	23.1	57.7	17.9	1.30	0	65	3.10	38.5	40.0	15.4	3.10
Irish medium education is open to all—working, middle, and upper class.	79	45.6	49.4	2.50	2.50	0	64	7.80	54.7	23.4	10.9	3.10
Mainstream education is keeping the Irish language alive.	77	9.10	39.0	20.8	27.3	3.90	65	0	43.1	44.6	10.8	1.50
Mainstream education is open to all—working, middle, and upper class.	77	48.1	48.1	2.30	1.30	0	64	9.40	67.2	18.8	3.10	1.60
Speaking Irish at school and English at home will ultimately damage a child's education.	78	0	1.30	6.40	29.5	62.8	65	1.50	1.50	4.60	52.3	40.0
Those attending Irish medium education learn a different curriculum from those in mainstream education.	78	1.30	3.80	20.5	44.9	29.5	63	1.60	4.80	38.1	30.2	25.4
Irish medium education does not negatively affect English language skills.	77	36.4	36.4	13.0	11.7	2.60	65	15.4	41.5	30.8	7.70	4.60

Table 76. Parents' attitudes towards immersion and English medium education. Statements 6 and 7 were re-coded for the correlational analyses as these were negative/incorrect statements towards bilingualism and immersion education whilst the remaining 6 statements were positive. Immersion =1, English medium = 2. Mean usage ranges from Always =1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

Correlations of Parental Attitudes Towards Immersion and English Medium Education

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Age at test in months	-												
2.Type of schooling	.054	-											
3.Mother's Mean Usage Score	.022	.387**	-										
4.Father's Mean Usage Score	.087	.350**	.605**	-									
5.Child's Mean Usage Score	-.014	.661**	.683**	.548**	-								
6.Irish medium education is keeping the Irish language alive.	-.065	.411**	.130	.161	.215*	-							
7.Speaking Irish at school and English at home will ultimately benefit a child's education.	.127	.458**	.238**	.142	.339**	.485**	-						
8.Irish medium education is open to all-working, middle, and upper class.	.089	.502**	.385**	.344**	.454**	.471**	.374**	-					
9.Mainstream education is keeping the Irish language alive.	-.055	-.022	.145	.220*	.034	.214*	.149	.040	-				
10.Mainstream education is open to all-working, middle, and upper class.	.067	.459**	.306**	.241**	.408**	.401**	.366**	.714**	.003	-			
11.Speaking Irish at school and English at home will ultimately damage a child's education.	.006	.206*	.242**	.142	.241**	.260**	.165*	.354**	.124	.397**	-		
12.Those attending Irish medium education learn a different curriculum from those in mainstream education.	-.213*	.142	.341**	.075	.188*	.122	.180*	.134	.165	.279**	.392**	-	
13.Irish medium education does not negatively affect English language skills.	-.029	.207*	.313**	.221*	.392**	.183*	.107	.277**	-.135	.322**	.360**	.326**	-

Analyses of parental attitudes and motivations affecting school choice. Descriptive statistics of parental attitudes and motivations affecting school choice seemed to indicate that when compared to English medium parents, immersion parents thought more highly of the school's reputation and resources and its ability to provide better Irish language skills and career prospects (see Table 77). The remaining measures dealing with school availability, school location, and school experiences of parents and their other children and the experiences of other people did not seem to reveal any group difference. This was supported by correlational analyses (see Table 78) that revealed Type of Schooling correlated positively with the four measures of reputation, resources, career prospects, and the Irish language.

Furthermore, analyses revealed two positive correlations between Children's Age and parents' responses on this part of the questionnaire. Specifically, when compared to parents of older children, parents of younger children felt that their schools had a better reputation and provided children with better career prospects than did other schools in the area and that these were prominent factors they considered whilst making a choice of school for their children.

Results also showed that the mean usage score of mothers, fathers, and children correlated with a minority of measures and that a minority of these measures correlated with each other.

Table 77. Parents' answers to questions pertaining to their perceptions of schools in their area and their motivations in choosing schools for their children.

Parental Attitudes and Motivations of School Choice				
Measure	N	Yes	N	Yes
Has a better reputation than other schools in the area	45	93.3	43	72.1
Has better resources than other schools in the area	25	76.0	45	44.4
Was the only school available	11	9.10	33	6.10
Has the most convenient location	27	63.0	48	60.4
Provides better career opportunities for students	31	80.6	37	24.3
Provides better Irish language skills	70	98.6	32	6.30
Have your experiences in school influenced your choice of school for your child?	76	57.9	61	49.2
Have your other children's experiences in school influenced your choice of school for your child?	70	48.6	61	41.0
Have other people's experiences in school influenced your choice of school for your child?	73	32.9	60	35.0

Table 78. Parents' attitudes and motivations in choosing a school for his/her children. Immersion =1, English medium = 2. Mean usage ranges from Always =1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5. Statements responses were Strongly Agree = 1, Agree = 2, Neither Agree or Disagree = 3, Disagree = 4, Strongly Disagree = 5. **<.01, *<.05 level.

Correlations of Parental Attitudes and Motivations of School Choice

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age at test in months	-													
2.Type of schooling	.054	-												
3.Mother's Mean Usage Score	.022	.387**	-											
4.Father's Mean Usage Score	.087	.350**	.605**	-										
5.Child's Mean Usage Score	-.014	.661**	.683**	.548**	-									
6.Has a better reputation than other schools in the area	.212*	.300**	.144	-.013	.204	-								
7.Has better resources than other schools in the area	.233	.304*	.211	.018	.207	.531**	-							
8.Was the only school available	-.064	.052	.042	-.188	.115	.126	.262	-						
9.Has the most convenient location	-.027	.025	.089	-.129	.034	.175	.227	.318*	-					
10.Provides better career opportunities for students	.262*	.561**	.311*	.137	.497**	.326*	.687**	.299	.111	-				
11.Provides better Irish language skills	.091	.931**	.414**	.279**	.616**	.424**	.460**	.233	.141	.745**	-			
12.Have your experiences in school influenced your choice of school for your child?	-.019	.087	.108	-.120	.132	.180	.177	.277	-.075	.125	.178	-		
13.Have your other children's experiences in school influenced your choice of school for your child?	-.109	.076	.104	.066	.144	-.020	.017	.025	-.101	.252	.136	.360**	-	
14.Have other people's experiences in school influenced your choice of school for your child?	.108	-.022	-.098	.056	-.075	.119	.061	.042	-.205	.147	-.086	.267**	.391**	-

Children's Language Use and Attitudes towards Irish and English Languages and towards Irish Medium and English Medium Education

To aid analyses, this questionnaire was split into two segments: (i) children's language use in various socio-linguistic domains, which were analysed by correlational analyses, and (ii) children's attitudes towards the English and Irish languages in schools and communities, which were analysed by Chi square analyses.

Analyses of children's language use. Descriptive statistics of children's language use within their family, school, and their community seemed to indicate that immersion children use Irish more in the home and schools than do their peers (see Table 79). This was supported by correlational analyses (see Table 80) that revealed Type of Schooling correlated positively with language use measures with immediate family members and in school with teachers and school friends—within school and outside school. Type of Schooling did not correlate with Irish Language Use with children's extended family members, their neighbours, or their non-school friends.

Furthermore, analyses revealed three correlations between Children's Age and children's responses on this part of the questionnaire. Specifically, when compared to younger children, older children were more likely to use Irish with their school friends, non-school friends, and their siblings. Results also revealed that there were positive correlations amongst the vast majority of measures of Irish language use which suggests that children employ similar patterns of language usage in various socio-linguistic domains as measured here.

Table 79. Children's self-reported use of the English and Irish languages within their family and community. OE = Only English; MESI = Mostly English Some Irish; EIE = English and Irish Equally; MISE = Mostly Irish Some English; OI = Only Irish.

Children's Use of the English and Irish Languages												
	Immersion						English Medium					
Measure	N	OE	MESI	EIE	MISE	OI	N	OE	MESI	EIE	MISE	OI
Mother	88	51.1	40.9	5.70	2.30	0	78	70.5	28.2	1.30	0	0
Father	87	67.8	26.4	4.60	1.10	0	77	88.3	10.4	1.30	0	0
Teacher	88	0	1.10	2.30	23.9	72.7	78	2.60	85.9	11.5	0	0
Siblings	81	51.9	43.2	4.90	0	0	75	82.7	14.7	2.67	0	0
Extended Family	88	85.2	13.6	1.10	0	0	78	93.6	5.10	1.30	0	0
School friends in class	87	0	4.60	11.5	11.5	72.4	78	73.1	24.4	2.60	0	0
School friends in playground	88	8.00	11.5	8.00	21.8	50.6	78	87.2	11.5	1.30	0	0
School friends outside of school	87	80.5	17.2	1.1	0	1.10	78	93.6	5.10	1.30	0	0
Other friends outside of school	82	96.5	3.50	0	0	0	78	92.3	7.70	0	0	0
Neighbours	88	95.1	4.90	0	0	0	77	98.7	1.30	0	0	0

Table 80. Children's self-reported use of the English and Irish languages within their family and community. Immersion =1, English medium = 2. Only English = 1; Mostly English Some Irish = 2; English and Irish Equally = 3; Mostly Irish Some English = 4; Only Irish = 5. **<.01, *<.05 level.

Correlations of Children's Use of the English and Irish Languages

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1.Age at test in months	-											
2.Type of schooling	.054	-										
3.Language Use with Mother	.146	-.212**	-									
4.Language Use with Father	.050	-.227**	.350**	-								
5.Language Use with Teacher	-.019	-.912**	.190*	.182*	-							
6.Language Use with Siblings	.263**	-.300**	.559**	.254**	.292**	-						
7.Language Use with Extended Family	.082	-.132	.252**	.270**	.072	.278**	-					
8.Language Use with School Friends in Class	.018	-.897**	.201**	.211**	.909**	.306**	.160*	-				
9.Language Use with School Friends in Playground	.055	-.820**	.205**	.207**	.825**	.313**	.109	.849**	-			
10.Language Use with School Friends Outside School	.163*	-.191*	.379**	.309**	.176*	.427**	.334**	.213**	.291**	-		
11.Language Use with Other Friends	.164*	.091	.196*	.188*	-.086	.237**	.178*	-.098	-.061	.231**	-	
12.Language Use with Neighbours	.061	-.101	.168*	.087	.164*	.203*	.188*	.141	.165*	.375**	.127	-

Analyses of children's attitudes towards English and Irish languages. Table 81 displays the descriptive statistics of children's attitudes towards their use of the English and Irish languages and their use within their school and community and shows results of several chi square analyses. When compared to their English medium peers, it seemed that immersion children have a more positive attitude towards their use of Irish, a similar attitude towards their use of English, and a similar attitude towards the importance of and use of Irish throughout the country. Also, it seemed that both groups of children shared a similar perspective upon a bilingual education and a bilingual society—for Irish people and non-Irish people alike.

The chi square analyses seemed to support the majority of these observations because for the main there were no differences between groups. There were two violations of expected cell counts, found on the children's attitudes towards their speaking and reading/writing in English measures. However, analyses show the vast majority of children (85—95%) reported that they enjoyed using English in these domains. This suggests that there were no group differences.

There was one group difference found however, in relation to children's attitudes towards their use of Irish. However, it seemed that whereas there was a group difference in children's attitudes towards their speaking Irish, there were no differences in their attitudes towards their reading/writing or learning in Irish.

Overall, it seemed that children's attitudes towards their use of the English and Irish languages and their use within their school and community are similar across school groups.

Table 81. Children's self-reported attitudes towards their use of the English and Irish languages and their use within their school and community. Other = Don't Know and Undecided. *<.05 level. †<66.7% of cells had expected count less than five.

Children's Attitudes towards the English and Irish Languages

	Immersion					English Medium					
Measures	N	Yes	No	Other		N	Yes	No	Other		χ^2
Do you like to speak in Irish?	89	73.0	18.0	9.00		78	51.3	29.5	19.2		8.65*
Do you like to read/write in Irish?	89	48.3	31.5	20.2		78	32.1	39.7	28.2		4.61
Do you like to learn in Irish?	89	69.7	19.1	11.2		78	59.0	29.5	11.5		2.61
Do you like to speak in English?	89	92.1	3.40	4.50		78	94.9	2.60	2.50		0.56†
Do you like to read/write in English?	89	92.1	4.5	3.40		78	84.6	7.70	7.70		2.42†
Do you like to learn in English?	89	76.4	14.6	9.00		78	74.4	12.8	12.8		0.69
Do you think it is important to speak Irish?	89	81.8	11.4	6.80		78	72.7	19.5	7.80		2.28
Do you think many people in Ireland speak Irish?	89	38.6	48.9	12.5		78	35.9	51.3	12.8		0.14
	N	English	Irish	Both	Other	N	English	Irish	Both	Other	χ^2
What language would you prefer to learn through?	89	18.0	11.2	62.9	7.90	78	35.9	11.5	44.9	6.40	7.56
What language do you think is better to learn through?	88	20.5	18.2	51.1	10.3	78	33.8	20.8	37.7	7.80	4.80
What language do you think everyone in Ireland should speak?	88	11.4	30.7	50.0	7.90	78	14.1	21.8	50.0	14.1	2.92
What language should immigrants to Ireland learn?	87	36.8	8.00	35.6	19.5	78	28.2	5.10	51.3	15.4	4.20

Children's Sense of Importance of the Irish Language in Comparison to their Performance on EF Tasks

There were several questions pertaining to children's attitudes towards the languages used in Ireland (see Table 81 above)—many of which dealt with the Irish language and bilingualism in Ireland. As such, due consideration was given to computing a composite attitudinal score for all the children as per their responses on these questions relating to Irish and bilingualism. However, it was deemed more appropriate, statistically speaking, to use children's responses to only one of the attitudinal questions instead. There were several reasons for this.

For instance, obtaining a composite score of all the questions would have been flawed because all the questions were not investigating the same issue—some questions included elements of bilingualism others solely investigated use of one specific language. Also, obtaining a composite score of a sub-section of the questions would have decreased the N size (thus robustness of the findings) because many children were undecided on several of the issues raised by the questionnaire.

Therefore, Question 13, "Do you think it is important to be able to speak Irish', of the Children's Attitudes towards Language Use Questionnaire was used as a sole measurement of children's attitude towards the Irish language when performing the following correlational analyses. This question was chosen because (i) it was a direct question that dealt with children's attitudes to the importance of the Irish language, (ii) it permitted children to consider the language more generally as opposed to their usage of it and the challenges that occur with using an L2, and (iii) it had the highest response rate thus increasing the robustness of the findings.

Only children who answered “Yes” or “No” were included in analyses: children who answered “Don’t know” were excluded as they were unsure of their own attitude towards the importance to be able to speak Irish.

The attitude measurement was correlated with several EF measurements to investigate whether or not children’s attitudes towards the Irish language related to their performance on the EF tasks. In an effort to reduce the amount of performed analyses, only a selection of measurements of children’s performance on the EF tasks was used. These measurements include: three accuracy scores and two Mean Reaction Time (MRT) scores on the SART, accuracy and MRT scores on the Flanker tasks, and accuracy scores on the English- and Irish-Stroop tasks. Whereas better performance on the accuracy measurements of the SART was indicated by high scores, better performance on the remaining measurements was indicated by low scores.

Regarding the MRT measurements of the SART, obviously, better/faster performance was indicated by low scores. However, the remaining measurements are “Difference” scores which give a measurement of the participants’ difficulty of overcoming the challenges presented in the incongruent trials as opposed to the challenges presented in the congruent trials. (Accuracy and MRT scores on the Flanker tasks are Incongruent trials – Congruent trials = Difference Score, and accuracy scores on the Stroop tasks are $\frac{\text{Word}-\text{Match}+\text{Colour}-\text{Match}}{2} - \text{Stroop Trial} = \text{Stroop Effect}$). As such, better performance on these tasks was indicated by low scores.

Therefore, it is important to note that a negative correlation with one of the accuracy scores on the SART and any other measure indicates that children who are more accurate on the SART are more likely to score well on the other measure also (i.e., high accuracy scores and low “Difference” scores). But a positive correlation with one of the accuracy scores on the SART and any other measure indicates that children are more likely to score better on one task than on the other (i.e., high accuracy scores and high "Difference" score or low accuracy scores and low "Difference" score). However, correlations on the aforementioned "other measures" can be interpreted in the standard way, i.e., a positive correlation indicates that children who score well on one measure are more likely to score well on the other measure and a negative correlation indicates that children who score well on one measure are less likely to score well on the other measure.

Also, for this set of analyses, children were separated into their appropriate age group: 8YO and 12YO, as per EF analyses in previous chapters.

Analyses of the effects of 8YO children's attitudes upon EF performance. The vast majority of children from both school groups had a positive attitude towards Irish: 86.5% of immersion children had a positive attitude towards Irish and 73.7% of English medium children had a positive attitude towards Irish, as measured by Question 13.

Descriptive statistics of children's EF performance seemed to indicate that overall there were no differences between groups based on school or attitudes towards Irish (see Table 82). This was supported by correlational analyses (see Table 83) that revealed Type of Schooling measure and the importance of being able to speak Irish measure did not correlate with any of the EF measures.

Table 82. The relationship of children's self-reported sense of importance of the Irish language and their performance on EF tasks.

Children's Sense of Importance of the Irish Language in Comparison to their Performance on EF Tasks.

	Immersion—Yes			Immersion—No			English Medium—Yes			English Medium—No		
Measures	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Flanker Task-Original Difference Score	32	0.56	2.06	5	0.20	1.30	28	0.79	1.57	10	0.70	2.58
Flanker Task-Original Difference MRT in milliseconds	32	127	358	5	169	112	28	123	303	10	161	258
Flanker Task-Modified Difference Score	32	3.34	2.55	5	3.40	3.65	28	2.32	2.44	10	3.20	2.74
Flanker Task-Modified Difference MRT in milliseconds	32	1105	812	5	1493	1427	28	1345	811	10	1450	1044
SART Correct Score	32	213	7.59	5	213	3.65	28	209	9.19	10	213	5.57
SART Correct Press Score	32	196	5.32	5	198	2.05	28	195	7.65	10	195	6.48
SART Correct Pass Score	32	16.8	4.16	5	15.6	3.21	28	14.5	5.15	10	18.1	2.60
SART MRT in milliseconds (with number 3)	32	704	107	5	705	114	28	669	166	10	716	114
SART MRT in milliseconds (without number 3)	32	604	101	5	614	118	28	585	154	10	616	104
English Stroop Effect Score	31	20.4	6.51	5	25.9	12.1	28	23.9	8.56	10	24.8	9.84
Irish Stroop Effect Score	21	19.9	6.37	5	25.8	4.04	18	24.1	8.60	6	19.2	6.44

Table 83. The relationship of children's self-reported sense of importance of the Irish language and their performance on EF tasks. Immersion =1, English medium = 2. **<.01, *<.05 level.

Correlations of Children's Sense of Importance of the Irish Language in Comparison to their Performance on EF Tasks.

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age at test in months	-													
2.Type of schooling	.290**	-												
3.Is It Important to Speak Irish	-.029	.160	-											
4.Flanker Task-Original Difference Score	.186	.074	-.028	-										
5.Flanker Task-Original Difference MRT	.011	.035	.050	-.033	-									
6.Flanker Task-Modified Difference Score	-.088	-.054	.062	-.140	.000	-								
7.Flanker Task-Modified Difference MRT	-.071	.119	.113	-.068	.186	-.100	-							
8.SART Correct	.020	-.035	.087	-.052	-.040	-.101	.016	-						
9.SART Correct Press	.077	.021	.005	.050	-.056	-.121	-.108	.898**	-					
10.SART Correct Pass	-.103	-.137	.138	-.216*	.001	.021	.249*	.404**	-.039	-				
11.SART MRT +3	-.234*	-.132	.075	-.167	.093	.048	.244*	-.151	-.488**	.675**	-			
12.SART MRT -3	-.224*	-.105	.066	-.126	.102	.051	.210	-.282**	-.564**	.536**	.981**	-		
13.English Stroop Effect Score	.141	.140	.151	.101	-.059	.033	.065	-.372**	-.264*	-.287**	-.141	-.068	-	
14.Irish Stroop Effect Score	.103	.123	.019	.217	.030	.091	.136	-.136	.020	-.287*	-.188	-.138	.471**	-

Analyses of the effects of 12YO children's attitudes upon EF performance. The vast majority of children from both school groups had a positive attitude towards Irish: 88.9% of immersion children had a positive attitude towards Irish and 84.8% of English medium children had a positive attitude towards Irish, as measured by Question 13.

Descriptive statistics of children's EF performance seemed to indicate that overall there were no differences between groups based on school or attitudes towards Irish (see Table 84). This was supported by correlational analyses (see Table 85) that revealed the importance of being able to speak Irish measure did not correlate with any of the EF measures and that the Type of Schooling measure correlated with only one EF measure—Flanker Task-Modified Difference MRT which suggests that immersion children responded faster on accurate scores than did their English medium peers.

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Table 84. The relationship of children's self-reported sense of importance of the Irish language and their performance on EF tasks.

Children's Sense of Importance of the Irish Language in Comparison to their Performance on EF Tasks.

	Immersion—Yes			Immersion—No			English Medium—Yes			English Medium—No		
Measures	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Flanker Task-Original Difference Score	40	0.58	1.01	5	0.40	1.52	28	0.32	1.02	5	0.0	0.00
Flanker Task-Original Difference MRT in milliseconds	40	93.7	103	5	34.4	165	28	68.3	76.2	5	80.0	112
Flanker Task-Modified Difference Score	40	2.70	2.34	5	3.60	3.78	28	2.57	1.91	5	2.40	1.82
Flanker Task-Modified Difference MRT in milliseconds	40	915	393	5	805	151	28	784	280	5	699	285
SART Correct Score	40	217	5.42	5	219	4.49	28	218	4.88	5	217	2.55
SART Correct Press Score	40	199	2.21	5	200	0.45	28	199	1.57	5	199	1.79
SART Correct Pass Score	40	18.1	4.14	5	19.4	4.34	28	18.4	4.35	5	17.8	1.92
SART MRT in milliseconds (with number 3)	40	570	84.4	5	596	34.4	28	546	119	5	537	65.7
SART MRT in milliseconds (without number 3)	40	447	76.0	5	461	25.3	28	420	107	5	416	71.6
English Stroop Effect Score	40	25.4	9.19	5	28.3	4.64	28	25.9	8.40	5	22.7	10.7
Irish Stroop Effect Score	18	28.2	10.0	2	33.8	2.47	16	25.3	5.89	3	22.5	6.50

Table 85. The relationship of children's self-reported sense of importance of the Irish language and their performance on EF tasks. Immersion =1, English medium = 2. **<.01, *<.05 level.

Correlations of Children's Sense of Importance of the Irish Language in Comparison to their Performance on EF Tasks.

