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The acquisition and alteration of food consumption patterns in preverbal and verbal children

Fleming, Paul F. J

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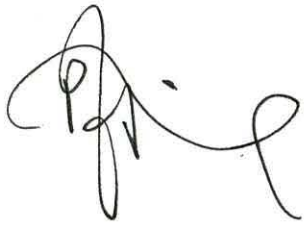
The Acquisition And Alteration Of Food Consumption Patterns In Preverbal And Verbal Children



Paul F.J. Fleming

Ph.D.
1999

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CHAPTER FIVE

INTRODUCTION

As reviewed above (see section 1.4), a recent series of theoretical papers have presented an account of how children learn to name and how this might bring about particular types of categorisation (see Horne and Lowe, 1996, 1997; Lowe and Horne, 1996; Horne and Lowe, in press). In the context of this work, the account suggests that when a child learns to name a food, he might well proceed to name other foods in a like manner - either owing to an observed physical similarity or a similarity of function among these items, or through directly being taught to categorise the items in this way by, for instance, a parent. Thus, this naming may proceed to allow the child to categorise a class of stimuli that then becomes functionally related to each other through the common name response. Thus one might expect that teaching a young child such a common name for a set of stimuli could not only faciliatate the appropriate learning of categorisation but might also be a potent means of transferring behaviour to new category members without the need of direct training.

Such transfer may proceed on the basis of physical similarity:

"In conformity with the bahavioral principle of stimulus generalization, once the name relation has been established with one exemplar of a class of objects it should extend to include other stimuli that physically resemble that exemplar"
(Horne and Lowe, in press, p.16)

or through learning from, for example, a caregiver:

"Name relations may also be extended by means other than stimulus generalization, however. If caregivers apply the same name to a range of exemplars, some physically similar, others not, and the child echoes this common name in the presence of the different exemplars, all of them, no matter how disparate their appearance, amy come to be incorporated in the child's own common name relation. A name relation of this kind is a functional unit with extraordinary generative power"
(Horne and Lowe, in press, p.16).

What effects might such training ultimately have upon the child's behaviour? One clear prediction is that the child may, through such learning, establish stimulus classes:

"...our account predicts that under such conditions training a common vocal response, and hence common naming, for each of a range of items may be sufficient to establish stimulus classes or categories"
(Horne and Lowe, in press, p.18)

and when such learning has occured, what effects may be seen when new exemplars are encountered:

"...a common name for physically different objects can provide a powerful means of establishing entirely new behavior towards both the stimuli that are already encompassed within that name relation, and any future exemplars that come to be brought within the same relation"
(Horne and Lowe, in press, p.21).

Thus not only may a child learn to categorise stimuli within particular classes but novel stimuli may become members of such classes through an extension of this initial verbal learning.

Horne and Lowe (in press) have tested this hypothesis in relation to two-four-year-olds responding to abstract wooden shapes. Participating children were presented with three pairs of stimuli, one member of each pair was named "Zag" and the other "Vek". When the children exhibited reliable naming of the stimuli in each pair they were trained to emit a novel behaviour in response to one of the Zag stimuli and another response in response to one of the Vek stimuli. Upon testing, it was found that the children responded to the remaining two Zag stimuli with the novel response that had been trained to the first Zag stimulus, simlarly a novel response was emitted to the remaining two Vek stimuli consonant with that trained to the first Vek. This transfer of responding had never been directly trained and Horne and Lowe concluded that it emerged via the common naming of the featured stimuli. Thus, the hypothesised effect of common naming was observed with wooden blocks, but what of foods? Experiments Four, Five, Six and Seven tested the application of just such a procedure to the categorisation of novel foods, and the potential emergence of food choices, consumption, and preferences that not been directly trained was closely tracked.

The central aim of these experiments was to devise a new procedure for investigating how naming and categorisation may influence children's reactions to foods, in particular how they expect novel foods to taste and whether they might choose to eat them. Children were presented with a number of food samples that were visually identical, except in their colour which differed from sample to sample. Without ever tasting the foods, the children were taught one common name for each of three of them (e.g. Yaz) and another common name for each of another three (e.g Lud). Unknown to the children, one set of three all had the same palatable

flavour, and the other set of three the same unpalatable flavour (it should be noted that the common names used were counterbalanced over the different coloured sets of foods, also that each subject responded to each palatable food positively, and each unpalatable food negatively was initially assessed with each individual participant). Having learnt to name each food sample, identifiable by it's colour, the children were then asked to taste one Lud and one Yaz. The aim here was to establish a link between each name and palatability - with for example, the Yaz tasting "nice" and the Lud tasting "nasty" - allowing an investigation as to whether this name-taste relation would determine choices among the other samples that were named either Yaz or Lud. Subjects then proceeded to taste four other named samples - two from each named category. In the later experiments the number of trials linking name and taste was considerably extended. Subsequently, the strength of this name-taste relation was tested by exposing each participant to novel Yazs and Luds that were not in accord with the previously learned category name-taste relations in that they had neutral tastes.

Four experiments are reported here, two in Chapter Five and two in Chapter Six. The initial study served as a pliot study to comprehensively test all main aspects of the procedure used to train the name-taste relations and explore their subsequent effects. Experiment Five, using a procedure featuring considerable refinements, explored the impact of such training and again dictated a number of significant procedural modifications. Finally, Experiment Six and Experiment Seven explored the impact of such training in young children of different ages.

The Overall Design

All of the following experiments were conducted in five phases as follows:

Familiarisation Phase

The purpose of this phase was to allow the children to be introduced to the experimenter and to familiarise them with the research setting and the materials used in the preference testing.

During this phase the experimenter initially spent one hour with all of the subjects concurrently. This initial session began with the children designing and colouring their own name badges and the session proceeded to a general discussion. In a subsequent session the experimenter saw the children individually in the research room - during this session the experimenter introduced the children to the faces response sheet which was subsequently used in the preference testing.

Phase One

Preference Testing

Subjects rated their preferences of the positive, negative, and neutral flavoured food samples which were later used in the experiment in Phase Three and Phase Five.

Phase Two

Training and Testing of Colour-Name Relations

Six food samples, each of a different colour, were presented to the subjects. Three of the samples were referred to with one common name (i.e. 'Yaz') and the other three samples were referred to with a different common name (i.e. 'Lud'). The subjects were taught to recognise each individual sample when referred to by name. The subjects were also taught to produce the name of each individual sample when requested.

Phase Three

Training and Testing Name-Taste Relations

A positive flavour was added to each of the three members of one category (e.g. the Yazs) and a negative flavour was added to each of the three members of the other category (e.g. the Luds).

Subjects tasted samples from each category and were asked about their preferences. Thus subjects learning of the relation between a particular name (e.g. Yaz) and a particular flavour (e.g. positive) was promoted.

Phase Four

Training and Testing the Colour-Name Relations

Six new food samples, each of a different colour, were presented to the subjects. Three of the samples were referred to with one common name (i.e. 'Yaz') and the other three samples were referred to with a different common name (i.e. 'Lud'). The subjects were taught to recognise each individual sample when referred to by name. The subjects were also taught to produce the name of each individual sample when requested.

Phase Five

Testing Extension Of Naming

A neutral flavour was added to each of the three members of one category (e.g. the Yazs) and each of the three members of the other category (e.g. the Luds) of stimuli introduced in Phase Four.

Subjects could elect to taste samples from each category as they wished and were asked about their preferences.

EXPERIMENT FOUR

The Effects of Common Naming on The Acceptability of, and Preferences for, Novel Foods in Four - Five Year Olds

A Pilot Study

Method

Subjects

Five subjects completed this experiment. They were recruited from a Primary One school class at a local primary school. They were chosen from a large group of children whose parents had granted permission for them to participate having received a letter summarising the study. The children ranged in age from 4 years and 5 months to 5 years and 1 month at the time the experiment began. There were two boys and three girls.

Table 4.1
Experiment Four
Age of Subjects

Subject	Age at Start
HH	4 yrs 7 mths
AN	5 yrs 1 mths
JJ	4 yrs 5 mths
SW	4 yrs 6 mths
JH	4 yrs 7 mths

Mean age of subjects at start = 4 yrs 8 mths

Setting and Apparatus

The experiment was conducted in a quiet room adjacent to one of the classrooms in the school. The room was ordinarily used as a small library. The subject was seated across a table from the experimenter. All experimental sessions were video-recorded using a Panasonic M7 video recorder.

Materials

1. The Foods

During all phases of the experiment the 'novel food' employed was Fromage Frais.

Flavours

A 'positive' flavour was produced by adding either (i)150ml of icing sugar, (ii)150ml of maple syrup, or, (iii) 5ml of vanilla essence to 250g of Fromage

Frais. A 'negative' flavour was produced by adding either (i)15ml salt, (ii) 15ml vinegar, or (iii) 5ml of lime juice to 250g Fromage Frais. In this experiment, a 'neutral' flavour was produced by allowing the Fromage Frais to remain unaltered i.e. no 'positive' or 'negative' ingredients were added.

Colours

Twelve different colours of Fromage Frais were produced. To produce the colours, food colouring was added to 10ml portions of Fromage Frais in the following manner:

White	- no additional colour
Blue	- 8 units blue
Yellow	- 12 units yellow
Green	- 25 units green
Red	- 15 units red
Lilac	- 8 blue + 20 red
Purple	- 15 blue + 20 red
Orange	- 15 red + 10 yellow
Brown	- 8 green + 8 yellow + 15 red + 2 blue
Turquoise	- 18 blue + 8 green
Lime	- 8 green + 25 yellow
Dark orange	- 35 red + 10 yellow

2. Other items

Plastic tubs of 12cm in diameter in which to present the foods.

A blindfold for use in the preference testing.

Response sheets upon which to record subjects responses.

Experimental Design

After an initial familiarisation phase the experiment proceeded in five phases as outlined below.

Phase One

Preference Testing

During this phase subjects tasted positive, neutral, and negative food samples whilst blindfolded. Each food sample was tasted three times to assess response reliability. After tasting each food sample the blindfold was removed and the child indicated their preference for the taste by indicating a face on the response sheet (see below).

Phase Two

Training and Testing Colour-Name Relations I

During this phase subjects were trained to name six food stimuli (S1 - S6). All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Three

Training and Testing Name-Taste Relations

During this phase subjects tasted the food stimuli. Positive flavours (sugar, maple syrup, or vanilla essence) were assigned to one named category and negative flavours (salt, vinegar, or lime juice) were assigned to the other named category.

Phase Four

Training and Testing Colour-Name Relations II

Six new food stimuli were introduced (S7 - S12). During this phase subjects were trained to name these stimuli. All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Five