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age at test in months	-													
2.Type of schooling	.250*	-												
3.Is It Important to Speak Irish	.041	.060	-											
4.Flanker Task-Original Difference Score	-.056	-.118	-.090	-										
5.Flanker Task-Original Difference MRT	.067	-.042	-.089	.185	-									
6.Flanker Task-Modified Diff' Score	-.059	-.111	.053	.220*	.051	-								
7.Flanker Same Colour Diff' MRT	-.006	-.228*	-.107	-.286**	-.181	-.169	-							
8.SART Correct	.193	.016	.048	-.115	-.056	-.425**	-.019	-						
9.SART Correct Press	.174	.087	.068	-.180	-.119	-.367**	.013	.621**	-					
10.SART Correct Pass	.165	-.007	.034	-.052	-.014	-.339**	-.037	.927**	.294**	-				
11.SART MRT +3	-.107	-.143	.022	-.015	.029	-.112	.073	.495**	-.177	.690**	-			
12.SART MRT -3	-.181	-.156	.011	.010	.036	.002	.094	.234*	-.335**	.456**	.952**	-		
13.English Stroop Effect Score	-.068	.011	-.003	-.083	.160	.134	.060	-.028	-.044	-.010	-.015	-.015	-	
14.Irish Stroop Effect Score	.010	-.254	.008	-.318*	.130	-.103	.368*	.175	.212	.119	.047	.021	.402**	-

Summary of Analyses of Questionnaires

Of the various measurements used in this part of the analyses, many found differences between groups, some of which were predictable. For instance, analyses of self-reports of Irish language use within various socio-linguistic domains indicated that immersion parents were more likely to use their Irish in various settings than were their English medium peers. Similar results were found when comparing children from immersion and English medium education as revealed by self- and parental-report. And it seemed that all participants used similar patterns of their language usage in various socio-linguistic domains as measured here.

Analyses also revealed that, when compared to their English medium peers, immersion parents had a more positive attitude towards (i) the Irish language from cultural, tangible, and personal/social perspectives, (ii) English-Irish bilingualism in Ireland, (iii) Irish immersion education, (iv) their school's reputation and availability of resources, and (v) their schools ability to deliver better Irish language skills and career prospects for their children.

Further, analyses revealed that immersion children had a more positive attitude towards their speaking Irish than did their English medium peers, but there were no group differences on measures of attitudes towards reading/writing or learning in Irish, or on measures of attitudes towards speaking, reading/writing, or learning in English. Children also shared similar attitudes towards the importance of and use of Irish throughout the country and towards a bilingual education and a bilingual society for Irish people and non-Irish people alike.

Analyses investigating the effects of children's age upon language use in the family, as reported by parents, revealed that whereas age did not affect the mother's language use, it did affect the fathers and children language use. Specifically, (i) when compared to fathers of older children, fathers of younger children were more likely to use their Irish when speaking with their friends and with their neighbours, and (ii) when compared to younger children, older children were more likely to use their Irish when reading and using computers, emailing, etc. Somewhat similar findings were found with analyses of children's self-reports of their Irish use. Specifically, older children used their Irish more frequently than did younger children. However, children reported increased vocal usage with their school and non-school friends and with their siblings, rather than with their literacy use as found in parental-report.

Analyses investigating the effects of children's age upon parental attitudes towards English-Irish bilingualism in Ireland and immersion and English medium education in Ireland, and towards the Irish language (on a cultural, tangible, and personal/social perspective) revealed that parents of younger and older children had similar attitudes. However, when compared to parents of older children, analyses revealed that parents of younger children were more likely to be motivated in their choice of school for their children by their perception that their school of choice had a better reputation and provided children with better career prospects than did other schools in their area.

Finally, analyses revealed that younger children's and older children's performance on EF tasks was not affected by their attitude towards Irish, the vast majority of whom (>73%) felt that it was important to be able to speak Irish.

Language Use and Attitudinal Questionnaires

*   *   *

The final chapter presents a discussion of the findings in relation children's performance of the various tasks and how this rests with other research in the field of bilingualism. Further consideration is given to the immersion education system and how it, overall, had no negative affects upon children's L1 skills and had some positive effects on children's cognitive skills (as measured here) and how such findings could be used in relation to informing policy makers and parents alike.

Chapter 13

Discussion

The main purpose of this research was to investigate the effects of Irish medium education (immersion) on children's first language (L1—English) academic abilities and EF abilities. This was achieved by measuring 8 Year-Old (8YO) and 12 Year-Old (12YO) children's performance on a range of tasks testing their L1 vocabulary, reading, writing, creative, and descriptive (academic) abilities and their attention and control (EF) abilities.

Testing was performed in several locations, in Northern and Republic of Ireland. Specifically, testing occurred in three school types: (i) two immersion schools in the Republic of Ireland, which teaches the curriculum through Irish but has English as a subject for approximately 3.5 hours per week; (ii) three English medium schools in the Republic of Ireland (EM(south)), which teaches the curriculum through English but has Irish as a subject for approximately 3.5 hours per week; and (iii) two English medium schools in Northern Ireland (EM(north)), which teaches the entire curriculum through English. Children's performance on several tests was compared across the school groups and within age groups.

Analyses revealed that, overall, when compared to their EM(north) and EM(south) peers, immersion children's L1 academic abilities and EF abilities were not negatively affected by their type of education as measured here.

This chapter outlines (i) the children's performances on the tasks used in this study, (ii) the relevance of these performances alongside the findings of other pertinent studies, and (iii) the implications of these findings in the minority language education setting. Whereas specific statistical reports can be found in Chapters 6 to 11, an overview of children's performances can be found in Tables 13 to 16, pp. 144 to 147.

Additionally, further consideration is given to the parents' and children's self-reports of their use of and attitudes towards Irish language use in the home, in the society, and on the curriculum (see Chapter 12 for statistical reports) and how the findings could be used in relation to informing policy makers and parents alike.

First, however, I will discuss issues relating to the sampling of participants, since these issues have important implications for the interpretation of the language and EF results.

Background Measures

The Family Background Questionnaires were designed to elicit information on as many variables as possible, including age, gender, whether or not the child had a disability, amount of second language (L2; Irish) use, home language use, parents' time per-week spent with children helping them with their homework, maternal/paternal education, and household annual financial income. Additionally, the Raven's Progressive Matrices was used to measure children's non-verbal reasoning ability. Such measures were undertaken because previous research has demonstrated that certain background variables can impact on L1 and EF performance.

Although every effort possible was made to match children as per background variables and non-verbal skills, and this was achieved overall, some differences between groups were found on factors such as SES and Raven's that could not be avoided, particularly among the 12 YOs. Nevertheless, it was reasoned that analyses of covariance (ANCOVAs) could be used in the main analyses, as appropriate, to eliminate/minimise any variance that may have occurred in test performance. However, such background differences between groups necessitates caution when interpreting results. Similarly, in instances of small N sizes, particularly with 8YO EM(north) group, any significant effects that are not below .01 should be interpreted cautiously.

Regarding the 12YO children, although there were significant age differences between the groups, i.e., EM(south) were older than their peers, these differences were considered to be negligible in terms of cognitive development. Additionally, results revealed that immersion children performed better than peers on various tasks, despite their being younger than their EM(south) peers and similar in age to their EM(north) peers, which further suggests that age difference was not a confounding factor.

We know from previous research that variations in background variables such as IQ and SES factors can affect children's performance on language and EF tasks.

For example, deficits in non-verbal intelligence has long been associated with language acquisition deficits and is considered as a probable casual factor in language impairment (e.g., Rice, Tomblin, Hoffman, & Richman, 2004). Further, non-verbal intelligence can affect various aspects of children's EF (e.g., Stroop Effect, Arffa, 2007)—although not necessarily younger children (<10YO; Duan & Shi, 2011). The lack of such controls might account for group differences in EF tasks found previously in other bilingual research (Carlson et al., 2002).

Regarding socio-economic status (SES), research shows that when compared to their High SES peers, children from Low SES are more likely to (i) perform poorer on academic tests (see Sirin, 2005, for review) and (ii) develop late-emerging reading difficulties (Kieffer, 2010).

Regarding gender, research suggests that there is a female advantage in young children on linguistic tests of reading (e.g., Baker & Jones 1993; Gallagher & Kaufman, 2005; Nowell & Hedges, 1998), and tests of verbal fluency, general verbal ability, reading, grammar, spelling, etc. and that such advantages can diminish over time (see Feingold, 1993, for review). However, other research, but with a lesser degree of confidence, proposes a male advantage in children on certain EF tasks (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Ardila & Rosselli, 1994; De Luca et al., 2003), with a potential gender crossover on tasks of attentional control and speed of processing (Anderson, 1998). Furthermore, there are suggestions that many reported female advantages are overstated and that gender accounts for a minimal amount of variance in test scores (e.g., White, 2007).

It should be clear therefore, that the above research reveals that performance of the L1 and EF tests used in this study can be affected by children's background variables, and placing controls on these variables is essential. However, due to the issues outlined above, whilst it was largely possible to match children on these variables across the various groups among the 8YOs, in particular, Raven's which suggests that children had similar non-verbal reasoning skills, many differences were seen across groups among the 12YOs.

However, by use of ANCOVAs with Raven's, Gender, SES, and HHT as covariates, any variance on test performance that could be accounted for by the effects of these background variables were controlled for in the main analyses. Nevertheless, one should remain cautious in interpretation of the data, particularly when the significant patterns reflect the same differences in background variables across the groups.

In general, however, of the four background variables used to account for the variability in performances on all of the tests, Raven's was by far the most likely to affect performance, followed by Gender, HHT, and SES, which seems to suggest that variance measured here is more contingent upon the differences between individual children themselves rather than differences in their background environments.

The ANCOVAs revealed several effects of Raven's, and to a lesser extent, SES—the directions of both sets of effects were as expected. For instance, regarding the 12YOs, when compared to their peers, effects of High Raven's contributed to better performance on the vast majority of L1 and EF measures; however, effects of High SES only contributed to better performance on one DV, verb frequency on the Creativity task. Regarding, the 8YOs, effects of High Raven's contributed to better performance on four measures only (BPVS, Creativity, and accuracy on the Flanker tasks); however, effects of Low SES only contributed to better performance on one DV, interference score on the Stroop Task-English. This suggests that as measured here, the effects of SES are negligible and that individual differences between children as per their non-verbal reasoning abilities become more instrumental to progress throughout children's schooling years. However, longitudinal studies would give a better measurement of long term effects of SES and non-verbal reasoning abilities.

Less expected however, were (i) effects of Gender that revealed a younger male advantage and an older female advantage on several L1 and EF tasks(contrary to the research outline above), and (ii) effect of HHT which pertained to younger children only who received low amount of homework help time. (The Gender findings shown here could suggest that further studies looking specifically at children's engagement with language in the Irish context are warranted. See Tables 93 to 96, Appendix 7, for more on significant effects of background variables.)

Overall, this section highlights the necessity of controlling for these background variables as they can impact on performance of the L1 and EF tests used in this study. In the present study, although ANCOVAs were employed to account for the potential effects of these variables, one must interpret statistical differences, particularly those that are above the .01 level of significance, cautiously.

Of course although age differences between groups can affect group performance and, therefore, analyses, the age differences found here were negligible in terms of cognitive development. Additionally, results revealed that immersion children performed better than peers on various tasks, despite their being younger than their EM(south) peers and similar in age to their EM(north) peers.

The next section discusses the analytical findings of children's test performance per school group that were acquired through a series of ANCOVAs that used Raven's, Gender, SES, and HHT as covariates.

Discussion

Effects of Education Type on Test Performance

One of the main questions posed in this research was to what extent Irish medium educated children compared to their English medium peers on tests of English proficiency. A secondary question related to the wider effects of learning a second language in school on children's non-linguistic abilities. It was expected that receiving immersion education would be at no cost to a child's L1 skills and they would demonstrate the same advances in EF skills that are typically seen among those who continually switch between their two languages and continuously inhibit attention to one language whilst using the other. This section discusses the implications of the findings in relation to these two questions.

L1 Measures

Whereas analyses of the majority of the language measures found no statistically significant differences between groups, none of the group differences that were found revealed a negative effect of Irish medium education. Rather, immersion children outperformed (in terms of optimal scores) either one or both of their peer groups on many of these group differences, as outlined below.

Reading. Regarding the 8YO children, there were no group differences on several aspects of reading ability as measured by the NARA. This seems to tie in with research both internationally (Genesee, 1987; Oller & Eilers, 2002; Swain & Lapkin, 1982) and nationally (Ó hAiniféin, 2008; Parsons & Lyddy, 2009a, 2009b) that suggested that any negative effects of immersion education are short-term as children "catch-up" with their

L1 educated peers after a few years' education[19].

Regarding the 12YO children, there were several group differences. For instance, immersion and EM(south) children outperformed their EM(north) peers on accuracy, comprehension, and completion of reading. However, there were no differences between the ROI groups on all of measures. These findings seem to contradict Ó hAiniféin's (2008) claim that immersion children are "way ahead'' of their English medium educated peers—this is despite the interesting trend that revealed that when compared to their EM(south) peers, immersion children were more likely to complete all seven of the readings (+23%).

Analyses also revealed that immersion and EM(north) children outperformed their EM(south) peers on speed of reading in the extended passage of reading. It is worth noting, however, that the EP Rate measurement was not standardised (unlike accuracy and comprehension scores) and the NI population, at this stage of the reading test, was very small. Additionally, speed of reading could have been disadvantageous to EM(north) children's accuracy and comprehension scores which although not significantly different were nevertheless more than 11% lower than their peers.

Overall, these findings suggest that immersion education has no negative effect on L1 reading ability when compared to their ROI peers, which has clear ramifications for language policy initiatives in Ireland as well as in other minority language situations, as discussed later.

Vocabulary. Similar to the findings for reading above, there was no group difference across the 8YO groups as measured by the BPVS. However, regarding the

[19] Although no testing was performed on children under 8YO, it is fair to assume that in their initial years of education through an L2 Immersion children may not perform as well as their peers because of their lower exposure time to their L1 in a formal education setting.

12YOs, whereas analyses revealed that EM(south) children had a significantly higher vocabulary than EM(north) children in English, analyses revealed no significant difference between immersion children and their peers. These findings correspond with many other findings in the field of bilingualism that have shown immersion education does not have a negative effect on children's L1 vocabulary (e.g., Bamford & Mizoknwa, 1991; Gray, 1986; Swain et al., 1981)—despite the interesting trend that showed 12YO EM(south) children to have scored 10 percentile points higher than their immersion peers. This trend could suggest that EM(south) children are starting to surpass their immersion peers on L1 vocabulary skills.

Writing. Analyses of the writing tasks revealed a lot more group differences than the previous two L1 measures. For instance, for both the 8YOs and the 12YOs the EM(north) children were significantly less creative than their peers as measured by the creative writing test. Although these results seem to corroborate with aforementioned studies that suggested bilingualism promotes creative thought (Lasagabaster, 2000), divergent thinking (Ianco-Worrall, 1972), and creative story telling (Doyle, Champagne, & Segalovitz, 1978), such advantages, as measured here, were not specific to immersion children but to EM(south) children also when compared to their EM(north) peers.

The reasons for an ROI advantage are unclear, so speculation remains. Perhaps the ROI children are provided more flexibility in their expression and encouragement of their creativity than the NI children by (i) the schooling system, which could be indicative of curricula differences that cannot be controlled, and/or (ii) parents, which could be indicative of SES differences between groups. Indeed, Lareau (2003) highlights that when compared to low SES parents, those from high SES are more likely to encourage, promote, and assess their child's talents, opinions, and skills, and to enable their expressing ideas, and finding the worth of their own importance in expressing them. This seems to be corroborated by the correlational analyses here that show that High SES children were more likely to perform better on many of the writing tasks than their Low SES peers. However, as SES was used as a covariate in analyses and was found to have no significant effect on the majority of writing measures, and SES did not significantly differ between 8YO EM(north) and EM(south) groups, it seems unlikely that it is the causative factor of group differences in any of the writing tasks. Another explanation could relate to a specific cohort effect among the EM(north) children. Since the EM(north) group came from one school per age group, these favourable results may relate specifically to this one group of children. Further studies are now needed to look at these effects across a wider cohort of participants.

A further explanation is that a person's knowledge of an L2, i.e., frequent engagement of two linguistic structures, promotes his/her knowledge of the arbitrariness of languages (e.g., metalinguistic understanding of language beyond its communication), increases his/her attention and control upon languages and their processes, and necessitates frequent switching from using one language to another, and the cognitive flexibility to do so, all of which thereby improves his/her creative use of languages. Additionally, just as such advantages occur with immersion children (Lasagabaster, 2000), it seems that they can also occur with children who learn an L2 for as little as 3.5 hours per week, as demonstrated here.

Regarding the descriptive writing test however, the immersion children performed significantly better than their EM(north) and EM(south) peers on word count, as per both age groups, and descriptive skills as per 8YOs. Immersion children also performed better than their EM(north) peers on the descriptive, word frequency, and noun frequency scores as per the 12YOs. Such findings corroborate somewhat with similar research that revealed that bilinguals had greater descriptive and linguistic analytical skills than their monolingual peers (Kessler & Quinn, 1987).

Overall, results herein suggest that increased exposure to an L2 delivered through immersion education can increase certain creative, descriptive, and analytical skills of one's L1.

Metalinguistic. Regarding the Lexical Fluency task, the results were unexpected and revealed that when compared to their peers, immersion children's lexical access was not hindered by their lower L1 exposure time. Rather immersion and EM(south) children performed better than EM(north) children on one of the easier aspects of this task—8YOs on the Linguistic condition and 12YOs on the Semantic condition. There were no group differences on the more difficult aspect of the task, the Linguistic and Semantic condition combined.

These results suggest therefore that immersion children's education did not result in their acquiring any lexical retrieval disadvantages that are typically found with simultaneous bilinguals (Bialystok, 2008; Gollan, Montoya, & Werner, 2002). It seems that despite receiving significantly lower exposure time to formal English than their EM(south) and EM(north) peers, immersion children did not display any significant "weak links" in their L1 (English) or "lexical conflict" in their languages that hindered or slowed down their L1 lexical retrieval. These again signify positive outcomes to immersion education that contribute constructively towards language policy issues in minority language contexts. However, these results could also suggest that the differences between previous studies and the present findings are because the Irish immersion children are not simultaneous bilinguals; rather, they are successive bilinguals, with limited fluency in their L2 due to numerous sociolinguistic reasons such as a lack of use of Irish outside school and the all-pervasive nature of English in the community.

Similarly there were no negative effects of Irish medium education on children's ability to control and analyse grammatical and/or semantic violations of various sentences. Whereas there were no group differences between the 8YO children's performance on the Grammatical Judgement task, there were several differences with the 12YO groups. In particular, the results of the Gs condition, an EF measure, revealed that immersion children performed better than EM(north) children, which was expected, but not EM(south) children. It was thought that immersion children's increased exposure to an L2 would enhance their abilities on the Gs condition when compared to both other groups. However, as the EM(south) children also performed better than their EM(north) peers, this ROI advantage also remains unclear.

Again familial and regional background differences might be considered as a causative factor. However, such group differences were controlled in the analyses. Perhaps a more probable explanation is that children's attention and control of a language is promoted by their knowledge and experience of learning another language, even if that learning is for 3.5 hours per week only, as is the case with EM(south) children. As such, whilst children would increase their awareness of the symbolic, arbitrary, and flexible nature of languages, they would also increase their experiences of switching between languages and inhibiting the use of one in favour of the other. Therefore, these skills and awareness would most likely improve children's attention and control to linguistic aspects of language, as well as EF aspects of language. (Cf. Yelland, Pollard, & Mercuri, 1993, who found that young children in their first year of education who learnt an L2 for as little as one hour a week for 6 months had greater metalinguistic and reading acquisition skills than their monolingual peers.)

Further consideration is required of the results of the gs condition whereby immersion children performed better than EM(north). Unlike the Gs condition which requires similar control skills but less attention skills, the extra attentional challenges on the gs condition, it seems, are more easily overcome by those who have had increased exposure to an L2. This suggests that the metalinguistic awareness and attention and control of language processing and analysing is promoted by knowledge of two linguistic systems and the frequent experiences of switching from using one linguistic system to another.

Overall, results herein suggest that immersion education has no negative effects on children's metalinguistic skills; rather, that it can help to enhance children's attention and control of their L1 at no cost to their lexical retrieval (see Bialystok, 1988, for more on positive effects of varying degrees of bilingualism upon children's metalinguistic skills).

Implications. Regarding the theoretical implications, the findings of this research supplements other research into the effects of bilingualism and immersion education, most of which supports the efficacy of immersion education programmes. In effect, the results herein suggest that when compared to their NI and ROI peers, immersion education children performed to a similar level or indeed better than their peers on several L1 measures. However, more data are now needed to corroborate these results in a wider selection of Irish immersion schools.

Moreover, the trends of 8YOs and 12YOs mean scores suggest a favourable trajectory for immersion children that necessitate further research investigating the L1 skills of older immersion children in comparison to their EM(south) peers. For this purpose, a longitudinal study would be more instructive to help highlight actual development across age.

Bearing in mind that this was not a longitudinal study, and although mean scores revealed virtually no group differences on most of the reading measures, one could speculate that the older immersion children seem to be advancing further than their peers. Specifically, the 12YO groups' mean scores suggested enhanced accuracy skills and reading completion ratio in favour of immersion children. If this trajectory and the language provision type received by children were to continue, this suggests that by 15YO, say, they might even exceed their peers on several reading skills. Additionally, such hypotheses could also apply to the children's descriptive writing ability; particularly their use of less-frequent words which denote their fluency and vocabulary range. Whether or not such patterns could emerge is difficult to predict as a myriad of factors unique to each child's attitudes, abilities, and experiences are integral to his/her progression in language skills and could only be resolved with further studies.

However, such conjecture, as it is, could also be applied to the trends of children's vocabulary scores that revealed virtually no difference between 8YOs performance but by 12YO EM(south) children showed advanced performance in comparison to immersion children. Likewise to above, although there is no immersion disadvantage by 12YO, there might well be a disadvantage by 15YO—a typical deficit often found in research investigating effects of bilingualism when comparing bilinguals' vocabulary skills in one language to their monolingual peers in that same language (e.g., Bialystok, 2007; Oller et al., 2007). However, bilinguals can be shown to have an overall larger L1 and L2 vocabulary item count than their monolingual peers (e.g., Junker & Stockman, 2002).

Overall, results from analyses of children's reading and vocabulary abilities correspond with much of the previous research in the field of bilingualism that has shown that children in immersion education can learn an L2 at no cost to their L1. However, children's word frequency scores as measured by SUBTLEXus (Brysbaert & New, 2008) are in direct contradiction with research that suggests that increased exposure to L2 can reduce children's range of vocabulary in their L1. Results revealed that immersion children had a broader range of vocabulary and highlight the necessity of more research in this field within the Irish context.

In addition, although the above tests are very informative as to children's receptive and productive L1 skills, perhaps more in-depth measurements of L1 production that would reveal children's broader understanding of their L1 could be implemented. For instance, tests measuring children's ability to (i) categorise words according to their linguistic or semantic definition or grouping, (ii) provide synonyms, antonyms, hypernyms, hyponyms of words, (iii) manipulate, modify, correct, the morphosyntactical aspects of sentences, etc., would provide a more comprehensive understanding of children's L1 repertoire and potentially clarify any contradictory findings relating to vocabulary range found herein.

Regarding the educational implications, the findings in this study are encouraging for those in the *Gaelscoileanna* movement as they suggest that whilst successful practices are being employed, children are also obtaining a major component of their cultural heritage at no cost to their L1 academic skills. These findings, in addition to the majority of research in immersion education and bilingualism, share similar conclusions of the efficacy of immersion education and can be used to allay what is perhaps at the core of many Irish parents' concerns about immersion education: "will my child's English language skills be hindered by learning through Irish?" Overall, the evidence does not support or exacerbate such concerns; rather, the evidence can be used to assuage or rebut them.

EF Measures

Results of the EF tasks are less straightforward than those of the L1 tasks above, as there is a mixture of significant results that do not favour one particular group, and do not overall show enhanced EF skills of immersion children as one might predict. As such, this raises many further considerations that will be discussed below. However, suffice it to say that in no way do the results suggest that Irish medium education has a negative impact on children's EF skills as measured here.