Testing Extension Of Naming to the Novel Foods

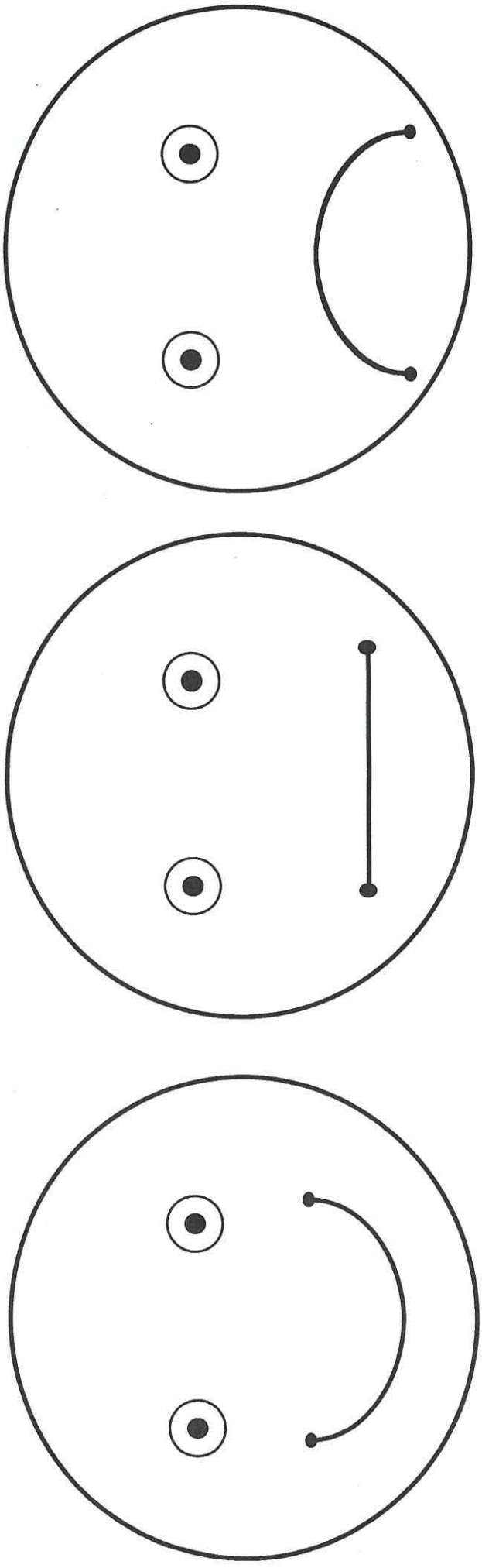
The subjects were offered the opportunity to taste S7 - S12 and verbalise their preferences for the stimuli. None of these six stimuli had any additional 'positive' or 'negative' flavours. The extension of naming to the novel foods was assessed.

PROCEDURE

Familiarisation Phase

In the second session in the Familiarisation Phase the experimenter introduced the faces response sheet to the subject - this is presented overleaf on page 320. The response sheet was placed on the table between experimenter and subject and the experimenter said

> "Look at this (the experimenter indicates the faces response sheet). This face looks sad because she/he's just tasted something really horrible (experimenter indicates frowning face); this one looks okay because she/he's just tasted something that was okay (experimenter indicates neutral face); this one looks happy because she/he's just tasted something really nice (experimenter indicates smiling face). Next time I visit I'll



> want you to taste some foods and point to this face if it's horrible (experimenter indicates frowning face), this face if it's nice (experimenter indicates smiling face), and this face if it's just okay (experimenter indicates neutral face)".

The experimenter proceed to say (indicating the response sheet)

> "Which one should you point to if it tastes nice?
> Which one should you point to if it tastes horrible?
> Which one should you point to if it tastes OK?"

Phase One

Preference Testing

The experimenter sat at a table, opposite the subject, and placed the Faces Response Sheet on the table facing the subject. The experimenter proceeded to repeat the instructions issued at the end of the second familiarisation session saying...

> "Today we are going to play a new game. Look at this (the experimenter indicates the faces response sheet). This face looks sad because she/he's just tasted something really horrible (experimenter indicates frowning face); this one looks okay because she/he's just tasted something that was okay (experimenter indicates neutral face); this one looks happy because she/he's just tasted something really nice (experimenter indicates smiling face). I want you to taste some foods and point to this face if it's horrible (experimenter indicates frowning face), this face if it's nice (experimenter indicates smiling face), and this face if it's just okay (experimenter indicates neutral face). To show how good you are at tasting I'm going to blindfold you with these special goggles".

When it was clear that the subject had understood the instructions the testing proceeded. The subject was blindfolded and presented with the first food sample (the first sample was always positively flavoured to prevent subject attrition). After each taste the blindfold was removed and the subject was requested to point to whichever face they felt best indicated their preference for the flavour. The subjects were encouraged to take a drink of water between trials to cleanse the palette before experiencing the next taste - thereby preventing contamination of the taste perception. All trials were randomised with the following constraints: (i) the first food stimulus presented in the experiment was always positively flavoured, (ii) each food stimulus was presented three times, (iii) no particular food stimulus appeared twice in succession. Throughout the preference testing the food samples were kept under the table so that the subject could not see the colour of the food at any time. If the preference testing of any particular subject extended over more than one session (which was almost

invariably the case for all subjects in the present experiment) the experimenter began each new session by placing the Faces Response Sheet on the table and saying...

> "Do you remember these faces?
> Which one should you point to if you like the food?
> Which one should you point to if you don't like the food?
> Which one should you point to if it's just OK?"

When it was clear that the subject had understood the instructions the testing proceeded as above.

Phase Two

Training and Testing Colour-Name Relations

Six food stimuli were introduced to each subject. Each of the six stimuli was coloured differently. Subjects were trained to name three of the novel stimuli "Yaz" and the remaining three stimuli as "Lud" (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were distinguishable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation. This training proceeded in three stages.

Stage One: Colour-Name Production Training

The experimenter placed two foods, L1 (Lud 1) and Y1 (Yaz 1), in clear round plastic bowls, on the table. The experimenter then said

> "I've got some special foods here and I want you to learn what they are called. When you can tell me their names I'll give you a star to show you how good you are".

The experimenter then proceeded to model the correct response saying

> "This is called a 'Lud' (indicating L1) and this one is called a 'Yaz' (indicating Y1)".

> The experimenter then pointed to one of this first pair and said

> "What's this one called?"

If the subject responded correctly the experimenter said

"Clever girl/boy, yes that's right it's a 'Lud/Yaz' ".

If the subject responded incorrectly the experimenter said

"This is a 'Lud/Yaz' - Can you say 'Lud/Yaz'?"

There were four trial types;
(i)Yaz presented on the left; Lud presented on the right - Yaz indicated;
(ii) Yaz presented on the left; Lud presented on the right - Lud indicated;
(iii) Lud presented on the left; Yaz presented on the right - Yaz indicated;
(iv) Lud presented on the left; Yaz presented on the right - Lud indicated.
Trials continued on a daily basis in randomised blocks of eight with the following constraints:
1. Each trial type occurred twice in each block of eight
2. The same trial type never occurred twice in succession.
When the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. Thus a subject could attain criterion performance in three trial blocks. Upon attaining criterion performance the stimuli were presented in random pairs for at least one block to test that each stimulus was reliably identified outside of the context of the original stimulus presentation pair.
Stage Two: Comprehension Training/Testing

The experimenter placed two foods, L1 (Lud 1) and Y1 (Yaz 1), in clear round plastic bowls, on the table. The experimenter then said

"Can you give me the Lud/Yaz?"