Flanker tasks. Analyses revealed some unexpected results for both age groups and for both Flanker tasks. Although the majority of the research outlined in Chapter 4 highlights a bilingual advantage for simultaneous bilinguals, it might be expected that those in immersion education would benefit similarly when compared to their peers who had been less exposed to an L2 (Bialystok et al., 2009). However, results did not reveal immersion children's enhanced EF skills when compared to EM(south) or EM(north) children.

Regarding the Flanker Task-Original, whereas no group differences were found between the 8YO groups, there were group differences between the 12YO groups. Specifically, both immersion and EM(south) children performed more accurately than EM(north) children on the Correct Incongruent trial. However, the cost of frequent switching from congruent to incongruent trials mid-task, as measured by Difference Score, seemed to have a lesser effect on the accuracy scores of EM(south) children than their immersion or indeed EM(north) peers.

Regarding the Flanker Task-Modified, whereas 8YO EM(north) children were faster than their ROI peers on the Correct Congruent trials, the 12YO EM(south) children were faster than their EM(north) peers on the Correct Incongruent trials. These results are perplexing and suggest that knowledge of an L2 seems to benefit the older children but not the younger children. This leaves open speculation why such findings may have occurred.

Likely explanations that account for these unexpected results include issues relating to the tests themselves (this is discussed in greater detail in the Further Methodological Considerations section below), and a school/cohort effect for the EM(north) children in particular. Specifically, the speed of response of the 8YO EM(north) children on the correct incongruent trials of the original task was twice as fast as their immersion peers. Such a result is puzzling as there is an abundance of research that shows no monolingual advantage on tests of EF skill. Therefore it seems that this sample was particularly precocious and/or experienced in terms of attention and control as measured here.

An alternative explanation could be that the 8YO successive bilingual children studies here did not have enough L2 exposure time to manifest in typical cognitive benefits often seen in similarly aged simultaneous bilinguals. In particular, whereas simultaneous bilinguals receive increased and repeated experiences of using and switching between their two languages thereby enhancing their attention and control, all of which commences from a very young age, successive bilinguals (as those involved in this study) would have had similar experiences but to a much lesser degree, which would only have commenced at approximately age 4. Therefore the cognitive benefits of bilingualism might only occur at an older age for successive bilinguals when they acquire more L2 exposure and repeated experiences of using and switching between their two languages thereby enhancing their attention and control.

However, this does not explain the disparate score trends on the Original task which favoured EM(south) children when compared to their immersion peers, and the similarity of scores on the Modified task. For this purpose, a longitudinal study would be more instructive to help highlight actual development across age. As per the present study, the disparity of results between age groups links us back to the tests themselves as an explanation, and to a cohort effect of the 8YOs.

Overall, however, results could be interpreted to show that Irish medium education does not provide EF advantages typically seen with simultaneous or "balanced" bilinguals.

SART. Analyses revealed some unexpected results for both age groups. Although no group differences were expected, the analyses of the 8YO group revealed that the EM(north) children performed better than their immersion peers, in terms of speed, conversely, 12YO EM(north) performed worse than their immersion and EM(south) peers, in terms of accuracy.

Regarding the younger children, it could be that the ROI children were yet to reap the benefits of exposure to their L2. This seems to have occurred by the age 12. However, a more likely explanation is a cohort effect of the younger EM(north) children as outlined above which suggests the potentiality of EM(north) children's enhanced non-linguistic computer skills.

Regarding the 12YOs, the ROI children displayed more ability than their EM(north) peers to inhibit their response upon seeing the target stimuli "3". This could suggest that knowledge of an L2 may even enhance people's response inhibition as measured here, which has not been shown previously on the SART (cf, Bialystok et al., 2008; Meuter & Orr, 2011; Meuter & Simmond, 2007). In general, then, younger monolingual children seemed to excel at this task, whilst older bilinguals seemed to outperform the monolinguals.

Stroop tasks. Regarding the Stroop Task-English, analyses revealed expected findings with the younger children as there were no group differences on this measure (cf Tipper, Bourque, Anderson, & Brehaut, 1989). It could be suggested therefore that the benefits of bilingualism do not extend to skills of response inhibition in successive bilinguals and that the Stroop task does not replicate a bilingual experience as measured here (cf Martin-Rhee & Bialystok, 2008). However, that conclusion does not tally with the analyses of the 12YO children, which showed the ROI children outperformed their EM(north) peers. This could suggest that knowledge of an L2 can be advantageous on this task, but only once a critical mass of exposure to the two languages has been reached.

However, whereas both sets of results present diverse findings, this seems to match the general research field which is one of varied conclusions in relation to bilinguals' performance on the Stroop. Research using the Stroop task shows a bilingual advantage for certain types of bilinguals based on their level of exposure to languages (e.g., Gathercole et al., 2010, who distinguish between bilingual groups based on languages in the home: Only English in home, Welsh and English in the home; and only welsh in the home) or a bilingual disadvantage (e.g., Biederman & Tsao, 1979), or even no difference between immersion and monolingual groups (e.g., Tipper et al., 1989).

Additionally, the cohort effect pertaining to the 8YO EM(north) children's advanced computer skills/experiences that potentially existed on the Flanker tasks needs to be addressed. It might be expected that these children would have enhanced skills on this task too. However, although the same group of children performed both sets of tasks, the Stroop task differs from the Flanker tasks insofar as the Stroop task contains an additional verbal component, thus heavily relies upon linguistic skills. As such, any advantageous skills of the EM(north) children that were utilised on the SART and Flanker tasks might have been unused, hindered, or reduced on the Stroop task which reliant on linguistic skills.

These results could suggest that the benefits of attention and control typically found in balanced bilinguals occur later for successive bilinguals as they acquire increased exposure to their L2. Overall however, whilst results show limited advantages for immersion children where an advantage is expected on EF tasks, Irish medium education in no way has a negative impact of children's attention and control abilities as measured here. In fact, regarding the Stroop Task-Irish, analyses revealed a baseline Colour-Match condition in favour of 8YO immersion children but no such difference was found between 12YO groups. This age distinction might be explained by EM(south) children's lower amount of exposure to their L2 when compared to their immersion peers. However, longitudinal studies would be necessary to clarify any suggestions of the effects of increased exposure to Irish, as measured here.

However, analyses also revealed expected findings with the younger and older children as there were no group differences on the Stroop Effect measure. It could be suggested therefore that (i) any benefits of bilingualism upon children's attention and control in their L2 applies to immersion and EM(south) children somewhat equally, and/or (ii) as the immersion children are more fluent in their L2 than the EM(south) children, results herein demonstrate that the Stroop task does not replicate a bilingual experience. Additionally, the data suggest that Irish immersion children may not be at a level of exposure to their two languages that allow for the bilingual experience that result in advanced EF performance as documented elsewhere in the literature. Overall however, results show that in no way does Irish medium education have a negative impact of children's attention and control abilities in both of their languages, as measure here.

Implications. Regarding the theoretical implications, the overall findings of this research could be interpreted as been mostly consistent with other research into the effects of bilingualism and immersion education. Whereas there were several examples of a bilingual advantage, particularly in relation to measures of English language abilities, there were also examples of no bilingual advantage, and no clear overall advantage in relation to EF abilities. At no stage of analyses, however, did results reveal any negative effects of immersion education. Nevertheless, there were several unexpected findings which require further consideration and further research.

Regarding the educational implications, the findings in this study are encouraging for those promoting the teaching of Irish in all schools as results suggest that when compared to their monolingual peers, children who learn an L2 can avail of enhanced attention, control, and inhibitory skills due to their cognitive experiences of learning another language.

These findings, in addition to the majority of research into bilingualism in the worldwide setting, and in addition to the L1 academic skills evidence above, could be used to reassure parents that successive bilingualism obtained from *Gaelscoileanna* has no negative effects upon children's English language abilities, or their attention, control, and inhibition skills.

Discussion

Further Methodological Considerations

L1 tasks. There were six L1 tasks used. The standardised tests NARA and BPVS, and the Lexical Fluency task (Bialystok, 2009) have been shown to be reliable tests of language ability. The three remaining tasks however are less reliable.

Although both writing tasks used a standard frequency list (SUBTLEXus; Brysbaert & New, 2008) they also contained subjective measures of creativity and ability to describe a novel experience. Although each of these aspects of children's L1 ability was thoroughly measured, further adjustments could be made to provide more thorough measurements. For example, the scale used—1 to 5—could be increased to a scale of 1 to 10 to provide a more sensitive scale of measurements. Furthermore, the inter-rater reliability score was obtained by one researcher who marked 11% of stories. A more thorough examination may have been provided by two extra raters who marked 100% of the stories. Unfortunately, for this investigation this was not possible due to time and financial constraints.

The last L1 measurement, Grammatical Judgement task, was created specifically for this study. Although piloting did not ascertain any problems with the test, it could be suggested that this tool is not sensitive enough to ascertain differences between groups of children as per their metalinguistic skills. This would necessitate further examination of this tool and trials to improve the internal validity.

Flanker tasks. The findings of analyses of the Flanker tasks pose several difficulties as they do not entirely conform to the expectation that children's expertise in an L2 translates into enhanced skills on tasks of attention and control. Indeed language skills, in this setting, might have been a contributing factor to some of the findings, but not in the expected direction. Specifically, the strength of children's "suppression mechanism" can vary depending upon language experiences (Ransdell, Arecco, & Levy, 2001). As such, EM(south) children might have had a more automatic activation of this mechanism and a greater need of suppression of their L1 because they had substantially less exposure to their L2 than had immersion children. Such continual cognitive experiences might transfer to their performance on tests of attention and control, and, in part, explain the unexpected findings which showed no differences between immersion children and EM(south) children on the Flanker tasks.

Additionally, although various research has shown a bilingual advantage in terms of EF, several did not account for non-verbal reasoning abilities (e.g., Martin-Rhee & Bialystok, 2008; Yang & Lust, 2005). The omission of controlling for participants' non-verbal reasoning abilities could partly account for the existence (or non-existence) of a bilingual advantage found on the Flanker task or similar tests of interference suppression in other studies. This is supported by experimental analyses performed on the data set herein which revealed that the significant difference in favour of immersion children over EM(north) children on Correct Incongruent trials of the Flanker Task-Original disappeared when Raven's was not controlled. As such, the findings of the analyses in this research, and the stringency in which they were performed, support the importance of controlling for non-verbal reasoning skills as a bilingual advantage could be found where it otherwise might not exist—indeed, advantages might even be overlooked. Such stringency could partly explain why results are not what are typically found in this field of research. However, the tests design could also be instrumental in explaining the ambiguous findings.

Various studies have highlighted the possibility of a bilingual advantage being overlooked because of an inappropriate level of challenges on certain measures of interference suppression. For instance, Hernandez et al. (2008) proposed that there is a more favourable level of difficulty [or an optimum level of difficulty] on Flanker tasks in relation to congruent:incongruent ratio of stimuli (cf Martin-Rhee & Bialystok, 2008, on the Simon task) to effectively assess cognitive skills. They showed a bilingual advantage at 75% incongruent:25% congruent level of conflict on the Flanker task and further state that at 50:50% conflict tasks are too “easy” to elicit any measurable differences because the EF is not sufficiently challenged.

If we accept this theory then it stands to reason that there is a particular level of conflict in which participants have to further engage their EF skills than they normally would on easier levels of conflict such as at 50:50% level of conflict. Importantly, based on previous research which suggests “superior” EF skills for bilinguals, this point of further engagement of EF should differ for bilinguals and monolinguals. Therefore, theoretically, there could be a level whereby monolinguals reach (or are nearer to) the optimum level of EF challenges because they find the task challenging and bilinguals, although engaged, do not reach their optimum level of EF challenges because they still find a particular level to be “easy”. To take this idea a step further, less proficient speakers of an L2 (EM(south) children) should reach their optimum level of EF challenges quicker than their more-proficient peers (immersion children).

Analyses, and particularly the trends of the current study, add credence to this theory when both Flanker tasks—Original and Modified—are considered separate from each other. Although both tests were created for this study, the Original version was based on the work of others (Yang & Lust, 2005) which has been shown to demonstrate a bilingual advantage, the Modified version was not. Nevertheless, the modified version (i) is identical to the Original version in every way except the colour of the stimuli (Original contains target and distracter stimuli of different colours, and Modified contains target and distracter stimuli of the same colours), and (ii) should still be considered a bivalent task as it contains stimuli with two features (position and direction) that diverge (incongruent trials) onto one response or converge (congruent trials) onto another response. However, although it could be confidently said that the Modified version tests attention and control, and in particular interference suppression, and that it is more difficult than the Original version, it cannot be said that the Modified version is an extension of the Original version and that EF skills used for both tasks cannot necessarily be looked upon as on a continuum basis.

Additionally, it is important to stress that as the Modified version was created specifically for this study, as such, no other testing was performed with such a measure, and any atypical results could be indicative of a “test effect”. However, this seems unlikely as the Modified and Original versions seem to overlap hugely in design and skills required. Nevertheless, concern is warranted and more research using this tool is strongly recommended. This would give a better indication as to whether or not a test effect occurs on the Modified version.

In both tasks, results and trends revealed that EM(south) children performed better than their peers. As such, it could be suggested that whereas the EF challenges placed upon the children were pitched just right for EM(south) group, pitched too high for EM(north) children, and pitched too low for immersion children. However, this is speculative and further studies comparing the groups’ performance on the two Flanker tasks could help to illuminate this issue. For instance, by using the same Flanker tasks as above, but with the extra components of increased amount of trials to, say, 100, which contain 5 sets of 20 trials each with a different congruent:incongruent ratio (i.e., 10:90, 30:70, 50:50, 70:30, 90:10).

Such modifications could increase the sensitivity of the tests, increase the likelihood of testing children to a level that is appropriate to their various linguistic and cognitive backgrounds, decrease the likelihood of overlooking or misappropriating any bilingual advantage, and further elucidate any costs or benefits of bilingual education.

SART. Regarding the SART, it could be said that the very idea of using it to measure a bilingual advantage is questionable as there are varying interpretations as to the cognitive capacities employed when performing it. For example, although Manly (2009) states performance on SART incorporates response inhibition to measure sustained attention, SART could (i) be susceptible to rapid automatisation of response (Robertson et al., 1997)—however they attribute this to internal maintenance of attention rather than the external stimuli; (ii) be affected by sensory modality, event rate, stimulus uncertainty, memory load, and task complexity (Warm, 1993); (iii) encourage "mind wandering" because it is cognitively undemanding (Smith et al., 2006); and (iv) be susceptible to impulsive responding (Helton, 2009). In addition, most (if not all) of the previous research conducted in this area has found no bilingual advantage on the SART (e.g., Bialystok et al., 2008; Meuter & Orr, 2011; Meuter & Simmond, 2007).

Moreover, although Helton (2009) states that SART (cf Continuous Performance task, Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956, and Abbreviated Vigilance task, Temple et al., 2000) has overcome many of the criticisms of longer duration vigilance tests—e.g., long test times can (i) slow down the rate of data collection, (ii) raise ethical and economic considerations of participants' time, (iii) potentially limit their use in test batteries, and, (iv) be incompatible with imaging technology, such as fMRI and positron emission tomography (PET)—some of the criticisms can apply when working with children—particularly when collecting data in schools.

For instance, when collecting data in schools, researchers often use a battery of tests on children to get a more comprehensive view of their topic of interest. As the SART takes approximately 15/20 minutes to complete this increases the time the child is out of class raising ethical considerations of test fatigue, education time lost for the child, and teaching time lost for the teacher. And although the SART is an improvement on earlier vigilance tests which could take up to several hours to complete (Helton, 2009), there remains questions of relativity, i.e., 15/20 minutes can seem a very long time for a child, thereby, potentially, increasing his/her dissatisfaction or frustration with this test. (This was demonstrated to the author by several children who complained about the length of time on the SART—such did not happen with any of the other 13 tests.) Such concerns, if valid, could diminish the performance of bilinguals and monolinguals alike.

However, the legitimacy of using the SART in this research is sound because the task requires skills of sustained attention (Manly, 2009) that could be potentially overcome by the cognitive skills that are purported to be enhanced in bilingual participants when compared to their monolingual peers (e.g., Bialystok, 2001). Furthermore, it is important to not only use tests that are known to favour one group over another, thus biasing the research. Moreover, using the SART could provide further evidence in relation to the theory of two types of inhibitory control (Bunge et al., 2002) and how it can be helpful to ascertain possible processing differences in inhibitory control between bilingual and monolingual children (Martin-Rhee & Bialystok, 2008).

However, contrary to Martin-Rhee and Bialystok's (2008) theory that bilinguals would not outperform their monolingual peers on tests of response inhibition, results found herein seem to suggest that learning an L2, even for 3.5 Hours a week, can be beneficial to inhibiting a response, as measured here.

Stroop tasks. The findings obtained from analyses of the Stroop Task-English, present diverse findings that could be used to support or oppose the concept (i) of a bilingual advantage, as measured here, and/or (ii) that the Stroop task replicates a bilingual experience.

Regarding the Stroop Task-Irish, due to the linguistic nature of this task, it therefore requires greater degrees of response inhibition or employs greater degrees of automaticity on behalf of the immersion children when compared with their EM(south) peers due to immersion children's enhanced exposure to Irish in school. In essence, therefore, any enhanced attention and control skills that might have been gained by the immersion children might have been somewhat diminished by the extra challenges they alone face when controlling an L2 in which they are expert. It is fair to say that EM(south) children would not face such challenges to the same intensity.

This suggests that the use of the Irish version under these conditions is a flawed approach to measuring a potential "bilingual advantage", as it does not elucidate upon whether or not the Stroop task (i) actually measures a "bilingual advantage"' or (ii) can measure a "bilingual advantage" because this task tests response inhibition which does not replicate a bilingual experience.

Discussion

Language Use and Attitudes towards Irish

The main questions posed in this part of the research were to what extent Irish medium and English medium educated children, and parents thereof, used the Irish language and viewed its usage in various socio-linguistic domains. This section discusses the implications of the findings in relation to these questions.

As noted in Chapter 12, results suggest that attitudes towards Irish and use of Irish remained constant over time as there was no effect of Age on the vast majority of measures herein. Additionally, results also revealed that both groups of participants used at least some Irish and held positive attitudes towards its use in various linguistic settings, although immersion participants used Irish more and held more positive attitudes towards it than did their EM(south) peers. Nevertheless, attitudes towards Irish had no effect on group differences on any of the EF measures (see Table 82, p. 257, and Table 84, p. 260), suggesting that enhanced EF skills are acquired through continual experiences of using two linguistic systems, not the attitudes towards them. Specific issues relating to language use and attitudes among immersion and L2 speakers are discussed in detail below.

Language use. Analyses of mothers', fathers', and children's language use revealed positive correlations amongst the majority of language use measures, as reported by parents. This suggests that the participants held similar patterns of views and use of Irish in various socio-linguistic domains as measured here. Typically, results showed that English (L1) was the predominant language of choice but that Irish was used to a lesser degree by people from both school groups, i.e., 10% of participants at most reported their using Irish “Always” or “Often” in (potential) non-education settings[20]. However, further analyses did reveal that Irish was used significantly more in many language settings by people from the immersion groups than their EM(south) peers. Additionally, similar results were revealed from analyses of children’s self-reported language use. This could be used to support Baker’s (2004; p. 1) claim that [immersion or] “bilingual education is a major plank in language revitalisation and language reversal” as Irish is being spoken by immersion children and their parents more often than their EM(south) peers.

Of course, although there is a multiplicity of influences upon children’s language use, it is fair to say that regardless of attitudes towards Irish, immersion does increase Irish language use in school. This can be transmitted into language use in the home at least during homework time, and potentially into the community. However, although immersion children used Irish significantly more than their EM(south) peers, it nevertheless seems that the Irish language is not effectively penetrating the community. Descriptive statistics revealed that Irish was spoken somewhat infrequently in various socio-linguistic community domains for children (and parents) from immersion and EM(south) alike. Moreover, when compared to their children’s reports, it seems that immersion parents overestimated their children’s use of Irish in various socio-linguistic domains—according to the children, in general, Irish was used infrequently outside of school (see Table 79, p. 250), and when used, Irish was limited and mostly used for the purposes of completing homework. (See Appendix 8 for a brief overview of children’s typical responses as to why they do/do not use Irish outside of school.) Such results

[20] Several measures were excluded to make this particular point as it unsure to what extent education could have been involved in particular measures: “Work Colleagues” could pertain to fellow teachers; “Immediate Family” could pertain to homework help time; and “Friends” could pertain to within school friends on the children’s questionnaire.

highlight the importance of collecting background data not only from parents but also from the children themselves, particularly in relation to language.

Overall, then, it seems that when compared to those in the English medium education group, the immersion children were more likely to use Irish outside of school, in various linguistic settings, providing further support to the distinctive nature of the two ROI groups in this study. However, the exact incidence of their use of language remains unclear.

Attitudes towards Irish. Analyses of parental reported attitudes towards Irish in various settings revealed that immersion parents held more positive attitudes than did their EM(south) peers on all variables where there was a significant difference between groups. In particular, when compared to their EM(south) peers, immersion parents held more positive beliefs in (i) children's ability to learn and speak two languages, (ii) the potential of positive effects of L2 learning and improvement of career opportunities, (iii) pluralism in general and Ireland as a bilingual society in specific, (iv) the cultural and social/personal importance of Irish as a heritage language, (v) importance of Irish and bilingualism in Ireland currently in regards to the maintenance of the language, (vi) the accessibility of Irish medium education for all children, and (vii) the efficacy of Irish medium education in keeping Irish alive at no cost to children's L1 skills.

Overall, it seems that when compared to those in the English medium education group, the immersion groups were more likely to have more positive attitudes towards Irish and its use in various linguistic settings.

Implications. Results herein seem to suggest that although people have positive attitudes towards Irish, the use of the language itself is limited to educational spheres.

This seems to tally with arguments laid out in Chapter 3 (see Mac Gréil & Rhatigan, 2009; Ó Riagáin, 1997). Questions remain however, insofar as (i) how to improve the use of Irish outside of school particularly—when we consider that children do have the appropriate skills to use it and they and their parents do hold positive attitudes towards the language and its use and (ii) how to increase the provision of Irish medium education.

Although there is no question as to the quality of Irish been taught in both school groups (see Chapter 2) it seems to be that children take an "Irish is only for school" approach, and that when outside of school immersion children are unsure of other people's ability in Irish or in the "appropriateness" or their using it. This could support the argument that it is essential to take a multi-layered—school, family, community, workplace, etc.—approach to transmitting language from schools to community as L2 medium education cannot be the sole rescuer of a language (Fishman, 1991). Perhaps more could be done to combine homework with home-life and immediate community.

Children could be given assignments whereby they get to increase their exposure to Irish and can play an active role in increasing the exposure of Irish in the family and community themselves. For instance, (i) within the home, children could engage with and summarise any media (T.V., radio, newspapers) productions that was conducted in Irish, and perhaps could do this in partnership with family members, and (ii) within the community, children could catalogue examples of Irish in towns and where it can be used, where it is used, and indeed, where it might be used with proper encouragement. Perhaps with active partnership with local businesses, local authorities, and other community members children could be encouraged to use their Irish in various community settings; assured that speaking it will be accepted, effective, and supported.

Beyond the immediate community, perhaps certain celebrity role models could be seen using and supporting the Irish language and its use as an acceptable and fashionable mode of communication. As the celebrity endorsement can have a huge affect on uptakes of products and even ideas (e.g., Amos, Holmes, & Strutton, 2009), they could encourage the youth and not so youthful alike to use their Irish in various linguistic settings.