If the subject responded correctly the experimenter said

"Clever girl/boy"

If the subject responded incorrectly the experimenter said

"This is a 'Lud/Yaz' - Can you give me the 'Lud/Yaz'?"

The four trial types (as above) were presented with the same constraints until the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. After these three pairs were taught, the stimulus pairs were mixed so that all the Lud stimuli appeared with all the Yaz stimuli - each Lud appeared with each Yaz for at least one block of trials and blocks were repeated until criterion performance was attained (again seven out of eight correct responses).

Stage Three: Family Category Test

This stage occurred in two sub-stages.

(i) Naming

All six stimuli were placed on the table simultaneously.

Each stimulus was indicated in turn by the experimenter and the subject was required to produce the appropriate name for it.

The foods were randomly mixed between trials to ensure that the subjects were naming the foods by their colour and not being cued by the position of the foods. If a subject failed to perform this task adequately two stimuli were removed (one Lud and one Yaz) and the subject continued to perform the task until criterion performance was attained with four stimuli at which time the remaining two stimuli were re-introduced and the task continued until the subject attained criterion performance with all six stimuli simultaneously present.

(ii) Grouping

The subjects were asked to place all of the Luds or the Yazs to one side in a group. This substage ended when the subject attained criterion performance.

Phase Three

Training and Testing Name-Taste Relations

The subjects stimuli foods were flavoured in accordance with their individual taste preferences as recorded in the taste preference test i.e. if subjects indicated a positive face in response to tasting sugar, syrup and vanilla then these were used to flavour the positive stimuli; conversely, when subjects indicated a negative response to particular tastes e.g. salt that taste would be used to flavour the 'negative' stimuli. The experimenter then requested the subject to name all six stimuli to demonstrate adequate naming performance before proceeding.

The experimenter then presented L1 and Y1 on the table and said

" Do you like this?" (indicating each one of the pair in turn),

The experimenter then asked the subject

"Which one do you prefer?" (indicating the pair)

The experimenter finally asked the subject

"Would you like to eat one?" (indicating the pair)

With this first pair of stimuli (L1 and Y1) the subject was encouraged to taste both foods and were prompted to do so if they appeared reluctant.

Then the second pair of foods (L2 and Y2) were placed on the table and the questions outlined above (questions 1 - 3) were posed. Finally the third stimulus pair were presented (L3 and Y3) and the questions outlined above (questions 1 - 3) were again posed. When the second and third stimulus pairs were presented the subjects were not encouraged to taste them but were allowed to taste none/either/both foods from each stimulus pair if they elected to do so - thus we were able to assess the immediate effect of the first name-taste link on the remaining members of each named class. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

Phase Four

Training and Testing Colour-Name Relations II

A second set of six novel stimuli were introduced. Subjects were trained to name three of the novel stimuli "Yaz" and the remaining three stimuli as "Lud" (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were distinguishable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation through training in three stages - production training, comprehension training/testing and family category testing as in Phase Two.

Phase Five

Testing Extension of Naming to the Novel Foods

The second set of stimulus foods did not have any positive or negative flavour added. The experimenter requested the subject to name all six stimuli to demonstrate adequate naming performance before proceeding.

The experimenter then presented L4 and Y4 on the table and said

" Do you like this?" (indicating each one of the pair in turn),

The experimenter then asked the subject

"Which one do you prefer?" (indicating the pair)

The experimenter finally asked the subject

"Would you like to eat one?" (indicating the pair)

Throughout the extension test subjects were allowed to eat none, one,or both foods from each stimulus pair as they wished. They were not explicitly encouraged to eat any of the foods (thus we could see what they did or did not proceed to eat solely on the basis of the earlier training).

Then the second pair of foods (L5 and Y5) were placed on the table and the questions outlined above (questions 1 - 3) were posed. Finally the third stimulus pair were presented (L6 and Y6) and the questions outlined above (questions 1 - 3) were again posed. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

RESULTS

Phase One: Preference Testing

In this experiment, each subjects response to each food sample was coded either positive, neutral, or negative. When these results are combined they yield an overall positive, neutral, or negative rating for each flavoured food, and thus each named class of stimuli, for each subject. Please refer to Figures 4.1a and 4.1b overleaf for the graphical display of these results.

HH

HH responded most positively to sugar and maple syrup, each of which were regarded as positive on two out of three trials. HH least liked salt which was again regarded negatively on two out of three trials. His responses to the other flavours (as can be seen overleaf) were more variable.

AN

AN was reliable in responding negatively to salt and lime and reliable in responding positively to maple syrup and sugar.

JJ

JJ was reliable in responding positively to sugar, maple syrup, and vanilla. He was most reliable in responding negatively to salt.

SW

SW was reliable in responding positively to maple syrup and sugar and reliably responded negatively to vinegar.

JH

JH's data was the least reliable. Although positive responding to maple syrup was reliable his negative responding was very variable. Given these results it was considered that perhaps JH ought to be excluded from further participation but this was ultimately decided against as a comparison of his results and those of the more reliable responders was thought to be potentially valuable.

Figure 4.1a

Preference test response data for three subjects - HH, AN, and JJ.

Note that the green shading indicates a positive response, the yellow shading indicates a neutral response, and the red shading indicates a negative response. The data plotted include all three preference trials for all particpants, featuring all six foods. The overall response to each food can be observed by noting the proportion of each colour featured in the histogram for each food.