Such supportive practices could help to promote the Irish language as increased exposure could increase peoples skills in speaking and listening to Irish, could make it a normal form of communication, and effectively take it from being a school language only to a community language too.

More research could investigate parents' decision making processes in enrolling their children in Irish medium education in Ireland (or why they choose not to). Hodges (2011) investigated a similar point in L1 English speaking communities in Wales and found four main reasons why parents enrol their children to Welsh Medium education, two of which were: (i) cultural = national identity, intrinsic value of the heritage language itself, and sense of regret, embarrassment, and being incomplete for their not being able to speak the heritage language, and (ii) educational = good reputation, high academic success, extracurricular activities (the other two reasons were economic and personal). Perhaps Irish parents share similar motivations.

It is incumbent upon research to understand such motivations and learn from parents as well as to inform them. Not only would such research help to update people who are already committed to Irish medium education, but also for those who wish they could commit and those who are undecided—23.4% of parents would have sent their children to a *Gaelscoil* had there been one close to their home and a further 23.8% stated they were undecided on the matter (Ó Riagáin, 2007). To understand parents' point of view, answer their concerns, sharing the research-based evidence behind the known benefits of immersion education could all very well increase the demand for this education system to such an extent that it could not go unanswered by policy makers. The positive effects of immersion as revealed in this and other studies could help to promote this type of education and inform parents as to the true outcomes of immersion education and help them to make more informed decisions as to the type of education sought for their children.

Indeed the policy makers themselves could be informed as to the passion and desire of some parents for this education system and to the benefits that can accrue for the students enrolled in it.

Conclusion

This research was designed to investigate the affects of Irish medium education (immersion) on children's first language (L1; English) academic abilities and EF abilities.

Overall the results suggest that immersion has no negative effect upon children's abilities as measured here. Regarding L1 skills, even at the younger age of 8YO immersion children outperformed either one or both of their peer groups on several measures. This suggests that any typical "lag" in L1 academic skills of those from an immersion education background had disappeared by this age. Indeed by the older age of 12YO, a similar pattern of results emerged which further supports the argument that immersion does not have negative effects upon children's L1. Moreover, trends suggest the importance of further examining this issue with older groups of children to ascertain whether or not the potential widening gaps of children's reading and vocabulary skills continue to grow and indicate the more long term effects of this education system.

Regarding the EF skills, results suggest that the older children's exposure and knowledge of an L2 benefitted both ROI groups of children when compared to their EM(north) peers. This further suggests the importance of examining this issue with older groups of children to ascertain whether or not increased exposure and knowledge would benefit the immersion children more than the EM(south) children. It seems that the measurements used herein were less adept at finding differences between successive bilingual groups than they were at finding differences between either of the same groups and their monolingual peers. Perhaps as immersion children's increased exposure and knowledge to their L2 further surpasses their EM(south) peers in their adolescent years, it will be at this age that EF advantages are more easily identified and/or measured. Or, alternatively, it may well be that the Irish situation may never provide enough exposure to the L2 to give rise to the non-linguistic advantages found in previous studies. Only further studies will be able to tell.

The current research however, revealed that in no way was Irish medium education detrimental to children's reading, vocabulary, creativity, descriptive L1, or metalinguistic skills; rather, in some ways it was beneficial to promote vigilance to the components of L1 and its use. Nor was the schooling in any way disadvantageous towards children's EF skills; rather, immersion and EM(south) children's knowledge of a second language increased their ability to attend to the array of stimuli and to control and inhibit responses on the tasks used.

Such results have important implications for education policy and for parental decision making in choice of school to enrol their children; which of course, has important implications for the children who receive L2 education in Ireland. Additionally, such results bode well for the *Gaelscoileanna* movement as they efficiently educate children in Ireland and help to maintain the survival of the heritage language, Irish.

* * *

Discussion

Gaelscoileanna continues to succeed despite the many additional challenges that are often common (unique) to this educational system. For instance, there are additional administrative and resource challenges, as many *Gaelscoileanna* are small, developing, relatively new, grass roots organisations, thus requiring additional time in administrative procedures. It also poses extra teaching challenges, as most children learn the curriculum through their L2, thus requiring additional time in clarifications of teaching. Whether or not this success can continue unabated in the face of continual challenges (e.g., changes to the pupil-teacher ratio, the strong influence of the English language in Ireland) is yet to be seen. However, despite the challenges, it seems that children of *Gaelscoileanna* can benefit from being taught through their L2 in terms of increased cultural heritage, maintenance of sound English language abilities, and the ability to succeed at EF tasks as well (if not better in some cases) as their peers. .

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Appendices

Appendix 1: Consent Form, Description of Study, and Questionnaires for ROI

The following shows the forms received by the parents of each prospective participant. These forms include a consent form, description of the study, and what would be expected of each child were he/she to participate in the study. The following also shows questionnaires pertaining to each child's background and to parents' attitudes towards (i) Irish language, (ii) Irish and English medium education in Ireland, (iii) bilingualism, and (iv) their use of Irish, English, and any other language/languages.

Where applicable, sources of questions used are indicated below each questionnaire, otherwise it was created specifically for this study.

College of Education and

Lifelong Learning
Rhos Building
Normal Site
Bangor University
Bangor
Gwynedd
LL57 2PZ
e-mail - *ivan.kennedy@bangor.ac.uk*
Phone - 01248 388598

Dear Parent,

My name is Ivan Kennedy. I am originally from Carlow town but I am currently enrolled in Bangor University, Wales where I am conducting postgraduate research in education.

I am contacting you to ask for your permission to allow your child to participate in my research. I will be looking at English language, attention, control, and memory abilities of children who attend Irish medium education (Gaelscoil), and children who attend English medium education. Also, I'll be looking into parental and children's attitudes to Irish education and language.

I would be very grateful if you would consent to your child's, participation in my study. No hazards exist in these tests, all results will be kept confidential, and anonymity is guaranteed.

If you wish to know more about the background to the research and wish to obtain feedback on its findings, or have any questions, you can contact me on e-mail *ivan.kennedy@bangor.ac.uk* or by phone 0044 1248 388598. I attach a short description of what is involved for your child if s/he were to participate, a consent form, and a questionnaire for you to fill in.

I have discussed this study with [Principal's name] who is aware of its content and is happy for the study to be conducted at the school.

If you permit your child to participate in this research please tick the YES box, sign, and fill in the following forms. If you do not want your child to participate please tick the NO box and sign. **Please return by [date].**

YES ☐ NO ☐

Parent's/ Guardian's signature

…………………………………………..Date……………..

Kind regards,
Ivan Kennedy

Effects of bilingualism on children's language and reasoning skills.

Research project supervisor: Dr. Enlli Thomas.   Researcher: Ivan Kennedy.

This project involves research into the effects of bilingualism and Irish medium education on a child's language skills and reasoning abilities.

The instructions and assessments will be provided in English (other than for one Irish language test) and your child will participate in the following:

1: Non-verbal reasoning test—this assesses a child's ability to complete a pattern when there is a piece missing by choosing from one of several choices.
2: Reading abilities—this assesses a child's ability to read, understand and produce words.
3: Writing abilities—this assesses a child's ability to understand and express information that they receive in the classroom.
4: Metalinguistic skills—this assesses a child's ability to think about language and to manipulate words and separate them from sentences.
5: Executive functioning—this assesses a child's ability to ignore distracting information, and control their attention to appropriate information.
6: Attitudes towards Irish Language—this assesses parents', teachers', principals', and children's attitudes towards the Irish language.

The first test will be performed with all students present. This will be the non-verbal reasoning ability test. The other tests will take place with the researcher and 2 children present. The children will complete all the tests but they will perform them at different times from each other. For instance, when one child is being tested on writing abilities the other child will be tested on reading abilities. All children will be made aware that he or she may withdraw from the study at any time.

No harm should come to your child while he or she is participating in this study, and confidentiality and anonymity will be adhered to.

If you want to know more about the background of the research and want to obtain feedback on its findings, or have any questions, you can contact me on e-mail ivan.kennedy@bangor.ac.uk or by phone 0044 1248 388598.

If you have any complaints concerning the conduct of the research, they should be addressed to Professor Janet Pritchard, Head of College of Education and Lifelong Learning, Bangor University, Safle'r Normal, Bangor, Gwynedd, LL57 2PZ, Wales.

This is to certify that I,……………………………………, hereby consent to my child's participation in an authorised part of the research undertakings within the College of Education and Lifelong Learning, Bangor University, Wales, under the supervision of Dr. Enlli Thomas.
This research, and my and my child's part in the research, has been explained to me by Ivan Kennedy and I understand his explanation.

The procedures of this research and their risks have been explained to my satisfaction. I understand that all data will remain confidential with regard to my child's identity. I understand that I am free to withdraw my consent and end my child's participation at any time.
I understand that I may request a summary of the results of this study.

Parent's/ Guardian's Signature…………………………… Date ……………

I, the undersigned, have explained the investigation to the above individual.

Researcher's Signature……………………………. Date……………………

Dear Parent,

Here are some questions relating to your and your child's background. There are no right or wrong answers. Please be assured that all answers will be kept confidential and anonymity is guaranteed. If, for any reason, you feel uncomfortable answering any of these questions, please leave the answer blank and move on to the next question.

Background

Please indicate the following:

Child's name___________________________ Child's Date of Birth_______________Is your child male ☐ or female ☐

Does your child have any disability? None ☐ Suspected ☐ Confirmed ☐ Please state if any_____________________

Has your child always lived in Carlow? Yes ☐ No ☐
If you answered No, what area/country did your child previously live in_____________________________________
And, what language was spoken there? English ☐ Irish ☐ Other____

Did your child go to preschool? Yes ☐ No☐. If so, what language was spoken in it? English ☐ Irish ☐ Other_______

Did your child attend a school other than the one in which he or she is presently enrolled? Yes ☐ No ☐
If you answered Yes, what area/country was this school in_____________________________________
What language was spoken in that school? English ☐ Irish ☐ Other________________________________
And, what language was spoken in that area? English ☐ Irish ☐ Other______________________________

What is your home language (or languages) at present?
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

What language(s) do the following speak to your child:
Child's mother (or Guardian 1)
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

Child's father (or Guardian 2)
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

Child's siblings
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

What language(s) does your child speak to the following:
Child's mother (or Guardian 1)
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

Child's father (or Guardian 2)
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

Child's siblings
Only English ☐ Mostly English/some Irish ☐ English and Irish equally ☐ Mostly Irish/some English ☐ Only Irish ☐
Other____

How much time per day does your child speak either of the following:
Irish_________________________ English________________________ Other_________________________

Education is important for children.
Absolutely true ☐ Somewhat true ☐ Neither true or false ☐ Somewhat false ☐ Absolutely false ☐

How many hours a week do you spend with your child doing his or her homework? ______________________

What is your educational background? Please indicate:
No exams taken ☐ Inter/Junior Certificate ☐ Leaving Certificate ☐ Degree ☐ Postgraduate ☐
Other____

What is your household's annual financial bracket?
Below €20,000 ☐ €20,001 to €30,000 ☐ €30,001 to €40,000 ☐ €40,001 to €50,000 ☐ Above €50,001 ☐

Irish language use

Please indicate how often you and your child spend speaking, reading, and/or listening to Irish in the areas below. Answer by circling one of the following:

1=Always; 2=Often; 3=Sometimes; 4=Rarely; 5=Never

	Mother (Guardian 1)	**Father (Guardian 2)**	**Your Child**
Irish use with the following			
1. Immediate family.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2. Extended family.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3. Work colleagues/School	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4. Friends.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5. Neighbours.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6. Teachers.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
7. People in the community.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
8. Organisations.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
9. Bureaucrats and politicians.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other (please state below).			
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Irish use in the following areas:			
1. Shopping.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2. Reading newspapers,	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3. Listening to radio, music,	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4. Theatre, T.V., movies, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5. Work.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6. Clubs.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
7. Leisure, hobbies.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
8. Church.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
9. Computers, emailing, etc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other (please state below).			
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Please use this space to add anything that you think is relevant to any of the points above.

____

Language targets and domains taken from Baker (2007, p. 5).

Attitudes towards bilingualism

Here are some statements about the English and Irish languages. Please say whether you agree or disagree with these statements. There are no right or wrong answers. Be as honest as possible. Answer by circling one of the following:

1 = Strongly Agree; 2 = Agree; 3 = Neither Agree Nor disagree; 4 = Disagree; 5 = Strongly Disagree

1. It is important to be able to speak English and Irish.	1	2	3	4	5
2. To speak English is all that is needed.	1	2	3	4	5
3. Knowing Irish and English makes people smarter.	1	2	3	4	5
4. Children get confused when learning English and Irish.	1	2	3	4	5
5. Speaking both Irish and English helps to get a job.	1	2	3	4	5
6. Being able to write in English and Irish is important.	1	2	3	4	5
7. Schools should teach children to speak in two languages.	1	2	3	4	5
8. School wall displays should be in English and Irish.	1	2	3	4	5
9. Speaking two languages is not difficult.	1	2	3	4	5
10. Knowing both Irish and English gives people problems.	1	2	3	4	5
11. I feel sorry for people who cannot speak both English and Irish.	1	2	3	4	5
12. Children should learn to read in two languages.	1	2	3	4	5
13. People know more if they speak English and Irish.	1	2	3	4	5
14. People who speak Irish and English can have more friends than those who speak one language.	1	2	3	4	5
15. Speaking both English and Irish is more for older than younger people.	1	2	3	4	5
16. Speaking both Irish and English can help people get a work promotion.	1	2	3	4	5
17. Young children can easily learn to speak Irish and English at the same time.	1	2	3	4	5
18. Both English and Irish should be important in the region where I live.	1	2	3	4	5
19. People can earn more money if they speak both Irish and English.	1	2	3	4	5
20. I would like English to be the only language in this area.	1	2	3	4	5
21. I would like to be considered as a speaker of English and Irish.	1	2	3	4	5
22. I want my children to speak Irish.	1	2	3	4	5
23. Both the Irish and English languages can live together in this region.	1	2	3	4	5
24. People only need to know one language.	1	2	3	4	5

Please use this space to add anything that you think is relevant to any of the points above.

Modified from Baker and Prys-Jones (1998, p. 177).

Attitudes towards the Irish Language

Here are some statements about the Irish language. Please say whether you agree or disagree with these statements. There are no right or wrong answers. Be as honest as possible. Answer by circling one of the following:

1 = Strongly Agree; 2 = Agree; 3 = Neither Agree Nor Disagree; 4 = Disagree; 5 = Strongly Disagree

1. No real Irish person can be against the revival of Irish.	1	2	3	4	5
2. Ireland would not really be Ireland without Irish speaking people.	1	2	3	4	5
3. Ireland would lose its identity as a separate culture without the Irish language.	1	2	3	4	5
4. One must know Irish to really understand Irish culture.	1	2	3	4	5
5. Irish will die out if the Gaeltacht dies out.	1	2	3	4	5
6. The Gaeltacht is dying out.	1	2	3	4	5
7. Irish is a dead language.	1	2	3	4	5
8. Irish can be revived as a common means of communication.	1	2	3	4	5
9. Most people do not care about Irish.	1	2	3	4	5
10. Attempts to revive Irish are bound to fail no matter what the Government does.	1	2	3	4	5
11. Most people see all things associated with Irish as too old fashioned.	1	2	3	4	5
12. Irish will disappear in a generation or two if nothing is done about it.	1	2	3	4	5
13. The Irish language cannot be made suitable for business.	1	2	3	4	5
14. Far less money should be spent reviving Irish.	1	2	3	4	5
15. What the Government does about the Irish language is not important to me.	1	2	3	4	5
16. Public leaders should set a good example by using Irish in the Dáil and public life.	1	2	3	4	5
17. Irish speakers have a right to expect civil servants to be able to speak to Irish to them.	1	2	3	4	5
18. It is better for people to speak Irish badly than not at all.	1	2	3	4	5
19. The Government should support Irish language organisations.	1	2	3	4	5
20. Voluntary organisation should support Irish, not the Government.	1	2	3	4	5
21. I would be very upset if Irish were not spoken on the national radio and television.	1	2	3	4	5
22. Most children resent having to learn Irish in school.	1	2	3	4	5
23. Teaching Irish in schools is enough to keep the language alive.*	1	2	3	4	5
24. I will commit to improving my ability to speak and read Irish. (This only applies to those who are not proficient in Irish.)*	1	2	3	4	5

Please use this space to add anything that you think is relevant to any of the points above.

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Taken from Ó Riagáin (1997) except* 23 and 24.

Attitudes towards Irish Medium and Mainstream Education

Here are some statements about the Irish medium and mainstream education. Please say whether you agree or disagree with these statements. There are no right or wrong answers. Be as honest as possible. Answer with circling one of the following:

1 = Strongly Agree; 2 = Agree; 3 = Neither Agree Nor Disagree; 4 = Disagree; 5 = Strongly Disagree

1. Irish medium education is keeping the Irish language alive.	1	2	3	4	5
2. Speaking Irish at school and English at home will ultimately benefit a child's education.	1	2	3	4	5
3. Irish medium education is open to all—working, middle, and upper class.	1	2	3	4	5
4. Mainstream education is keeping the Irish language alive.	1	2	3	4	5
5. Mainstream education is open to all—working, middle, and upper class.	1	2	3	4	5
6. Speaking Irish at school and English at home will ultimately damage a child's education.	1	2	3	4	5
7. Those attending Irish medium education learn a different curriculum from those in mainstream education.	1	2	3	4	5
8. Irish medium education does not negatively affect English language skills.	1	2	3	4	5

Please use this section to indicate which education your child is enrolled in, and why you chose to enrol him/her in this type of education. There are some potential reasons given below, and a space provided for comments. Also, there is a space provided below for you to add any other reasons that are appropriate to you.

9. Your child goes to Irish medium education ☐ or Mainstream education ☐ because this type of education:

		Comments
Has a better reputation than other schools in the area	☐	________________
Has better resources than other schools in the area	☐	________________
Was the only school available	☐	________________
Has the most convenient location	☐	________________
Provides better career opportunities for students	☐	________________
Provides better Irish language skills	☐	________________

Have your experiences in school influenced your choice of school for your child? Yes☐ No☐
Comment____
____

Have your other children's experiences in school influenced your choice of school for your child? Yes☐ No☐
Comment____
____

Have other people's experiences in school influenced your choice of school for your child? Yes☐ No☐
Comment____
____

Other reasons:
____
____
____

Please use this space to add anything that you think is relevant to any of the points above.
____
____
____
____
____
____

Appendix 2: Consent Form, Description of Study, and Questionnaire for NI

The following shows the forms received by the parents of each prospective participant. These forms include a consent form, description of the study, and what would be expected of each child were he/she to participate in the study. The following also shows questionnaires pertaining to each child's background.

College of Education and
Lifelong Learning
Rhos Building
Normal Site
Bangor University
Bangor
Gwynedd
LL57 2PZ
e-mail - *ivan.kennedy@bangor.ac.uk*
Phone - 01248 388598

Dear Parent,

My name is Ivan Kennedy and I am currently enrolled in Bangor University, Wales where I am conducting postgraduate research in education.

I am contacting you to ask for your permission to allow your child to participate in my research. I will be looking at English language, attention, control, and memory abilities of children.

I would be very grateful if you would consent to your child's, participation in my study. No hazards exist in these tests, all results will be kept confidential, and anonymity is guaranteed.

If you wish to know more about the background to the research and wish to obtain feedback on its findings, or have any questions, you can contact me on e-mail *ivan.kennedy@bangor.ac.uk* or by phone 01248 388598. I attach a short description of what is involved for your child if s/he were to participate, and a consent form for you to fill in.

I have discussed this study with [Teacher's name] who is aware of its content and is happy for the study to be conducted at the school.

If you permit your child to participate in this research please tick the YES box, sign, and fill in the following forms. If you do not want your child to participate please tick the NO box and sign. **Please return by [date].**

YES ☐ NO ☐

Parent's/ Guardian's signature

…………………………………………..Date……………..

Kind regards,
Ivan Kennedy

____

Effects of bilingualism on children's language and reasoning skills.

Research project supervisor: Dr. Enlli Thomas. Researcher: Ivan Kennedy.

This project involves research into children's language skills and reasoning abilities.
If you consent, your child will participate in the following:

1: Non-verbal reasoning test—this assesses a child's ability to complete a pattern when there is a piece missing by choosing from one of several choices.
2: Reading abilities—this assesses a child's ability to read, understand and produce words.
3: Writing abilities—this assesses a child's ability to understand and express information that they receive in the classroom.
4: Metalinguistic skills—this assesses a child's ability to think about language and to manipulate words and separate them from sentences.
5: Executive functioning—this assesses a child's ability to ignore distracting information, and control their attention to appropriate information.

The first test will be performed with all students present. This will be the non-verbal reasoning ability test. The other tests will take place with the researcher and 3 children present. The children will complete all the tests but they will perform them at different times from each other. For instance, when one child is being tested on writing abilities the other child will be tested on reading abilities. All children will be made aware that he or she may withdraw from the study at any time.

No harm should come to your child while he or she is participating in this study, and confidentiality and anonymity will be adhered to.

If you want to know more about the background of the research and want to obtain feedback on its findings, or have any questions, you can contact me on e-mail ivan.kennedy@bangor.ac.uk or by phone 0044 1248 388598.

If you have any complaints concerning the conduct of the research, they should be addressed to Professor Janet Pritchard, Head of College of Education and Lifelong Learning, Bangor University, Safle'r Normal, Bangor, Gwynedd, LL57 2PZ, Wales.

This is to certify that I,……………………………………, hereby consent to my child's participation in an authorised part of the research undertakings within the College of Education and Lifelong Learning, Bangor University, Wales, under the supervision of Dr. Enlli Thomas.

This research, and my and my child's part in the research, has been explained to me by Ivan Kennedy and I understand his explanation.

The procedures of this research and their risks have been explained to my satisfaction. I understand that all data will remain confidential with regard to my child's identity. I understand that I am free to withdraw my consent and end my child's participation at any time.

I understand that I may request a summary of the results of this study.

Parent's/ Guardian's Signature…………………………… Date …………..

I, the undersigned, have explained the investigation to the above individual.

Researcher's Signature……………………………. Date…………………..

Dear Parent,

Here are some questions relating to your and your child's background. There are no right or wrong answers. Please be assured that all answers will be kept confidential and anonymity is guaranteed. If, for any reason, you feel uncomfortable answering any of these questions, please leave the answer blank and move on to the next question.

Background Please indicate the following:
Child's name___________________________ Child's Date of Birth_______________Is your child male ☐ or female ☐
Does your child have any disability? None ☐ Suspected ☐ Confirmed ☐ Please state if any_____________________
Has your child always lived in Newry? Yes ☐ No ☐ If you answered No, what area/country did your child previously live in______________________________________ And, what language was spoken there? English ☐ Other____
Did your child go to preschool? Yes ☐ No☐. If so, what language was spoken in it? English ☐ Other_______
Did your child attend a school other than the one in which he or she is presently enrolled? Yes ☐ No ☐ If you answered Yes, what area/country was this school in____ What language was spoken in that school? English ☐ Other_________________________________ And, what language was spoken in that area? English ☐ Other_______________________________
What is your home language (or languages) at present? English and/or other language which is__________________ If you or your child speak another language please indicate above and below where you see "other". Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐
What language(s) do the following speak to your child: Child's mother (or Guardian 1) Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐ Child's father (or Guardian 2) Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐ Child's siblings Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐
What language(s) does your child speak to the following: Child's mother (or Guardian 1) Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐ Child's father (or Guardian 2) Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐ Child's siblings Only English ☐Mostly English/Some other ☐ English and other equally ☐ Mostly other/some English ☐ Only other☐
How much time per day does your child speak either of the following: English __________________________ ________________________ Other_________________________
How many hours a week do you spend with your child doing his or her homework? ______________________
What is your educational background? Please indicate: No exams taken ☐ GCSE ☐ A/AS Levels ☐ Degree ☐ Postgraduate ☐ Other____
What is your household's annual financial bracket? Below £20,000 ☐ £20,001 to £30,000 ☐ £30,001 to £40,000 ☐ £40,001 to £50,000 ☐ Above £50,001 ☐

Appendix 3: Ethical Application Form

The following shows the ethical application form used to seek permission from the Ethics Task Group, Bangor University, to carry out this research. This highlights the many aspects that needed to be considered and clarified before commencement of data collection.