Figure 4.1a Preference Test Results

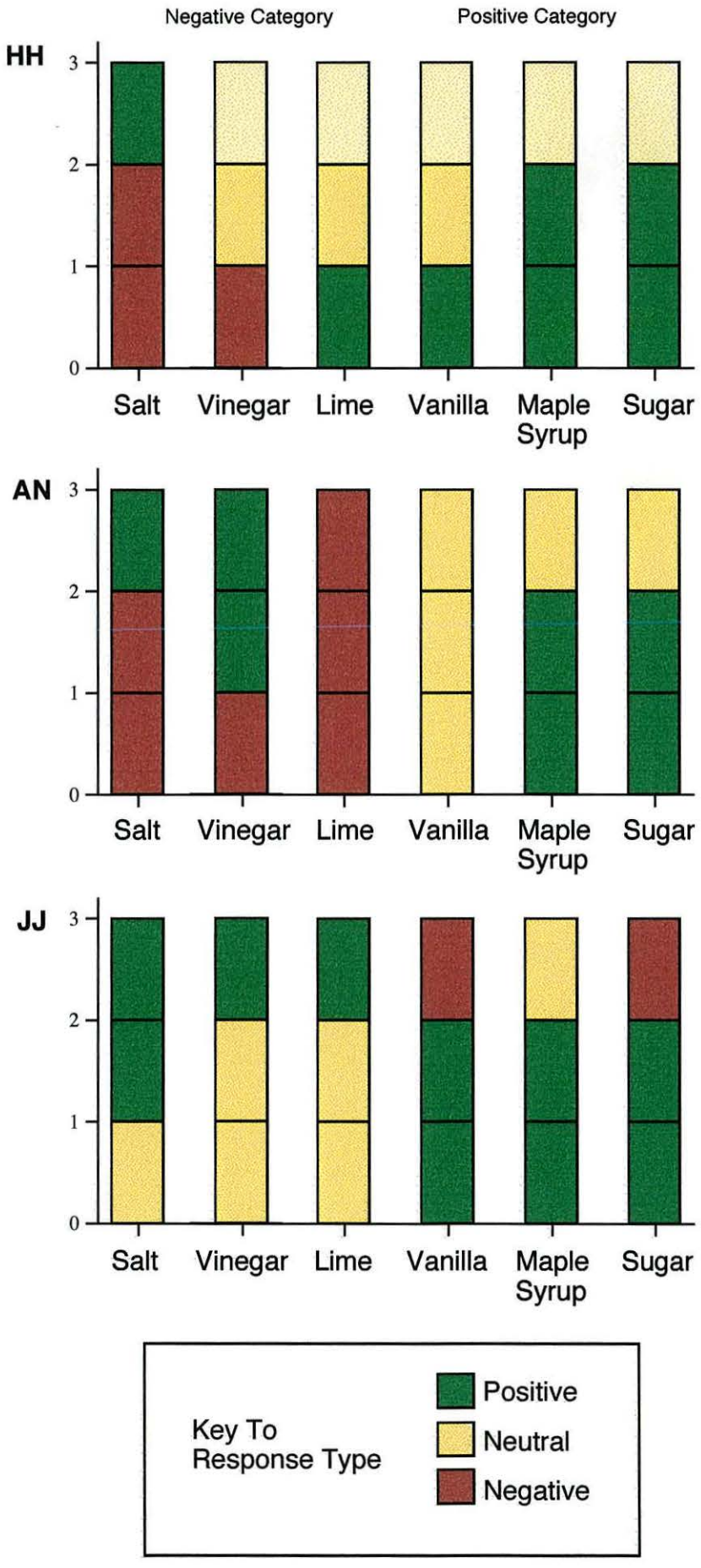
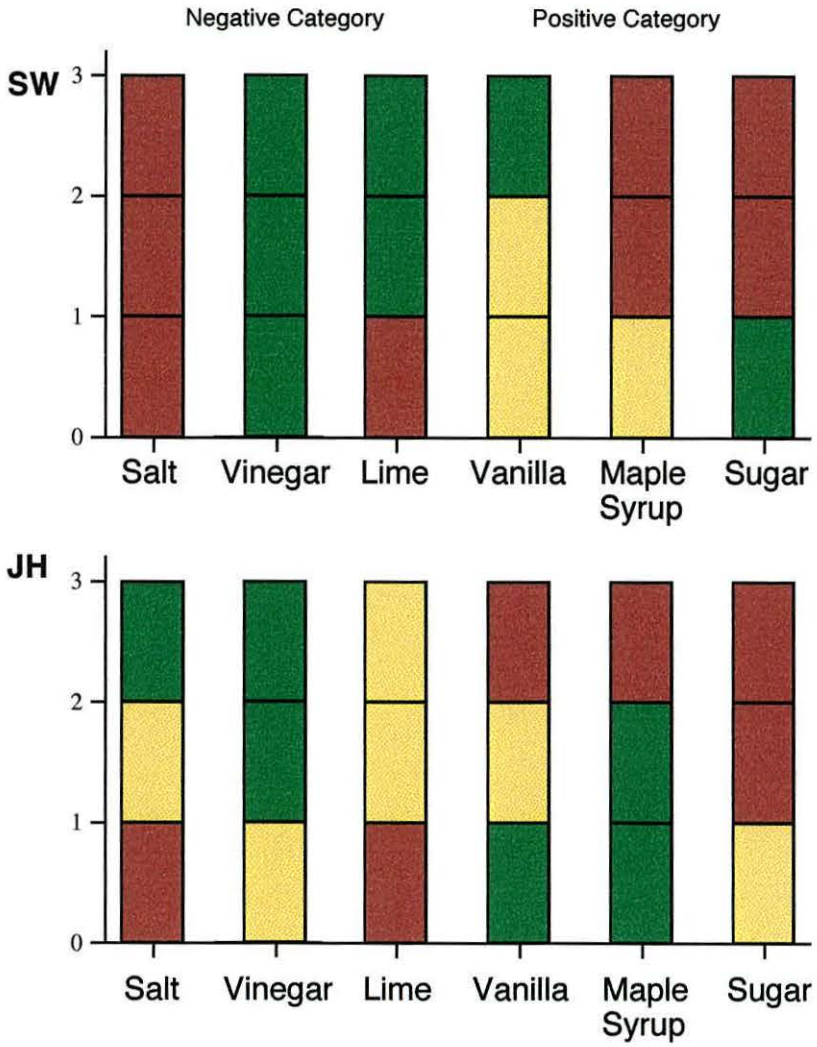
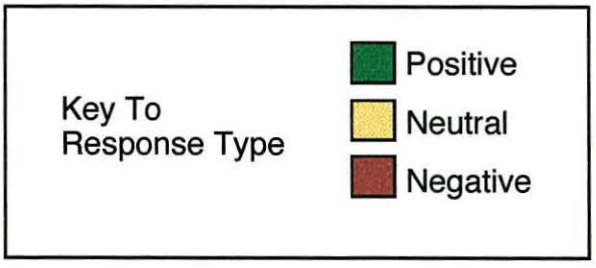


Figure 4.1b

Preference test response data for remaining two subjects - SW and JH. Note that the green shading indicates a positive response, the yellow shading indicates a neutral response, and the red shading indicates a negative response. The data plotted include all three preference trials for all particpants, featuring all six foods. The overall response to each food can be observed by noting the proportion of each colour featured in the histogram for each food.

Figure 4.1b Preference Test Results





Phase Two: Training and Testing Colour-Name Relations

These data are presented in Figures 4.2a and 4.2b.

HH

Production

Stimulus Set One

HH required six blocks of trials to attain criterion performance in the production training phase. Four blocks of trials were necessary to learn the name production of the first pair of stimuli (L1 and Y1). The next two pairs (L2 and Y2, L3 and Y3) were each acquired in the minimum possible of one block each.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, HH attained criterion performance in the production phase in the minimum possible number of trial blocks i.e. three.

Comprehension

Stimulus Set One

HH required a total of sixteen trial blocks to attain criterion performance in comprehension. HH attained criterion performance with each of the three stimulus pairs (L1 and Y1, L2 and Y2, L3 and Y3) in the minimum possible of one trial block each. When the stimuli were then rearranged so that each Lud appeared with each Yaz the number of trial blocks required to attain criterion performance increased - a further thirteen blocks were required to complete this phase.

Stimulus Set Two

HH required the minimum possible number of trial blocks necessary to complete comprehension training with the second set of stimuli i.e. nine blocks.

Figure 4.2a

Training and Testing Colour Name Relations

Data are shown for three of the subjects - HH, AN andJJ.

Total number of trial blocks completed during the initial production phase (minimum blocks to criterion = 3), comprehension phase (minimum blocks to criterion = 9) and subsequent production phase (production phase including performance when four, or all six stimuli - three from each stimulus set - were simultaneously presented; the number of stimuli presented was adjusted depending upon the subjects performance - see text for detail) and in the grouping task in Phase Two (Stimulus Set One) and Phase Four (Stimulus Set Two). The data was calculated by totalling block numbers performed until criterion performance was observed (see text for detail).