COLLEGE OF EDUCATION AND LIFELONG LEARNING

APPLICATION FOR APPROVAL OF POST-GRADUATE RESEARCH PROJECT BY ETHICS TASK GROUP

1. a. Title of qualification being undertaken

   b. Title of the research project:

   c. Date of degree registration commencement

2. Details of Student

   Title:
   Surname:
   Forename
   Current Academic Qualifications:
   Address

   Telephone Number
   E: Mail

   School/college in which research is being conducted:

   UWB Registration number:

3. Details of Supervisor

   Title:
   Surname:
   Forename
   Current post held:
   Location:

   Telephone Number
   E: Mail

4. Aims and objectives of the research project
Please list the aims and objectives in numerical order.

5. a. Proposed research start date: b. Proposed research end date:
6. Source of Research Funding
7. Describe the participant sample who will be contacted for the project, if appropriate. You need to consider the number of participants, their age, gender, recruitment methods and exclusion/inclusion criteria. Also, describe how they will be selected.
8. Describe the research tools that will be used to elicit data from the sample (e.g. tests, questionnaires, interviews, observation), and provide a clear and concise statement of ethical considerations in using these tools.
9. Describe where, how and for how long data will be stored. Indicate whether data will be coded so as to remain anonymous to all except the researcher. Indicate any implications for the potential of others to access data, such as surveys and interview transcripts, which may contain identifying notes such as names and addresses.
10. Explain by what method it is expected that the data will be published - e.g., journal article, report for a public body - and indicate how confidentiality will be maintained. It is important to ensure that participants are made aware on the consent form of the way in which it is expected that the data will be published.
11. Please attach a copy of the participant information sheet and consent form that will be used, if appropriate.
12. Does the project involve research at sites other than University of Wales, Bangor? YES/NO If YES then go to 13. If NO then go to 16.

14. Details of contact person on the site
 Title:
 Surname:
 Forename
 Post:
 Address:
 Telephone:
 E-mail:

15. Has written agreement been given by the appropriate person/body on the non-UWB site for the research to be conducted?

YES/NO

Note: research on sites outside of University of Wales Bangor may **NOT** be started until such written agreement has been given AND copies of that agreement submitted to the Ethics Task Group.

16. Please make a clear and concise statement of the ethical considerations raised by the project and how you intend to deal with them throughout the duration of the project.

17. Declaration

I confirm that the information in this form is accurate to the best of my knowledge.

Signature of Student: ………………………………………

Print name: ……………………………

Signature of Supervisor:…………………………………………

Print name: ……………………………

Date of submission:…………………………………………

For office use:

Date application received:

Date of review by Ethics Task Group:

Date student notified of decision of Ethics Task Group:

Appendix 4: Examples of Test Materials

The following sections show examples of all the tests used in this study. All children performed each of the tests. One exception was for the Irish language tests which were not performed by the NI Irish children because they did not speak Irish.

Non-Verbal Test

Raven's Progressive Matrices. This is an example of the Raven's as performed by the children in this study. The children were asked to identify the missing piece of the upper pattern from the array below. They did this by writing the number of their choice in the bottom right hand corner of the upper pattern. There were 60 patterns in total.

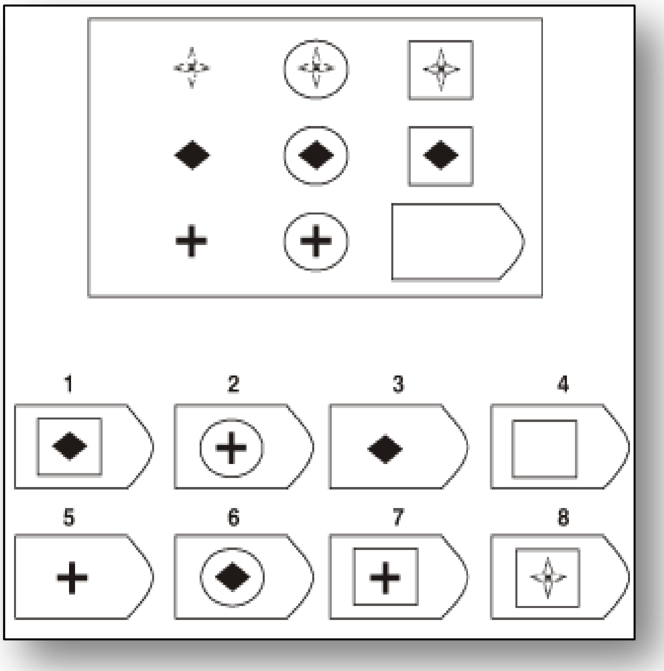

Figure 3. An example of The Raven's Standard Progressive Matrices 1998 Edition.

Irish Language Tests

Irish Vocabulary tests. This shows examples of the Irish vocabulary tests used in this study. The children were asked to say the letter of the picture that matched the word named by the researcher.

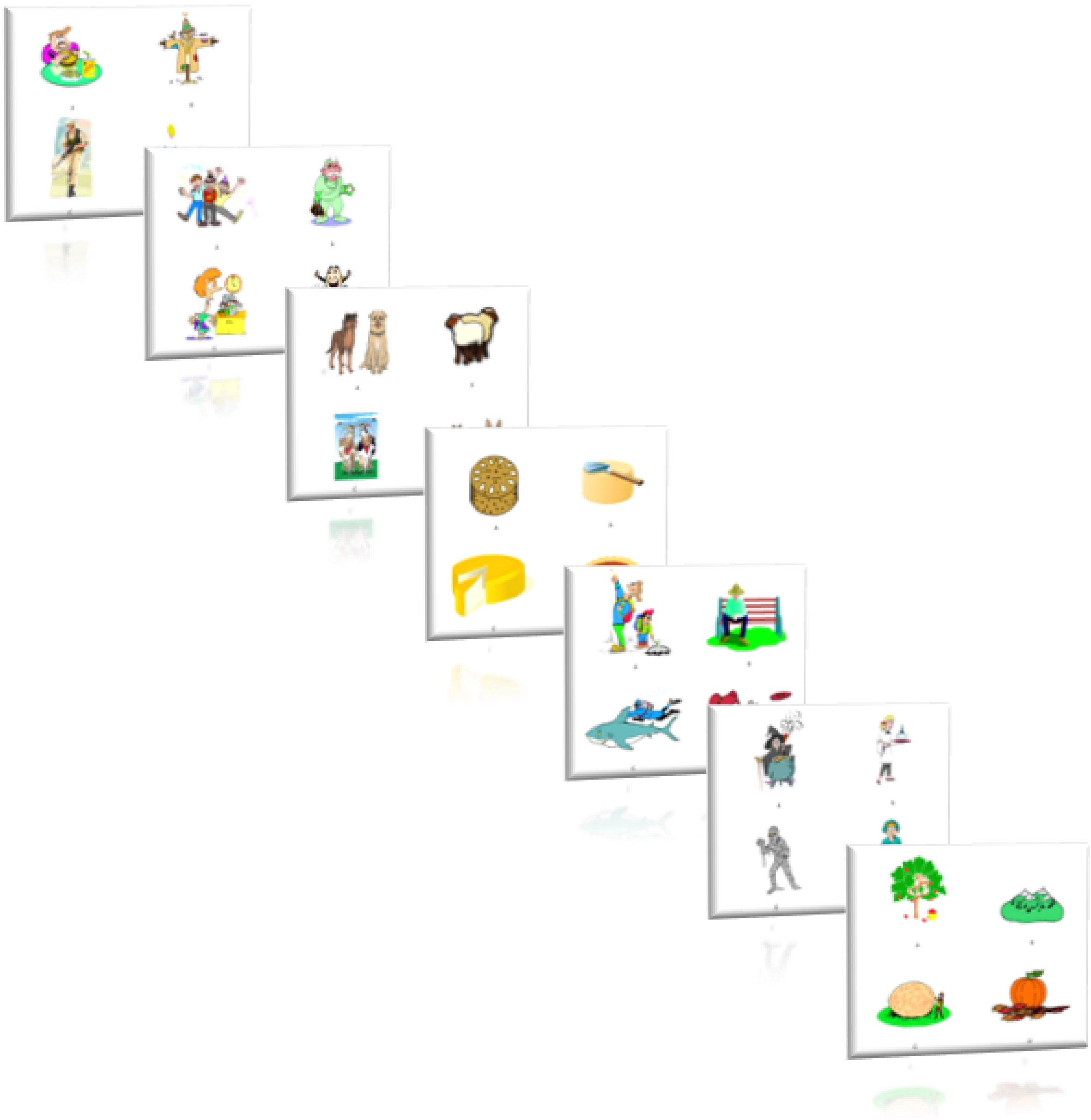

Figure 4. Examples of The Irish Vocabulary Tests.
In the first example children heard the word “crann” [tree] and were required to answer “A”.

Irish Cloze tests. This shows the Cloze tests that were performed by the 12YO and 8YO children in this study. Children were asked to fill in the missing parts of words.

Teach na Coille
Bóthar Luimnigh,
Oileán Chiarraí,
Co. Chiarraí.

20 Bealtaine 2009.

A Mhairéad, a chara,

Tá súil agam go bhfuil tú i ___mbarr na slainte. Mar a ___fheiceann tú ón seoladh tá_____ i mo _____each nua. Cheann_____ mo thuismitheoir_____ an teach mí o shin, agus d'aistríomar ón seanteach coicís ó shin.

Is breá liom an teach nua. Is bungaló é faoin tuath. Táim_____ ocht gciliméadar ón _____aile mór, ach is cuma liom, mar téann bus thar an _____eata ceithre huaire sa lá.

Tá ceithre _____eomra codla_____ sa teach, agus mar sin tá mo _____eomra féin agam. Níl orm mo _____eomra a roinnt le Caitríona níos mó, buíoch_____ le Dia. Tá leaba shingil agam le duvet nua. Tá bord beag in aice na leapa, vardús mór i _____úinne amháin, agus clár maisiúcháin. Tá dath gorm ar na ball_____ agus dath dúghorm ar an _____brat urláir. Lig mo _____áthair dom mo _____óstaeir a chur suas ar na ball_____. Chuir mé suas pictiúr de U2, Snow Patrol, agus Duffy.

Tá an-áthas ar mo thuismitheoir_____ mar tá cistin mhór sa teach le gach áis: bruthaire leictreach, cuisneoir, meaisín níocháin, agus triomadóir. Tá siad sásta chomh maith mar tá garáiste ann don _____arr agus do na rothair.

Nuair a thagann na laethanta saoire ón scoil tar chugainn ar cuairt. Beidh an-_____áilte romhat.

Slán go fóill. Do _____ara buan

Sile

Taken from Ar Aghaidh Linn: Leabhar Saothair (Ní Chéilleachair, 1993, p. 31).

Rug Daidí___ ar Aoibheann agus chuir sé isteach__ sa __bhugaí í.

"Cá bhfuil_____ ag dul?" a d'fhiafraigh Aoibheann tar éis tamaill. "Go dt______ an siopa," arsa Daidí. Caithf_____ mé an páipéar a _____eannach. Bhí Aoibheann breá sásta nuair a chuala sí é sin. "Is maith lio_____ an siopa," ar sise.

_____uair a chonaic Aoibheann na milseáin ar fad thosaigh sí ag béic_____ arís. "Tá milseáin ua_____," ar sise, "ceann acu sin agus ceann acu sin agus ceann acu sin!" "Ná bac leo sin. ______íl siad go maith duit," arsa Daidí agus amach an doras leo.

"Cá bhfuil_____ ag dul anois?" a d'fhiafraigh Aoibheann tar éis tamaill. "Ag siúl sa _____áirc," arsa Daidí. Bhí Aoibheann breá sásta nuair a chuala sí é sin. "Is maith lio_____ an _____áirc, "ar sise.

Nuair a shoich siad an pháirc scaoil Daidí Aoibheann amach as an _____ugaí. "Seo anois. Tabharf_____ bia do na lach_____ ar dtús," arsa Daidí.

Siúd leo go dtí an loch. Thug Aoibheann arán do na lach_____.

Faoin am seo bhí Daidí bocht tuirseach. "Bí ag rith leat ansin," ar seisean le hAoibheann, "agus léif_____ mise an páipéar. Maith an cailín."

Bhi Aoibheann breá sásta léi féin. Chonaic sí féileacán agus rith sí ina dhiadh. Chonaic sí beach agus rith sí ina diadh. .

Is ansin a chonaic Aoibheann an madra. "A Dhaidí," arsa sise. "Tá Glic anseo. Tá Glic anseo!" Ach níor chuala Daidí í. Bhí sé ag léamh an _____áipéir.

"Tar ans_____, a Ghlic," arsa Aoibheann leis an madra. "Tar ans_____." Ach rith an madra uaithi. Rith Aoibheann ina dhiadh.

Taken from *Cá bhfuil Aoibheann?* (Ní Shiordaín, 2006, pp. 3-8)

English Language Tests

British Picture Vocabulary Scale. This is an example of the BPVS as performed by the children in this study. The children were asked to say the number of the picture that matched the word named by the researcher. Testing stopped when children failed eight or more times in a set of twelve. There are 14 sets and the starting set for each child is based on his/her age as per BPVS guidelines.

Figure 5. An example of The British Picture Vocabulary Scale 2nd Edition.

Writing test—Creativity. This shows the story title list given to the children in this study and the marking guidelines for marking children's stories based on creativity as defined by Foster (1971).

Table 86. The list of 10 titles from which Children chose one and wrote a creative story based on his/her choice.

Choose a title from the list below and write a story based on this title.
1. My pet monkey thinks it is a tiger.
2. The crazy gardener.
3. My teacher stopped teaching.
4. My cat only runs backwards.
5. The postman that only delivered milk.
6. Who lives in no.44?
7. The sleepy blue giraffe.
8. The day the sky was green.
9. The Polliedoddles.
10. What makes a hiccup?

Points to mark on

Creativity

The following marking/score system will apply for the Creativity test: 1 inadequate to 5 Excellent.

1. Fluency—Inadequate=few ideas; Excellent =many ideas (disregarding quality);
2. Flexibility—Inadequate=single, inflexible approach with no expansion of topic; Excellent =wide range of reference and ideas and expansion of topic;
3. Originality—Inadequate=no individuality and stereotypical content; Excellent =unique, unusual, humorous (Foster, 1971).

Writing test—Descriptive. This shows the marking guidelines for children's descriptive explanation of the Raven's test and their part in it.

Points to mark on

The following marking/score system will apply for the *Writing Test—Describe Raven's*: 0 for not explaining the point; 1 for explaining the point somewhat; and 2 for explaining the point well. Paraphrasing any point will suffice it is not necessary to explain it verbatim.

Raven's

1. There are 60/many problems to do;
2. They get harder as we go along;
3. The pattern on the top of the page has a piece missing;
4. Choose one of the six/eight pieces at the bottom of the page to complete the pattern;
5. Only one of the pieces at the bottom of the page is the right pattern;
6. Write the choice number in the blank space where the missing piece should go.

Metalinguistic Tasks

Lexical Fluency task. This shows the recording sheet used for the lexical fluency task performed by the children in this study.

Name:	Date of birth:	School:
Words beginning with the letter:		
F	A	S
Items of clothing:		
Fluency test		
F	A	S

Grammatical Judgement task. This shows the example piece of the Grammatical Judgement task, followed by the test piece of the Grammatical Judgement task performed by the children in this study.

Examples	Right	Wrong	Write the sentence correctly.
The girl is smart.	☑	☐	
The ~~dag~~ barked.	☐	☑	The dog barked
My cat barks.	☑	☐	
I ~~rided~~ my bicycle on the treetops.	☐	☑	I rode my bicycle on the treetops.

Name:		Date of birth:		School:
	Error analysis	**Right**	**Wrong**	**Write the sentence correctly.**
1	The boy is very brave.	☐	☐	
2	I walking to school every day.	☐	☐	
3	Rain is made from chocolate.	☐	☐	
4	I learning to read in karate class.	☐	☐	
5	The girl cut her hair.	☐	☐	
6	The fell boy off the wall.	☐	☐	
7	Apples grow on noses.	☐	☐	
8	The man balls kicks with his ear.	☐	☐	
9	I'm too tired to go swimming.	☐	☐	
10	Rosie and Jim is friends.	☐	☐	
11	Fish walk from place to place.	☐	☐	
12	Has they been eating shoes for lunch?	☐	☐	
13	Vicky, although tired, had a wonderful day.	☐	☐	
14	Beryl and Joan skiing down the mountain.	☐	☐	
15	Jimmy slides on rainbows whenever they appear.	☐	☐	
16	Every night I see the horse jumped over the moon.	☐	☐	
17	The football team sped down the pitch.	☐	☐	
18	I felled the tree and it there lay for weeks.	☐	☐	
19	Some tigers prefer to shop than to hunt.	☐	☐	
20	The shopkeeper gives me sweets when I her give socks.	☐	☐	
21	Angry men in tracksuits were in hot pursuit.	☐	☐	
22	Walking in town alone at night are dangerous.	☐	☐	
23	I think with my feet whenever I do handstands.	☐	☐	
24	When we is thirsty we'll nibble on	☐	☐	

Executive Function Tasks

Flanker Task-Original. This shows examples of the Flanker Task-Original used in this study. The children were asked to press the response key (left or right) that corresponded with the direction of the target fish.

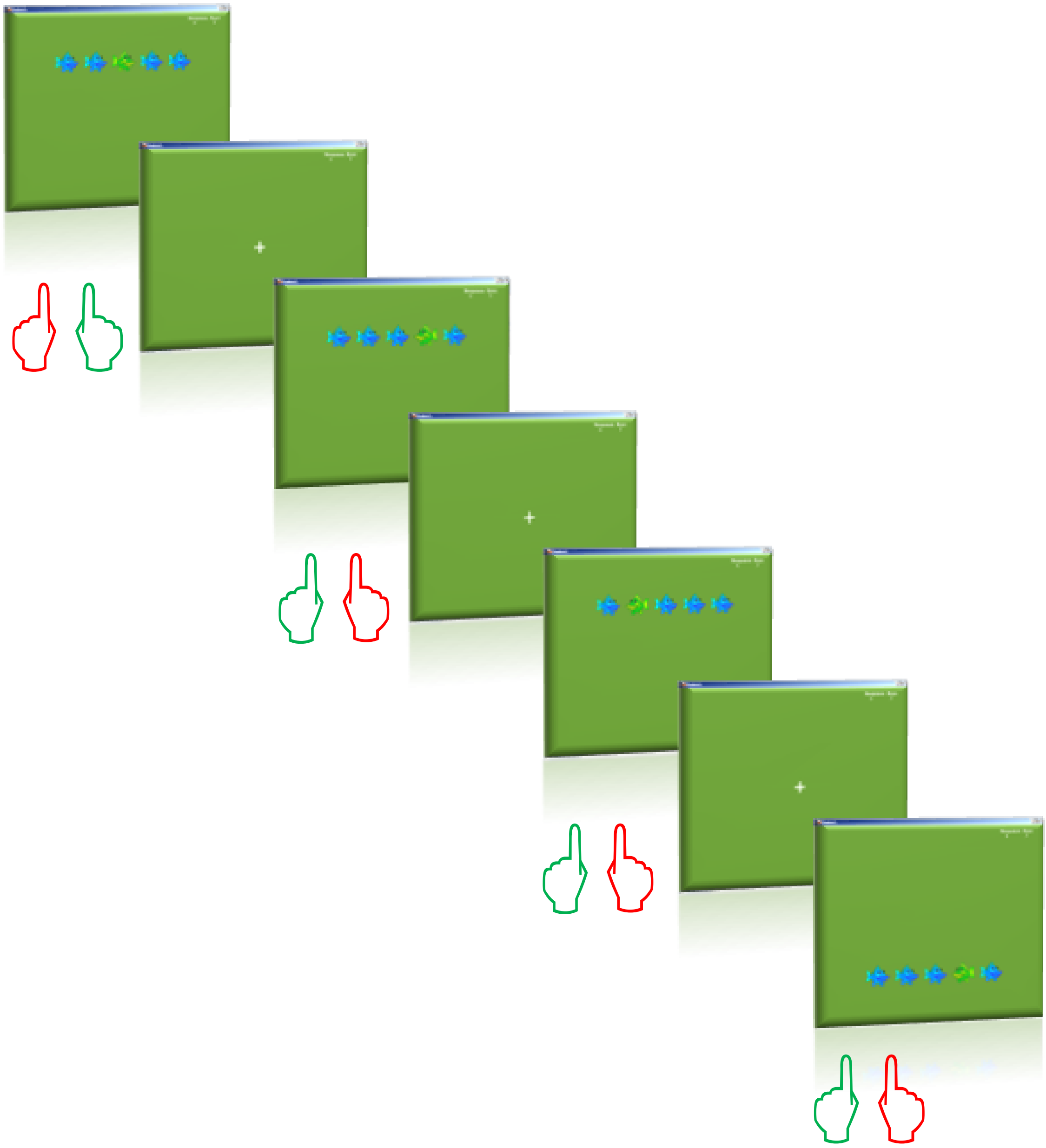

Figure 6. Examples of the Flanker Task-Original which was performed by 12YOs and 8YOs. Hand outlines are colour coded to indicate correct response: Green = Press; Red = Not press. The front example shows an incongruent trial as indicated by the green target fish pointing in the opposite direction of the blue distracter fish.

Flanker Task-Modified. This shows examples from the Flanker Task-Modified used in this study. The children were asked to press the response key (left or right) that corresponded with the direction of the target fish.