Figure 4.2a: Training and Testing Colour-Name Relations

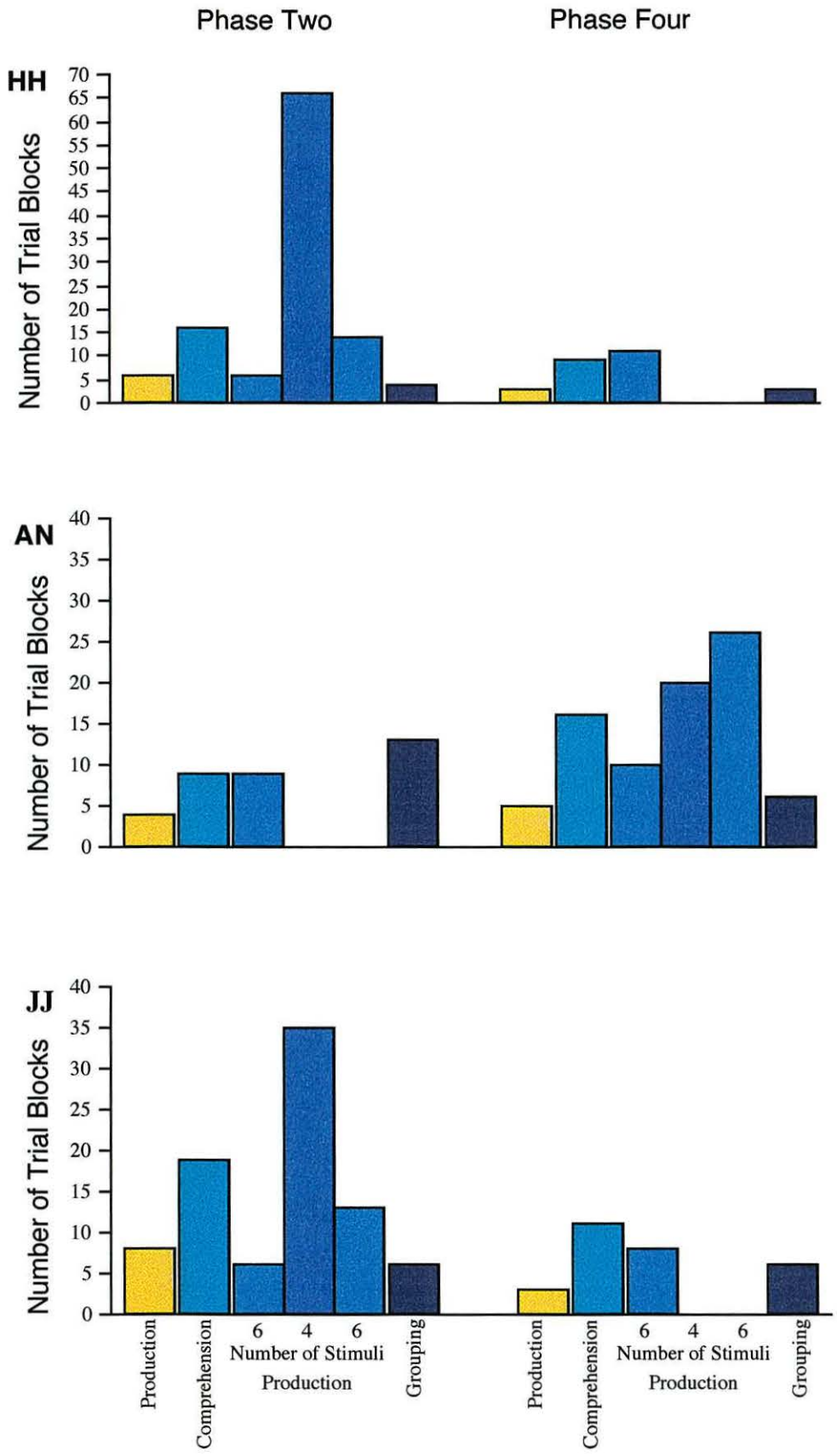


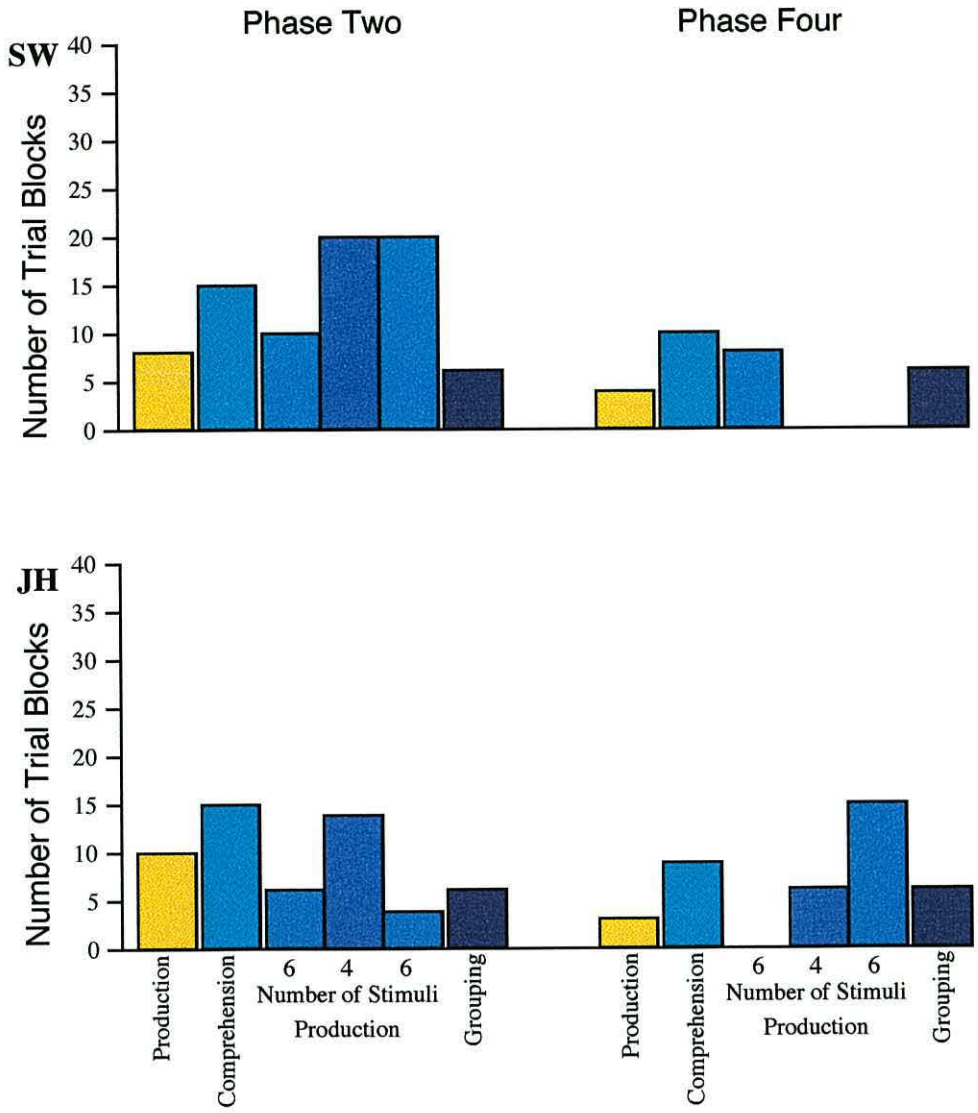
Figure 4.2b

Training and Testing Colour-Name Relations

Data are shown for the two remaining subjects, SW and JH.

Total number of trial blocks completed during the initial production phase (minimum blocks to criterion = 3), comprehension phase (minimum blocks to criterion = 9) and subsequent production phase (production phase including performance when four, or all six stimuli - three from each stimulus set - were simultaneously presented; the number of stimuli presented was adjusted depending upon the subjects performance - see text for detail) and in the grouping task in Phase Two (Stimulus Set One) and Phase Four (Stimulus Set Two). The data was calculated by totalling block numbers performed until criterion performance was observed (see text for detail).

Figure 4.2b: Training and Testing Colour - Name Relations



Family Category Testing

Stimulus Set One

Naming

Initially HH was presented with all six stimuli simultaneously. After six trial blocks it was evident that HH was having difficulty (at this stage his performance was unstable and oscillating at approximately 50% correct). Thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. HH attained criterion performance with these four stimuli after sixty-six trial blocks. All six stimuli were then simultaneously presented and HH attained criterion performance with all six after fourteen trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, HH attained criterion performance after eleven trial blocks. It was not necessary to revert to presenting four stimuli as HH's performance showed steady improvement from the beginning of this testing phase.

Grouping

Stimulus Set One

HH attained criterion performance in the stimulus grouping task after four trial blocks.

Stimulus Set Two

With the second stimulus set HH attained criterion performance in the grouping task after three trial blocks.

Total

In phase two (with the first stimulus set) HH required a total of 112 trial blocks; in phase four (with the second stimulus set) he required a total of 26 trial blocks yielding a grand total of 138.