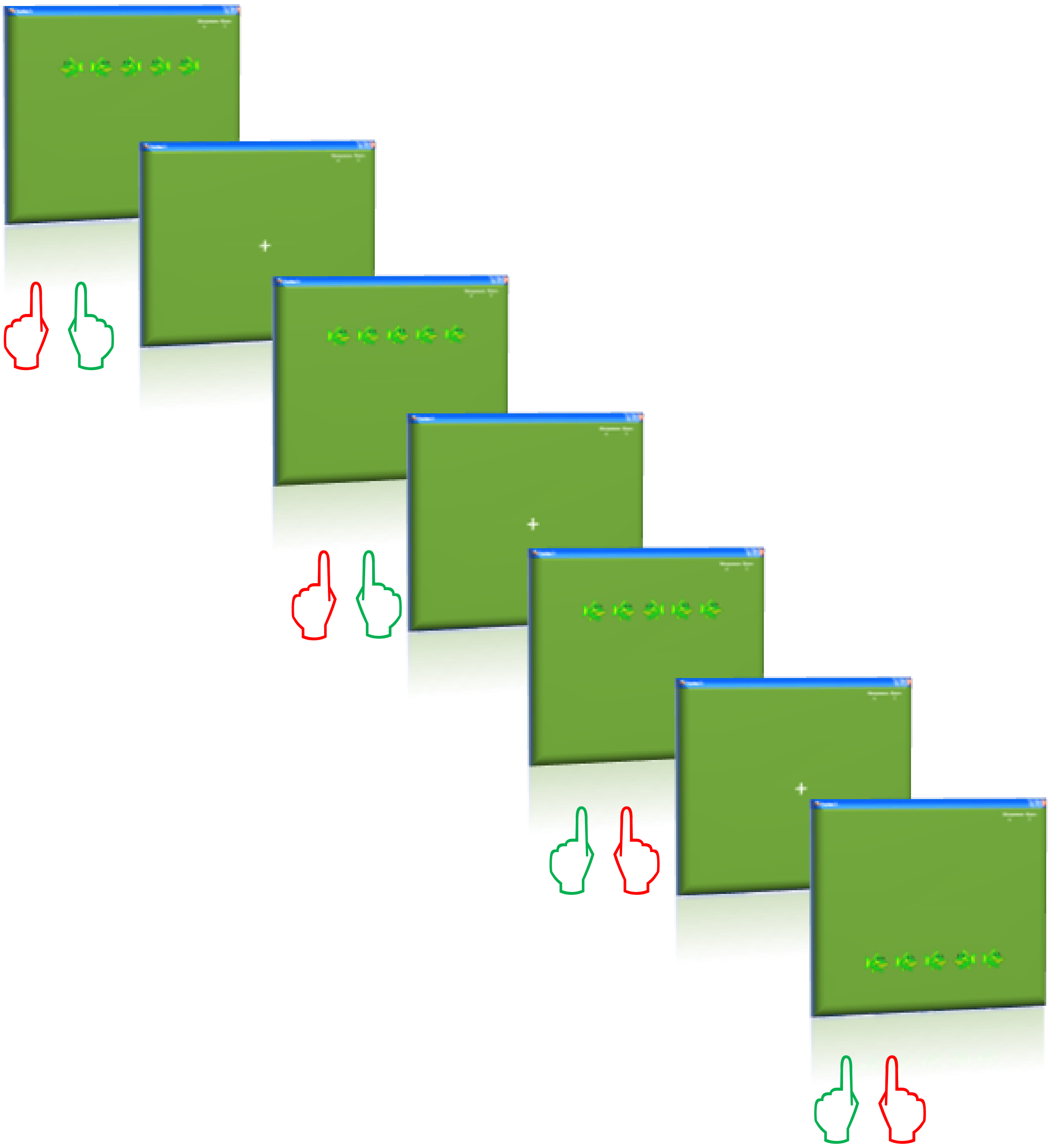

Figure 7. Examples of the Flanker Task-Modified which was performed by 12YOs and 8YOs.
Hand outlines are colour coded to indicate correct response: Green = Press; Red = Not press. The front example shows an incongruent trial as indicated by the green target fish pointing in the opposite direction of the other green distracter fish.

Sustained Attention to Response Task (SART). This shows examples of the SART used in this study. The children were asked to press the response key every time they saw a number except for the number "3".

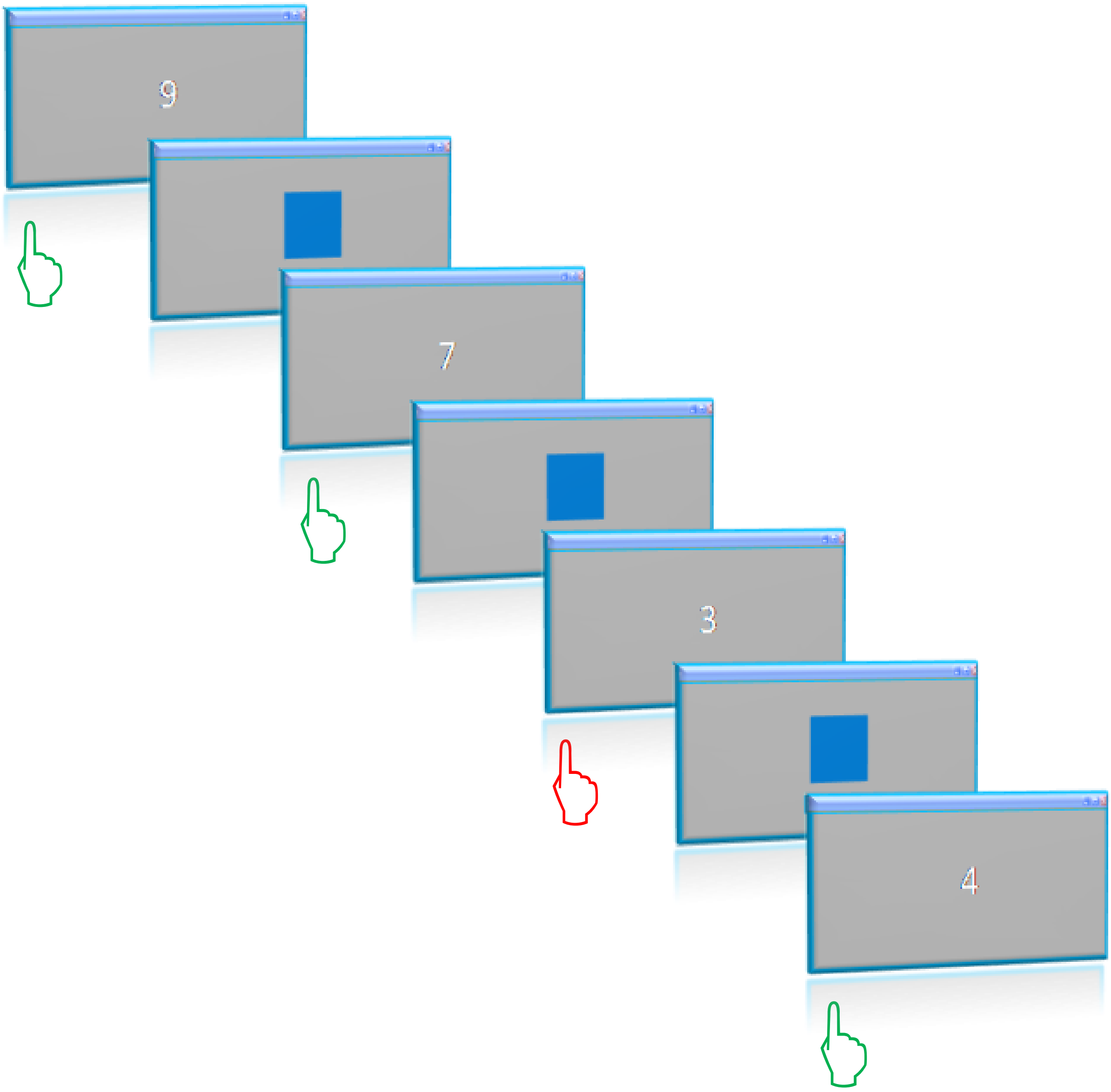

Figure 8. Examples of the Sustained Attention to Response Task (SART) used in this study. Hand outlines are colour coded to indicate correct response: Green = Press; Red = Not press.

Stroop Task-English. The following shows examples of the three trial sets of the Stroop task used in this study. Baseline scores were taken first and the delivery of Word-Match Condition and Colour-Match Condition were counterbalanced. The Stroop Condition were always last to be delivered.

Word-Match Condition.

The children were asked to name the word that appeared on the screen.

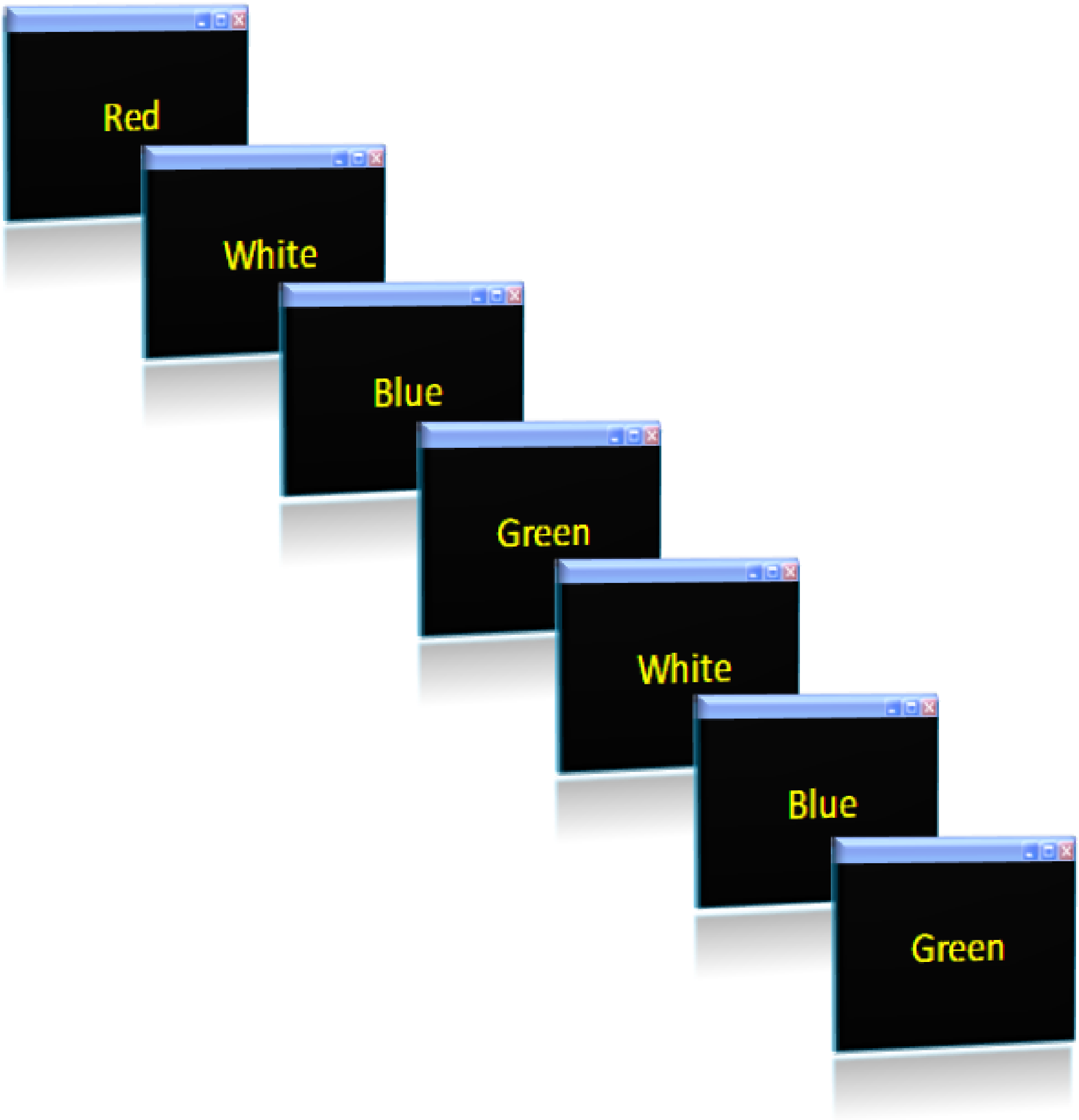

Figure 9. Examples of the Word-Match Condition of the Stroop task used in this study.

Colour-Match Condition.

The children were asked to name the colour that appeared on the screen.

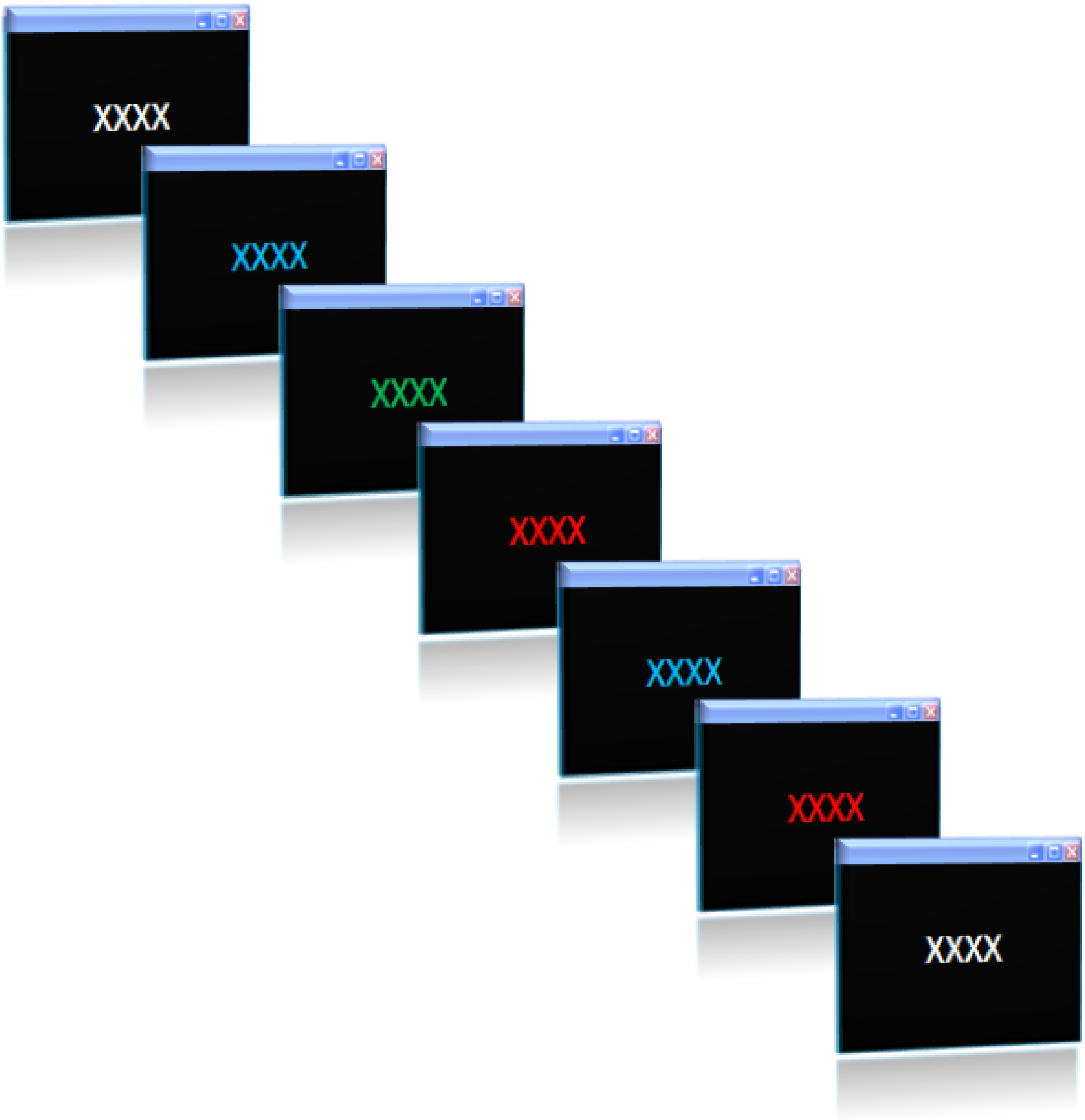

Figure 10. Examples of the Colour-Match Condition of the Stroop task used in this study.

Stroop Condition.

The children were asked to name the colour of the word that appeared on the screen and to be careful not to read the word that appeared on the screen.

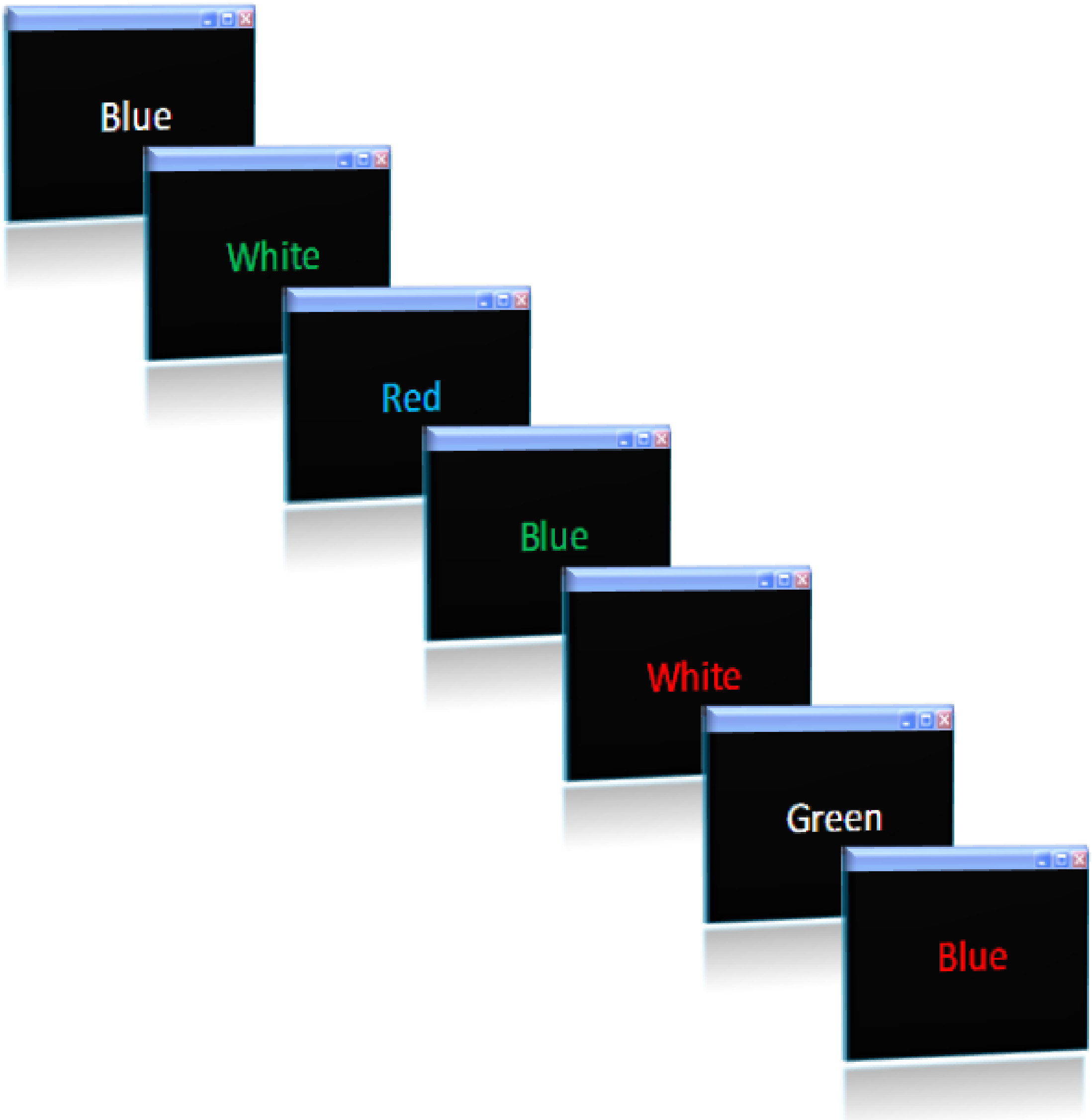

Figure 11. Examples of the Stroop Condition of the Stroop task used in this study.

Order of presentation and answer sheet.

The following answer sheet displays the order of presentation of target stimuli used on the Stroop Task-English and precedes a table displaying the Stroop condition.

Name:			School			
Date of birth:	Date of test:	Age at test:	Class:		Home Language(s):	
Word-Match		Colour-Match		Stroop		
1-48	49-96	1-48	49-96	1-48	49-96	Total scores
☐ White	☐ Blue	☐ Red	☐ Blue	☐ Blue	☐ Red	**Reading trial**
☐ Blue	☐ Red	☐ White	☐ Red	☐ Green	☐ White	Blue =____/24
☐ Red	☐ White	☐ Blue	☐ White	☐ Red	☐ Blue	White =____/24
☐ Green	☐ Green	☐ Green	☐ Green	☐ White	☐ Green	Green =____/24
☐ Blue	☐ White	☐ White	☐ White	☐ Green	☐ White	Red =____/24
☐ White	☐ Green	☐ Blue	☐ Green	☐ Blue	☐ Blue	**Total** =____/96
☐ Red	☐ Red	☐ Green	☐ Red	☐ White	☐ Green	
☐ Green	☐ Blue	☐ Red	☐ Blue	☐ Red	☐ Red	**XXXXs trial**
☐ Red	☐ Red	☐ Blue	☐ Red	☐ Blue	☐ Blue	Blue =____/24
☐ Green	☐ White	☐ White	☐ White	☐ Red	☐ White	White =____/24
☐ Blue	☐ Green	☐ Green	☐ Green	☐ Green	☐ Green	Green =____/24
☐ White	☐ Blue	☐ Red	☐ Blue	☐ White	☐ Red	Red =____/24
☐ Blue	☐ Red	☐ Green	☐ Red	☐ Red	☐ Green	**Total** =____/96
☐ Green	☐ Blue	☐ Red	☐ Blue	☐ Blue	☐ Red	
☐ White	☐ Green	☐ Blue	☐ Green	☐ White	☐ Blue	**Incongruent trial**
☐ Red	☐ White	☐ White	☐ White	☐ Green	☐ White	Blue =____/24
☐ White	☐ Green	☐ Green	☐ Green	☐ White	☐ Green	White =____/24
☐ Red	☐ White	☐ Red	☐ White	☐ Green	☐Red	Green =____/24
☐ Green	☐ Red	☐ White	☐ Red	☐ Blue	☐ White	Red =____/24
☐ Blue	☐ Blue	☐ Blue	☐ Blue	☐ Red	☐ Blue	**Total** =____/96
☐ Green	☐ White	☐ Red	☐ White	☐ Green	☐ Red	
☐ Blue	☐ Red	☐ Green	☐ Red	☐ White	☐ Green	**Any observations:**
☐ Red	☐ Blue	☐ White	☐ Blue	☐ Blue	☐ White	
☐ White	☐ Green	☐ Blue	☐ Green	☐ Red	☐ Blue	
☐ Blue	☐ Red	☐ White	☐ Blue	☐ White	☐ White	
☐ Green	☐ White	☐ Blue	☐ Green	☐ Blue	☐ Green	
☐ Red	☐ Blue	☐ Red	☐ Red	☐ Red	☐ Red	
☐ White	☐ Green	☐ Green	☐ White	☐ Green	☐ Blue	
☐ Green	☐ White	☐ Blue	☐ Green	☐ Blue	☐ Red	
☐ Blue	☐ Blue	☐ White	☐ Blue	☐ White	☐ Blue	
☐ White	☐ Green	☐ Red	☐ White	☐ Red	☐ Green	
☐ Red	☐ Red	☐ Green	☐ Red	☐ Green	☐ White	
☐ Blue	☐ Blue	☐ Red	☐ Blue	☐ Red	☐ Red	
☐ Red	☐ White	☐ Green	☐ Red	☐ Green	☐ White	
☐ Green	☐ Green	☐ Blue	☐ Green	☐ Blue	☐ Green	
☐ White	☐ Red	☐ White	☐ White	☐ White	☐ Blue	
☐ Red	☐ Green	☐ Blue	☐ Red	☐ Blue	☐ Green	
☐ Blue	☐ Red	☐ Green	☐ Blue	☐ Green	☐ White	
☐ White	☐ Blue	☐ White	☐ White	☐ White	☐ Red	
☐ Green	☐ White	☐ Red	☐ Green	☐ Red	☐ Blue	
☐ White	☐ Green	☐ White	☐ White	☐ White	☐ White	
☐ Green	☐ Red	☐ Red	☐ Green	☐ Red	☐ Red	
☐ Blue	☐ White	☐ Green	☐ Blue	☐ Green	☐ Blue	
☐ Red	☐ Blue	☐ Blue	☐ Red	☐ Blue	☐ Green	
☐ Green	☐ Red	☐ Green	☐ Green	☐ Green	☐ Blue	
☐ White	☐ Green	☐ Blue	☐ White	☐ Blue	☐ Red	
☐ Blue	☐ White	☐ Red	☐ Blue	☐ Red	☐ White	
☐ Red	☐ Blue	☐ White	☐ red	☐ White	☐ Green	

Figure 12. The answer sheet for the Stroop Task-English.

Stroop condition.

This table displays the presentation order of the target stimuli on the Stroop condition. It also highlights the colour-words that appear on the screen as per the colour in which they are printed.

Table 87. The presentation order of colour-words on the Stroop Task-English as per colour in which they are printed.

Presentation Order of Colour-words on the Stroop Task-English				
1	Red	Blue	White	Green
2	White	Red	Blue	Green
3	Green	Blue	White	Red
4	Green	White	Red	Blue
5	Blue	Red	Green	White
6	White	Blue	Red	Green
7	Green	Red	Blue	White
8	White	Red	Green	Blue
9	Green	Red	White	Blue
10	Green	Blue	Red	White
11	Green	White	Blue	Red
12	Red	White	Green	Blue
13	White	Blue	Green	Red
14	Red	Green	White	Blue
15	White	Green	Red	Blue
16	Blue	White	Red	Green
17	Red	Green	Blue	White
18	Blue	White	Green	Red
19	Red	White	Blue	Green
20	White	Green	Blue	Red
21	Blue	Green	Red	White
22	Blue	Red	White	Green
23	Blue	Green	White	Red
24	Red	Blue	Green	White

Stroop Task-Irish. The following shows examples of the three trial sets of the Stroop task used in this study. Baseline scores were taken first and the delivery of Word-Match Condition and Colour-Match Condition were counterbalanced. The Stroop Condition were always last to be delivered.

Word-Match Condition.

The children were asked to name the word that appeared on the screen.

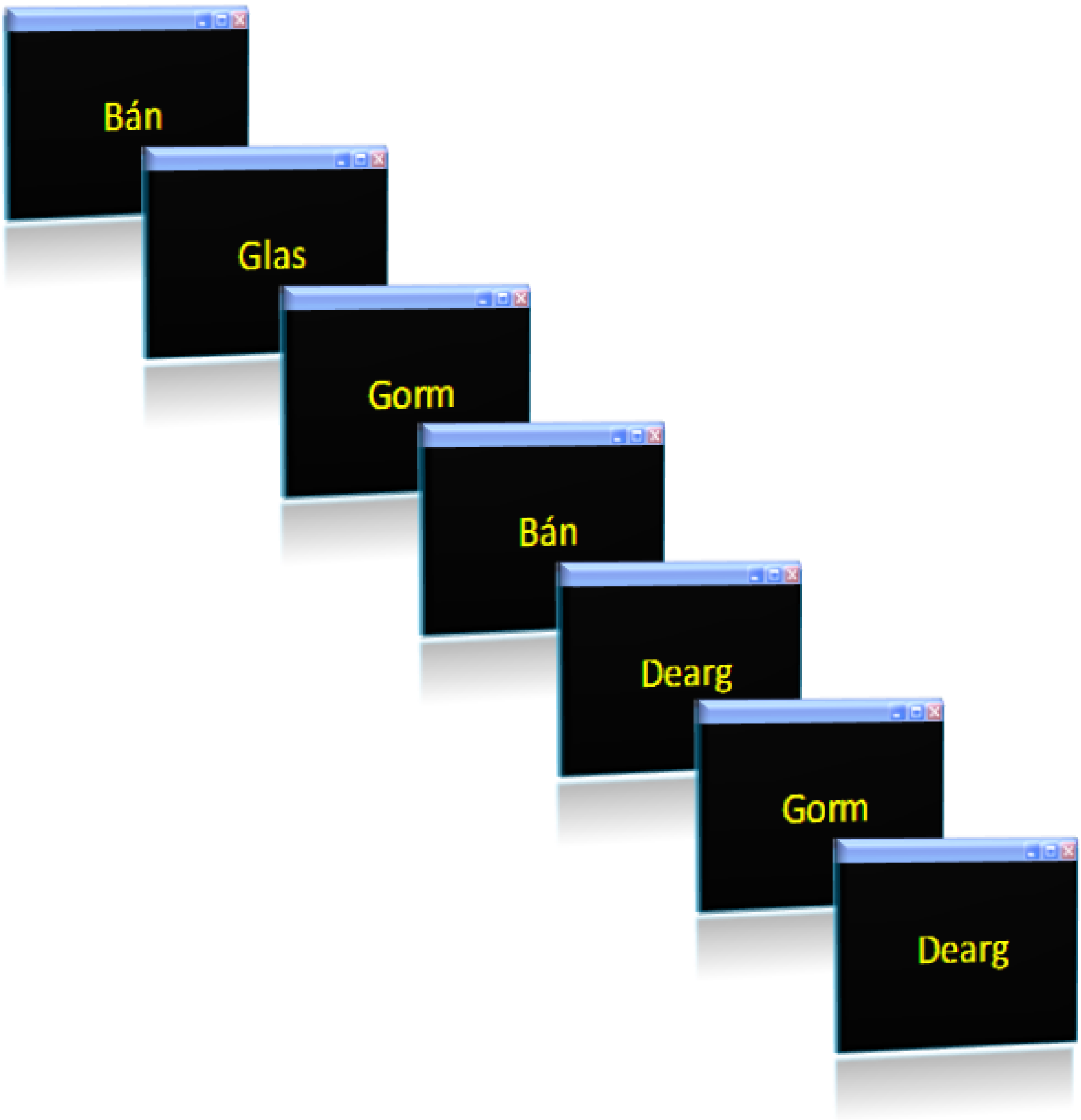

Figure 13. Examples of the Word-Match Condition of the Stroop task used in this study.

Colour-Match Condition.

The children were asked to name the colour that appeared on the screen.

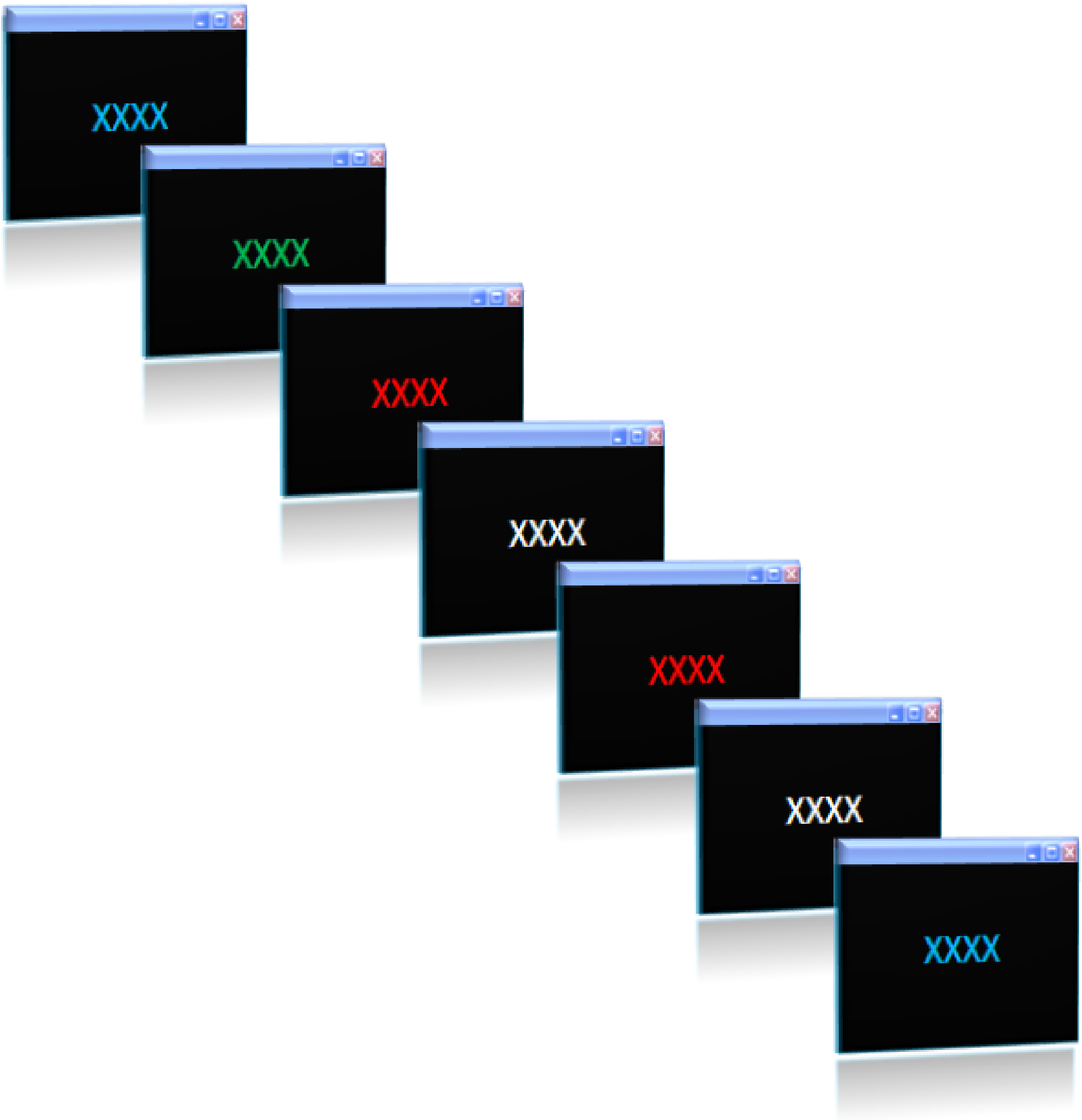

Figure 14. Examples of the Colour-Match Condition of the Stroop task used in this study.

Stroop Condition.

The children were asked to name the colour of the word that appeared on the screen and to be careful not to read the word that appeared on the screen.

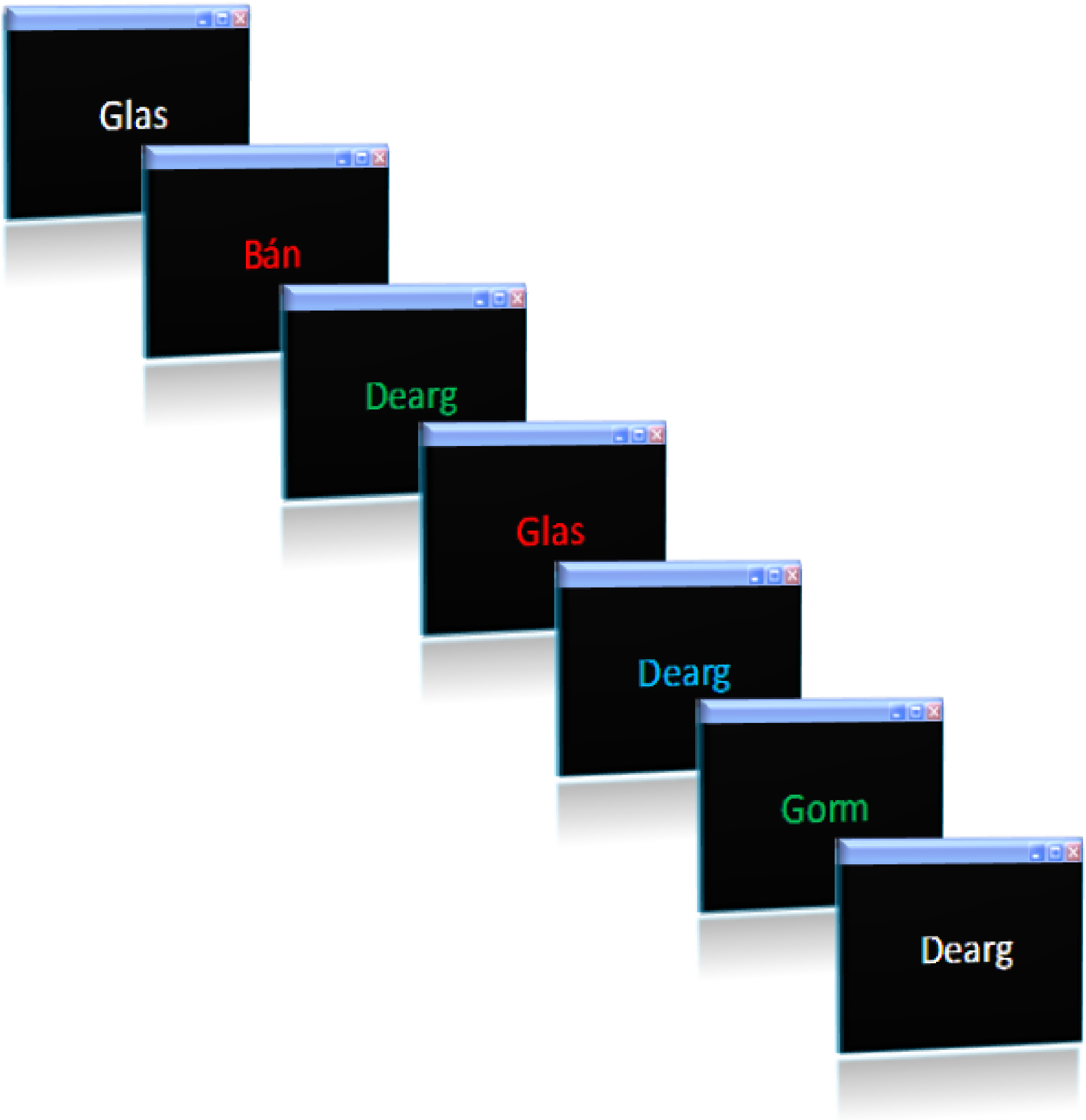

Figure 15. Examples of the Stroop Condition of the Stroop task used in this study

Order of presentation and answer sheet.

The following answer sheet displays the order of presentation of target stimuli used on the Stroop Task-Irish and precedes a table displaying the Stroop condition.

Name:			School	
Date of birth:	Date of test:	Age at test:	Class:	Home Language(s):

Word-Match		Colour-Match		Stroop	
1-48	49-96	1-48	49-96	1-48	49-96
☐ Glas	☐ Bán	☐ Bán	☐ Gorm	☐ Glas	☐ Gorm
☐ Bán	☐ Gorm	☐ Dearg	☐ Bán	☐ Dearg	☐ Bán
☐ Gorm	☐ Glas	☐ Gorm	☐ Dearg	☐ Bán	☐ Glas
☐ Dearg	☐ Dearg	☐ Glas	☐ Glas	☐ Gorm	☐ Dearg
☐ Bán	☐ Glas	☐ Bán	☐ Bán	☐ Glas	☐ Gorm
☐ Glas	☐ Dearg	☐ Glas	☐ Glas	☐ Dearg	☐ Glas
☐ Gorm	☐ Gorm	☐ Gorm	☐ Dearg	☐ Bán	☐ Bán
☐ Dearg	☐ Bán	☐ Dearg	☐ Gorm	☐ Glas	☐ Dearg
☐ Gorm	☐ Gorm	☐ Gorm	☐ Dearg	☐ Bán	☐ Glas
☐ Dearg	☐ Glas	☐ Glas	☐ Glas	☐ Dearg	☐ Gorm
☐ Bán	☐ Dearg	☐ Dearg	☐ Gorm	☐ Gorm	☐ Dearg
☐ Glas	☐ Bán	☐ Bán	☐ Bán	☐ Dearg	☐ Bán
☐ Bán	☐ Gorm	☐ Glas	☐ Dearg	☐ Bán	☐ Glas
☐ Dearg	☐ Bán	☐ Gorm	☐ Gorm	☐ Glas	☐ Dearg
☐ Glas	☐ Dearg	☐ Dearg	☐ Glas	☐ Bán	☐ Bán
☐ Gorm	☐ Glas	☐ Bán	☐ Bán	☐ Gorm	☐ Gorm
☐ Glas	☐ Dearg	☐ Glas	☐ Glas	☐ Glas	☐ Dearg
☐ Gorm	☐ Glas	☐ Dearg	☐ Bán	☐ Bán	☐ Gorm
☐ Dearg	☐ Gorm	☐ Gorm	☐ Dearg	☐ Gorm	☐ Bán
☐ Bán	☐ Bán	☐ Bán	☐ Gorm	☐ Bán	☐ Glas
☐ Dearg	☐ Glas	☐ Dearg	☐ Bán	☐ Gorm	☐ Bán
☐ Bán	☐ Gorm	☐ Bán	☐ Dearg	☐ Dearg	☐ Gorm
☐ Gorm	☐ Bán	☐ Glas	☐ Glas	☐ Glas	☐ Dearg
☐ Glas	☐ Dearg	☐ Gorm	☐ Bán	☐ Gorm	☐ Glas
☐ Bán	☐ Gorm	☐ Bán	☐ Glas	☐ Bán	☐ Dearg
☐ Dearg	☐ Glas	☐ Gorm	☐ Gorm	☐ Glas	☐ Bán
☐ Gorm	☐ Bán	☐ Dearg	☐ Bán	☐ Gorm	☐ Gorm
☐ Glas	☐ Dearg	☐ Glas	☐ Dearg	☐ Bán	☐ Glas
☐ Dearg	☐ Glas	☐ Bán	☐ Glas	☐ Glas	☐ Bán
☐ Bán	☐ Bán	☐ Gorm	☐ Gorm	☐ Dearg	☐ Glas
☐ Glas	☐ Dearg	☐ Dearg	☐ Bán	☐ Gorm	☐ Dearg
☐ Gorm	☐ Gorm	☐ Glas	☐ Dearg	☐ Dearg	☐ Bán
☐ Bán	☐ Bán	☐ Dearg	☐ Gorm	☐ Glas	☐ Gorm
☐ Gorm	☐ Glas	☐ Gorm	☐ Glas	☐ Dearg	☐ Dearg
☐ Dearg	☐ Dearg	☐ Glas	☐ Dearg	☐ Bán	☐ Gorm
☐ Glas	☐ Gorm	☐ Bán	☐ Bán	☐ Glas	☐ Glas
☐ Gorm	☐ Dearg	☐ Gorm	☐ Dearg	☐ Bán	☐ Dearg
☐ Bán	☐ Gorm	☐ Glas	☐ Bán	☐ Dearg	☐ Bán
☐ Glas	☐ Bán	☐ Bán	☐ Gorm	☐ Gorm	☐ Gorm
☐ Dearg	☐ Glas	☐ Dearg	☐ Glas	☐ Bán	☐ Glas
☐ Glas	☐ Dearg	☐ Bán	☐ Bán	☐ Gorm	☐ Gorm
☐ Dearg	☐ Gorm	☐ Glas	☐ Gorm	☐ Bán	☐ Dearg
☐ Bán	☐ Glas	☐ Dearg	☐ Glas	☐ Dearg	☐ Gorm
☐ Gorm	☐ Bán	☐ Gorm	☐ Dearg	☐ Glas	☐ Dearg
☐ Dearg	☐ Gorm	☐ Glas	☐ Glas	☐ Gorm	☐ Bán
☐ Glas	☐ Dearg	☐ Gorm	☐ Bán	☐ Dearg	☐ Glas
☐ Bán	☐ Glas	☐ Bán	☐ Gorm	☐ Glas	☐ Gorm
☐ Gorm	☐ Bán	☐ Dearg	☐ Dearg	☐ Bán	☐ Glas

Total scores	
Reading trial	
Blue	=___/24
White	=___/24
Green	=___/24
Red	=___/24
Total	=___/96
XXXXs trial	
Blue	=___/24
White	=___/24
Green	=___/24
Red	=___/24
Total	=___/96
Incongruent trial	
Blue	=___/24
White	=___/24
Green	=___/24
Red	=___/24
Total	=___/96
Any observations:	

Figure 16. The answer sheet for the Strop-Irish task.

Stroop condition.

This table displays the presentation order of the target stimuli on the Stroop condition. It also highlights the colour-words that appear on the screen as per the colour in which they are printed.

Table 88. The presentation order of colour-words on the Stroop Task-Irish as per colour in which they are printed.

Presentation Order of Colour-words on the Stroop Task-Irish				
1	Gorm	Glas	Dearg	Bán
2	Dearg	Gorm	Glas	Bán
3	Glas	Bán	Dearg	Gorm
4	Dearg	Bán	Gorm	Glas
5	Gorm	Glas	Bán	Dearg
6	Dearg	Glas	Gorm	Bán
7	Gorm	Bán	Dearg	Glas
8	Dearg	Gorm	Bán	Glas
9	Bán	Gorm	Dearg	Bán
10	Glas	Gorm	Glas	Dearg
11	Bán	Dearg	Glas	Gorm
12	Bán	Gorm	Dearg	Glas
13	Glas	Dearg	Bán	Gorm
14	Bán	Gorm	Dearg	Glas
15	Dearg	Bán	Gorm	Glas
16	Gorm	Glas	Dearg	Bán
17	Gorm	Bán	Glas	Dearg
18	Glas	Dearg	Bán	Gorm
19	Dearg	Gorm	Glas	Bán
20	Dearg	Bán	Glas	Gorm
21	Glas	Gorm	Bán	Dearg
22	Glas	Gorm	Dearg	Bán
23	Glas	Bán	Dearg	Gorm
24	Glas	Gorm	Bán	Dearg

Children's Questionnaires

Children's attitudes towards language use

Now I'm going to ask you some questions. You just relax and answer as best you can. Ok?

1. What is your name?____________________
2. What is your teacher's name? ____________________
3. What is the name of your school? ____________________

Easy, huh? The next questions are little trickier though but with these questions you are the only person who knows all the answers. These questions are about what you do and what you think. Ok? So again, you just relax and answer them as best you can?

What languages can you speak? English☐ Irish☐ Other____________________

4. What language do you speak to your
(Only English☐ Mostly English/some Irish☐ English and Irish equally☐ Mostly Irish/some English☐ Only Irish☐)

a. Mother	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
b. Father	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
c. Teacher	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
d. Sisters/brothers	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
e. Extended family	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
f. School friends in class	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
g. School friends in playground	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
h. School friends outside of school	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
i. Other friends outside of school	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________
j. Neighbours	OE ☐	MESI ☐	EIE ☐	MISE ☐	OI☐	Why? ________

5. Do you like to speak in Irish? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ☐____________
Why/why not? ____________________
6. Do you like to read/write in Irish? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ____________
Why/why not? ____________________
7. Do you like to learn in Irish? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ☐____________
Why/why not? ____________________

8. Do you like to speak in English? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ☐____________
Why/why not? ____________________
9. Do you like to read/write in English? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ☐____________
Why/why not? ____________________
10. Do you like to learn in English? Yes ☐ No ☐ Don't care ☐ don't know ☐ other ☐____________
Why/why not? ____________________

11. What language would you prefer to learn through?
English☐ Irish☐ both English and Irish☐ don't know☐ Don't care☐ other ☐____________
Why? ____________________
12. What language do you think is better to learn through?
English☐ Irish☐ both English and Irish☐ don't know☐ other ☐____________
Why? ____________________

13. Do you think it is important to be able to speak Irish? Yes ☐ No ☐ don't know ☐
Why/why not? ____________________
14. Do you think many people in Ireland speak Irish? Yes ☐ No ☐ don't know ☐
Why? ____________________
15. What language do you think everyone in Ireland should speak?
English☐ Irish☐ both English and Irish☐ don't know☐ other ☐____________
Why? ____________________
16. And what about people in Ireland who speak other languages?
Do you think they should learn English or Irish or both? Yes ☐ No ☐ don't know ☐ other ☐________
Why? ____________________

Ok! Thanks for that. Is there anything that you would like to add?
(Use this place for any observations.)
____
____
____
____

Appendix 5: Irish Language Tests Analyses

Irish Language Tests

Three non-standardised tests were used to measure children's L2 vocabulary and reading and writing skills: Irish Vocabulary Test (IVT) 1 and 2 and Irish Cloze test. Whereas, the IVTs provided measurements of aural receptive L2 skills, the Cloze test provided a measurement of reading and writing skills. First the 12YOs, then the 8YOs.

12YOs correlational analyses of background variables. Analyses of Gender and SES revealed no correlations on measurements of L2 skills. However, there were correlations between (i) Homework Help Time and IVT2 accuracy, $r(41) = .738$, $p < .001$, and IVT2 Rate, $r(41) = -.309$, $p = .050$, and (ii) Raven's and IVT1, $r(41) = .336$, $p = .032$, and Irish Cloze test, $r(44) = .311$, $p = .040$ (see Table 89). In line with this pattern of results, in the main analyses, the Homework Help Time and Raven's measures were used as covariates on the aforementioned variables in which they significantly correlated.

Table 89. Correlations among background variable and L2 vocabulary and reading and writing skills scores. ***<.001, *<.05 level (2-tailed).

Correlations Among Background and L2 Skills

Measures	1	2	3	4	5	6	7	8
1.Gender	-							
2.Homework Help Time	.245*	-						
3.SES	-.055	-.121	-					
4.Raven's	-.050	-.295*	.220	-				
5.IVT1	-.129	.038	.119	.336*	-			
6.IVT2	.241	.738***	-.135	-.058	-	-		
7.IVT2 Rate	-.227	-.309*	.225	.071	-	-.454**	-	
8.Cloze	.263	.160	-.054	.311*	-	.536**	-.309*	-

12YOs comparative analyses. Four one-way between-groups analysis of covariance (DVs: scores on IVT1, IVT2, IVT2 Rate, Cloze) were conducted to compare children's L2 abilities.

Results from main analyses (see Table 90) revealed three language group differences. As can be expected, post hoc comparisons showed that immersion children performed better than EM(south) children as measured by the IVT1, IVT2, and the Cloze test. Although there was no difference between groups on speed of IVT2, these results, overall, show a clear distinction between groups based on their knowledge of Irish, children's L2.

Table 90. Adjusted means (Std Error) and statistical analyses of children's L2 vocabulary and reading and writing skills scores. ***<.001, **<.01, *<.05 level (2-tailed). Covariate = Raven's for IVT1 and Cloze, and Homework Help Time for IVT2 and IVT2 Rate.

	L2 Skills					
	Adjusted Means (Std Error)		Schools		Covariate	
Fluency (N)	Immersion	EM(south)	F	ηp^2	F	ηp^2
IVT1 (27, 14)	79.7 (3.07)	56.2 (4.45)	16.9***	.307	0.09	.002
IVT2 (20, 21)	82.5 (3.28)	54.4 (3.15)	22.5***	.372	0.55	.014
IVT2 Rate (20, 21)	312 (33.4)	394 (32.0)	1.84	.046	0.14	.004
Cloze (22, 22)	66.4 (3.00)	56.4 (3.00)	5.36*	.116	7.79**	.160

Additionally, in consideration of the covariates, whereas Raven's was significantly related to the Cloze test, the remaining measures showed no significant effect of the covariates and accounted for less than 1.5% of the variance.

8YOs correlational analyses of background variables. There was one correlation only— SES and IVT1, $r(41) = .738$, $p < .001$. (See Table 91.) Therefore, SES was the only covariate used and was used for analyses of IVT1 only.

Table 91. Correlations among background variable and L2 vocabulary and reading and writing skills scores. ***<.001, **<.01 *<.05 level (2-tailed).

Correlations Among Background and L2 Skills							
Measures	1	2	3	4	5	6	7
1.Gender	-						
2.Homework Help Time	.053	-					
3.SES	-.016	-.055	-				
4.Raven's	-.127	-.322**	.303**	-			
5.IVT1	-.048	.002	.525*	.073	-		
6.IVT2	-.015	-.099	.109	.005	-	-	
7.Cloze	-.203	-.163	.065	.158	-	.745***	-

8YOs comparative analyses. One one-way between-groups analysis of covariance (DV: scores on IVT1) and three independent-samples t-tests were conducted to compare children's L2 abilities.

Results from main analyses (see Table 92) revealed three language group differences. As can be expected, comparisons showed that immersion children performed better than EM(south) children as measured by the IVT1, IVT2, and Cloze test, showing a clear distinction between groups based on their knowledge of Irish, children's L2. The covariate, SES, was found to have no significant effect upon children's L2 skills, as measured by IVT1.

Table 92. Adjusted means (Std Error), and means (SD)†, and statistical analyses of children's L2 vocabulary and reading and writing skills scores. ***<.001, *<.05 level (2-tailed).

L2 Skills						
			Schools		SES	
Measures (N)	Immersion	EM(south)	*F/t*	ηp^2	*F*	ηp^2
IVT1 (12, 12)	58.9 (1.49)	35.0 (1.64)	105***	.846	2.31	.108
IVT2 (27, 28)†	48.4 (9.80)	26.7 (8.46)	8.80***	.372	-	-
Cloze (24, 28)†	15.2 (9.80)	9.04 (3.64)	5.05*	.116	-	-

Appendix 6 Test Scripts

The following shows the test scripts used to perform the tests carried out in this study. Great care was taken to assure as little deviation as possible from the scripts.

Test scripts.

Non-Verbal.

1. Raven's.

Do you all have one of the booklets I have been handing out? And do you all have a pen or a pencil to write with? Ok. First thing to do is put your name on the first page of the booklet. Has everyone done that?

Now we'll start the test. This is a test which looks at how we see and think about things. There are 60 problems to do and they get harder as we go along. So pay lots of attention from the start. Let's look at the first problem together shall we?

The pattern on the top of the page has a piece missing [point to the picture]. And we have to choose which of the six pieces at the bottom of the page [point to all of the pictures] completes the pattern. All the pieces are the right shape but only one of the pieces is the right pattern. Can anyone tell which piece completes the pattern?

Number 1 is the right shape but not the right pattern. Number 2 is no pattern at all. Number 3 is totally wrong. So is Number 5. Number 6 is nearly right. But it is wrong too. The answer is Number 4. It completes the pattern of the top page.

What we do now is write '4' in the blank space [point to blank space] where the missing piece should go. Can everyone do that and show me. Fantastic!

Let's look at the second problem together shall we?

The answer is definitely Number 5 because the rest of the pieces at the bottom of the page are no pattern at all. And what we do now is? Write 5 in the blank space in the pattern at the top of the page. Can everyone do that and show me. Excellent! Does anyone have any questions so far?

Ok. Now I want everyone to try the third pattern by themselves. Can you all show me what you have done? Great.

Now I want everyone to do the rest of the test by him/herself. And that means no checking out your neighbour's work. If you make a mistake just cross it out and write in your new answer. Make sure you don't skip any answers and if you are not sure just make a guess, sometimes guesses are right. Go as far as you can in this test but if for any reason you want to stop just stop.

And remember to work at your own pace.

English Skills

2. NARA-R.

(As from page 9+)

"I want you to read some stories aloud and answer some questions on these stories. I'll help you at difficult words if you need help. I'm going to time you but you shouldn't read too fast because this can mix us up. It is more important that you read as best as you can and at the end of reading I'll ask you for your favourite story. But, first we will read a practice story."

Practice passage:

"Read this story to me first so that you understand what we are going to do. I will help you with any words you don't know. I will also ask you some questions about the story when you finish."

Testing:

"Look at this picture and then read the story to me. If you come to a hard word, try it aloud to yourself before I help you. I am going to record the time it takes you to read, but it is more important to read carefully and to remember what you read. At the end I will ask you some questions, so try to remember the story as you read it."

Stop testing if the child makes 20 errors (16 in first passage, 30 in extended passage).

3. Picture vocabulary test—English.

"I want you to look at some pictures with me. See all the pictures on this page?" [Point to all of the pictures.] "I will say a word; I want you to tell me which picture matches the word I say. Let's try one shall we? Ball. And another. Dog." (Use Training Plate A and B for children under 8 YO and C and D for over 8 YO.)

Stop testing if the child makes 8 or more errors in a set.

4. Creative writing test.

"I want you to write me a story. You can be as creative and silly and mad and weird as you like. The more creative the better. You are the boss! Choose a title from the list [point to the list] and write a story based on this title.

5. Descriptive writing test—Raven's

"Now I want you to write me another story. But this is a bit different from the story you just wrote. Do you remember the first test we all did in class? Ok. I want you to explain to me what it was you had to do in that test. Write it for me. Pretend that you are writing this story for someone who has never seen the test before. So you will have to explain it in as much detail as you are able."

Irish skills.

6. Picture vocabulary test—Irish.

"I want you to look at some pictures with me. See all the pictures on this page?" [Point to all of the pictures.] "I will say a word, but this time I will say the word in Irish; I want you to tell me which picture matches the word I say. Let's try one shall we? *Mór* (Big) and another. *Beag* (Small)."

(Continue to the end of the slideshow, unless it's too stressful or difficult for the participant.)

7. Cloze Test.

"I want you to look at some sentences for me. Some of the words have some letters missing [point to a blank space]. Sometimes a word could be missing one letter, or two, but never more than four letters. When you decide the answer I want you to fill in the missing letters on the lines [point to the blank space again].

Just right the letter or letters that are missing there is no need to right out the full word. If you make a mistake just cross it out and have another go.

[Then give three examples]. So for this word we right the letters XXX in the blank space. Got it? Ok. Can you finish the remaining sentences for me please?"

Metalinguistic skills

8. Grammatical Judgement

"Here are some sentences for you to have a look at [show the example list]. Some of them are wrong but some of them are right. Some of them are silly but that's ok, they are still right. Look at this list [show example list]. When the sentence is wrong we tick the 'wrong' box and write the sentence down as it should be written. But if the sentence is right we tick the 'right' box and move on to the next sentence. Do you see?

Now I want you to look at these sentences [give sentence list] and think about whether they are right or wrong. If the sentence is wrong, tick the 'wrong' box and write the sentence down as it should be written. If the sentence is right just tick the 'right' box and move on to the next sentence. And remember some of the sentences are wrong but some of them are right. Some of them are silly but that's ok, they are still right."

9. Fluency test (Remember to counter balance delivery.)

1	**2**	**3**	**4**	**5**	**6**
F	A	A	S	S	F
A	F	S	A	F	S

"Ok. Now we'll do some more tests.

(a) "Now we will play a naming game. You have 60 seconds to name as many items of clothing as you can think of. These words can start with any letter. Ok?

Ready, steady, go!"

(b) "Fantastic. Now I'm going to say a letter and I want you to name as many <u>words</u> as you can that start with that letter. You will have 60 seconds to do this. So if I were to say the letter 'T' you could say 'Telly, toaster, truck'. Ok?

So, please name as many words as you can that begin with the letter: F. A. S."

Executive functioning

10. Flanker Task-Original and -Modified.

Initiate the program with pertinent information completed and you are on the practice stage.

First block (alternate colours).

"Now we are going to play a game called feed the fish. I want you to look at the screen which shows some fishes. We are looking for the green fish who is with four of his/her blue friends. We need to feed the green fish because she/he is very, very hungry. But she/he keeps moving and disappearing on us. So we must look really hard at the screen.

The hungry fish will always be here, here, or here [point to the appropriate areas; position 2, 3, and 4 out of 5]. And when she/he appears we will feed her/him by pressing these buttons [point to appropriate buttons A and L]. When the hungry fish is facing to the left [point] press this button [point to A] and when she/he is facing right [point right] press this button [point to L].

Let's have a practice go shall we? And listen to how happy she/he is when we feed her/him [demonstrate] and how sad she/he is when we don't feed her/him [demonstrate].

That's it. I think you understand how it works. Let's do it for real. This time you will have to feed the fish lots of times. Ready? Go!"

Second block (all same colour).

"Now we will do it again except this time all the fish are the same colour.

So remember the hungry fish will always be here, here, or here [point to the appropriate areas; position 2, 3, and 4 out of 5], and if she/he is pointing left [point] press this button [point to A] and if she/he is pointing right [point] press this button [point to L].

But sometimes the hungry fish is facing the same way as her/his friends. And then it's very hard to know which fish is the hungry fish. When this happens just press the button that shows the way all the fish are facing.

Let's have a practice go shall we? And, again, listen to how happy she/he is when we feed her/him [demonstrate] and how sad she/he is when we don't feed her/him [demonstrate].

That's it. I think you understand how it works. Let's do it for real. This time you will have to feed the fish lots of times. Ready? Go!"

11. SART.

"Let's play another game on the computer. This time I will show you numbers 1 to 9 but I will show these numbers one at a time. I want you to press this button [point to spacebar] as quickly as possible each time you see one of these numbers—except when you see number 3. When you see number 3 don't press anything; just wait until number 3 disappears and the next number appears. Hit the button [point to spacebar] if this is not number 3. Let's have a practice go shall we? That's it. I think you understand how it works. Let's do it for real. This time you will have lots of goes. Ready? Go!"

12. and 13. Stroop test English and Stroop Test Irish. (Remember to counter balance delivery of Irish and English, and Baseline Trials A and B.)

First explain that this test has to be performed in English or Irish.

"Now we will play another game on the computer. This time you must read some words that appear on screen and name some colours that appear on screen. Let's have a practice at the first round."

Practice 1.

"Please read the <u>word</u> that appears on the screen. When you have read the word hit this button [point to spacebar] to bring up the next word. Read this new word and hit the button again [point to spacebar]. Keep doing this until the end. Ready? Go!"

Baseline Trial A.

"Excellent! Ok practice is over. Let's do it for real now. So, same as before, please read the <u>word</u> that appears on the screen. When you have read the word hit this button [point to spacebar] to bring up the next word. Read this new word and hit the button again [point to spacebar]. Keep doing this until the end. This time you have 60 seconds to get as many as you can. Ready? Go!"

Practice 2.

"Brilliant! Ok, Round 2. This time you must name some colours that appear on screen. Let's have a practice at this round shall we? Please name the <u>colour</u> that appears on the screen. When you have named the colour hit this button [point to spacebar] to bring up the next colour. Name this new colour and hit the button again [point to spacebar]. Keep doing this until the end. Ready? Go!"

Baseline Trial B

"Excellent! Ok practice is over. Let's do it for real now. So, same as before, please name the <u>colour</u> that appears on the screen. When you have named the colour hit this button [point to spacebar] to bring up the next colour. Name this new colour and hit the button again [point to spacebar]. Keep doing this until the end. You have 60 seconds to get as many as you can. Ready? Go!"

Practice 3.

"Terrific! Right, Round 3. And this round is the hardest. So we must be extra careful. Ok? This time you must name some colours that appear on screen. Don't read the word, just name the colour of the word. Let's have a practice at this round shall we? Please name the <u>colour</u> that appears on the screen. When you have named the colour hit this button [point to spacebar] to bring up the next colour. Name this new colour and hit the button again [point to spacebar]. Keep doing this until the end. Ready? Go!"

Stroop Effect Trials

"Wonderful! Ok practice is over. Let's do it for real now. So, same as before, please name the <u>colour</u> that appears on the screen. Don't read the word, just name the colour of the word. When you have named the colour hit this button [point to spacebar] to bring up the next colour. Name this new colour and hit the button again [point to spacebar]. Keep doing this until the end. You have 60 seconds to get as many as you can. Ready? Go!"

Appendix 7: Effects of Background Variables

The following tables present an overview of background variable effects on children's performances on all of the tests. These tables provide a snapshot of the correlational analyses that revealed likely effects of the background variables which were later used in the main analyses as covariates.

Within the appropriate sections below, significant (i) correlations of background variables on test measures are indicated by tick marks and (ii) effects of background variables when used as covariates are indicated by asterisks. Alpha levels are signified by ***<.001, **<.01, *<.05 level, tests are 2 tailed, and n/a means not applicable.

Table 93. Correlations of background variables and their significant effects upon L1 linguistic skills. ✓ = significant correlation. * = significant main effect of the covariate on the DV. ***<.001, **<.01, *<.05 level (2-tailed).

Background Variables and L1 Linguistic Skills																
	12-Year-Olds								8-Year-Olds							
Measures	Raven's		Gender		SES		HHT		Raven's		Gender		SES		HHT	
	High	Low	Male	Female	High	Low	High	Low	High	Low	Male	Female	High	Low	High	Low
Reading																
NARA Accuracy	✓***				✓				✓				✓			✓**
NARA Comprehension	✓**				✓				✓		✓		✓			✓*
NARA Rate	✓***			✓												✓***
EP Accuracy								✓	n/a		n/a		n/a			n/a
EP Comprehension	✓								n/a		n/a		n/a			n/a
EP Rate				✓*				✓	n/a		n/a		n/a			n/a
Completed all Readings	✓*				✓				✓				✓			✓
BPVS	✓***			✓					✓**		✓***		✓			
Creative Writing																
Creative Score	✓***		✓		✓				✓*				✓			
Word Count	✓**				✓											
MLU											✓**					
EWCR	✓***															
Word Frequency	✓*				✓						✓*					
Noun Frequency																
Verb Frequency	✓				✓**						✓*					
Adjective Frequency																

Table 94. Correlations of background variables and their significant effects upon L1 linguistic and metalinguistic skills. ✓ = significant correlation. * = significant main effect of the covariate on the DV. ***<.001, **<.01, *<.05 level (2-tailed).

Background Variables and L1 Linguistic and Metalinguistic Skills																
	12-Year-Olds								8-Year-Olds							
Measures	Raven's		Gender		SES		HHT		Raven's		Gender		SES		HHT	
	High	Low	Male	Female	High	Low	High	Low	High	Low	Male	Female	High	Low	High	Low
Descriptive Writing																
Descriptive Score	✓				✓								✓			
Word Count	✓*															✓
MLU	✓***															✓*
EWCR	✓**															
Word Frequency	✓															
Noun Frequency																
Verb Frequency	✓															
Adjective Frequency																
Grammatical Judgement																
Detection	✓**				✓											✓
Correction	✓***				✓											
GS	✓															
gS	✓**				✓						✓*					
Gs																
gs	✓**															✓*
Lexical Fluency																
Linguistic																
Semantic	✓															
Ling' and Semantic	✓				✓											

Table 95. Correlations of background variables and their significant effects upon the Flanker tasks. ✓ = significant correlation. * = significant main effect of the covariate on the DV. ***<.001, **<.01, *<.05 level (2-tailed).

Background Variables and Flanker Tasks Skills

	12-Year-Olds								8-Year-Olds							
Measures	Raven's		Gender		SES		HHT		Raven's		Gender		SES		HHT	
	High	Low	Male	Female	High	Low	High	Low	High	Low	Male	Female	High	Low	High	Low
Flanker Task-Original																
Correct Congruent									✓*							
Correct Incongruent																
Difference Score											✓*					
Correct Congruent MRT	✓***										✓					
Correct Incongruent MRT	✓***															
Difference MRT																
Flanker Task-Modified																
Correct Congruent	✓**								✓**							
Correct Incongruent	✓*							✓*								
Difference Score	✓							✓*								
Correct Congruent MRT	✓***										✓					
Correct Incongruent MRT	✓*															
Difference MRT																

Table 96. Correlations of background variables and their significant effects upon the Stroop tasks and the SART. ✓ = significant correlation. * = significant main effect of the covariate on the DV. ***<.001, **<.01, *<.05 level (2-tailed).

Overview of Background Variable Effects on EF Skills

	12-Year-Olds								8-Year-Olds							
Measures	Raven's		Gender		SES		HHT		Raven's		Gender		SES		HHT	
	High	Low	Male	Female	High	Low	High	Low	High	Low	Male	Female	High	Low	High	Low
Stroop-English																
Word-Match				✓*												
Colour-Match																
Stroop	✓**															✓***
Interference Score	✓													✓*		
Stroop-Irish																
Word-Match				✓*							✓*					
Colour-Match				✓***												✓
Stroop				✓**												✓**
Interference Score																
SART																
Correct Score	✓**															
Correct Press	✓**															
Correct Pass	✓															
MRT +No.3																
MRT –No.3	✓***															

Appendix 8: Children Self-reported use of Irish language

The following tables compare children's self-reported use of Irish in various linguistic settings per school group. Tables also contain general explanations given by children as to why they do/do not use Irish in each particular setting. This is not an exhaustive analysis and is only intended to provide a snapshot of children's language usage and choice. OE = Only English; MESI = Mostly English Some Irish; EIE = English and Irish Equally; MISE = Mostly Irish Some English. Scores are in frequency counts.

Table 97. Children's language use with their mother per school group (N).

Children's Use of the English and Irish Languages with Mother				
	Immersion (88)		English Medium (78)	
Language used	Why Irish is/is not spoken.	Sub-Total	Why Irish is/is not spoken.	Sub-Total
OE	Mother's inability	41	Mother's inability	25
	English is easier	2	Child prefers English	11
	Mother knows Irish but prefers English	2	Child's inability	12
	Mother speaks Irish but not with child	2	Other	7
	No reply	2		
MESI	Homework	11	Fun and practice	12
	Fun and practice	7	To say simple things	4
	Mother's ability/motivation	2	Homework	3
	To say simple things	5	Mother's Inability	2
	Mother's Inability	2	Other	1
	Other	6		
EIE/ MISE	Homework	1	Fun and practice	1
	Fun and practice	3		
	Speaks English when can't find Irish word	1		
	No reply	1		

Table 98. Children's language use with their father per school group (N).

Children's Use of the English and Irish Languages with Father				
	Immersion (87)		English Medium (77)	
Language used	Why Irish is/is not spoken.	Sub-Total	Why Irish is/is not spoken.	Sub-Total
OE	Father's inability	41	Father's inability	40
	Father speaks Irish but not with child	6	Child's inability	11
	Other	6	Child prefers English	5
			Doesn't know why	5
			Father knows Irish but doesn't speak it with child	4
			Other	4
MESI	Homework	7	Fun and practice	4
	Fun and practice	7		
	Father's Inability	5		
	Father knows Irish but doesn't speak it with child	2		
	Other	3		
EIE/ MISE	Homework	2	Fun and practice	2
	Fun and practice	2	Father's ability/motivation	2
	Father's ability/motivation	2		
	Speaks English when can't find Irish word	2		
	No reply	2		

Table 99. Children's language use with their siblings per school group (N).

Children's Use of the English and Irish Languages with Siblings				
	Immersion (88)		English Medium (78)	
Language used	Why Irish is/is not spoken.	Sub-Total	Why Irish is/is not spoken.	Sub-Total
OE	Sibling's inability	15	Sibling's inability	18
	Sibling speaks Irish but not with child	7	Child's inability	18
	Child prefers English	5	Child prefers English	8
	Irish for school only	3	Sibling prefers English	6
	Other	12	Other	12
MESI	Irish for school only	9	Fun and practice	6
	Sibling speaks Irish rarely with child	4	Homework	4
	Sibling's Inability	4	Other	5
	Homework	3		
	Secrecy	3		
	Practice	3		
	Other	8		
EIE/ MISE	Rest from Irish sometimes	4	Fun	1
	Fun and practice	4		
	No reply	4		

Table 100. Children's language use with their non-school friends per school group (N).

Children's Use of the English and Irish Languages with Friends				
	Immersion (82)		English Medium (78)	
Language used	Why Irish is/is not spoken.	Sub-Total	Why Irish is/is not spoken.	Sub-Total
OE	Friend's inability	67	His/Her/Friend's inability	31
	No reply	5	Child prefers English	29
	Not in school	4	Unsure why	2
	Other	3	No reason to	2
			Other	4
MESI	Fun and practice	1	Fun and practice	4
	No reply	1	No point	1
	Friend's inability	1	Other	3
EIE/ MISE			Fun	2