AN

Production

Stimulus Set One

AN required four blocks of trials to attain criterion performance in the production training phase. Two blocks of trials were necessary to learn the name production of the first pair of stimuli (L1 and Y1). The next two pairs

(L2 and Y2, L3 and Y3) were each acquired in the minimum possible of one block each.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, AN attained criterion performance in the production phase in five trial blocks.

Comprehension

Stimulus Set One

AN required a total of nine trial blocks to attain criterion performance in comprehension. AN attained criterion performance with each of the three stimulus pairs (L1 and Y1, L2 and Y2, L3 and Y3) and with every subsequent pairing of stimuli in the minimum possible of one trial block each.

Stimulus Set Two

AN required sixteen trial blocks to complete comprehension training with the second set of stimuli.

Family Category Testing

Naming

Stimulus Set One

With the first set of six stimuli, when all six were presented simultaneously, AN attained criterion performance after nine trial blocks. It was not necessary to revert to presenting four stimuli as ANs performance showed steady improvement from the beginning of this testing phase.

Stimulus Set Two

Initially AN was presented with all six stimuli simultaneously. After ten trial blocks it was evident that AN was having difficulty (at this stage his performance was unstable and oscillating at approximately 46% correct). Thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. AN attained criterion performance with these four stimuli after twenty trial blocks. All six stimuli were then simultaneously presented and AN attained criterion performance with all six after twenty-six trial blocks.

Grouping

Stimulus Set One

AN attained criterion performance in the stimulus grouping task after thirteen trial blocks.

Stimulus Set Two

With the second stimulus set AN attained criterion performance in the grouping task after six trial blocks.

Total

In phase two AN required a total of 35 trial blocks; in phase four he required a total of 83 trial blocks yielding a grand total of 118.

J J

Production

Stimulus Set One

JJ required eight blocks of trials to attain criterion performance in the production training phase. Six blocks of trials were necessary to learn the name production of the first pair of stimuli (L1 and Y1). The next two pairs (L2 and Y2, L3 and Y3) were each acquired in the minimum possible of one block each.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, JJ attained criterion performance in the production phase in the minimum possible number of trials blocks i.e. three.

Comprehension

Stimulus Set One

JJ required a total of nineteen trial blocks to attain criterion performance in comprehension. JJs performance varied unpredictably across the stimulus pairs ranging from passing the criterion with two pairs in the minimum of one block to requiring six blocks with other pairs.

Stimulus Set Two

JJ required eleven trial blocks to complete comprehension training with the second set of stimuli.

Family Category Testing

Stimulus Set One

Naming

Initially JJ was presented with all six stimuli simultaneously. After six trial blocks it was evident that JJ was having difficulty (at this stage his performance was unstable and oscillating at approximately 50% correct). Thus, two stimuli were removed (one Yaz and one Lud) and training

continued with four stimuli. JJ attained criterion performance with these four stimuli after thirty-five trial blocks. All six stimuli were then simultaneously presented and JJ attained criterion performance with all six after thirteen trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, JJ attained criterion performance after eight trial blocks. It was not necessary to revert to presenting four stimuli as JJs performance showed steady improvement from the beginning of this testing phase.

Grouping

Stimulus Set One

JJ attained criterion performance in the stimulus grouping task after six trial blocks.

Stimulus Set Two

With the second stimulus set JJ attained criterion performance in the grouping task after six trial blocks.

Total

In phase two JJ required a total of 87 trial blocks; in phase four he required a total of 28 trial blocks yielding a grand total of 115.

SW

Production

Stimulus Set One

SW required eight blocks of trials to attain criterion performance in the production training phase. Five blocks of trials were necessary to learn the name production of the first pair of stimuli (L1 and Y1). The next pair (L2 and Y2) required two blocks, and the final pair (L3 and Y3) was acquired in the minimum possible of one block .

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, SW attained criterion performance in the production phase in four trial blocks.

Comprehension

Stimulus Set One

SW required a total of fifteen trial blocks to attain criterion performance in comprehension. SW's performance varied unpredictably across the stimulus pairs ranging from passing the criterion with three of the pairs in the minimum of one block to requiring three blocks with other pairs.

Stimulus Set Two

SW attained criterion performance with the second set of six stimuli in ten trial blocks.

Family Category Testing

Stimulus Set One

Naming

Initially SW was presented with all six stimuli simultaneously. After ten trial blocks it was evident that SW was having difficulty (at this stage his performance was unstable and oscillating at approximately 59% correct). Thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. SW attained criterion performance with these four stimuli after twenty trial blocks. All six stimuli were then simultaneously presented and SW attained criterion performance with all six after twenty trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, SW attained criterion performance after eight trial blocks. It was not necessary to revert to presenting four stimuli as SW's performance showed steady improvement from the beginning of this testing phase.

Grouping

Stimulus Set One

SW attained criterion performance in the stimulus grouping task after six trial blocks.

Stimulus Set Two

With the second stimulus set SW attained criterion performance in the grouping task after six trial blocks.

Total

In phase two SW required a total of 79 trial blocks; in phase four he required a total of 28 trial blocks yielding a grand total of 107.

JH

Production

Stimulus Set One

JH required ten blocks of trials to attain criterion performance in the production training phase. Two blocks of trials were necessary to learn the name production of the first pair of stimuli (L1 and Y1). The next pair (L2 and Y2) required seven trial blocks, and the remaining pair (L3 and Y3) required one block.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, JH attained criterion performance in the production phase in the minimum possible number of trials blocks i.e. three.

Comprehension

Stimulus Set One

JH required a total of fifteen trial blocks to attain criterion performance in comprehension. Performance varied over stimuli pairs ranging from the minimum of one block to a maximum of three blocks.

Stimulus Set Two

JH required the minimum possible number of trial blocks necessary to complete comprehension training with the second set of stimuli i.e. nine blocks.

Family Category Testing

Stimulus Set One

Naming

Initially JH was presented with all six stimuli simultaneously. After six trial blocks it was evident that JH was having difficulty (at this stage his performance was unstable and oscillating at approximately 60% correct). Thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. JH attained criterion performance with these four stimuli after fourteen trial blocks. All six stimuli were then simultaneously presented and JH attained criterion performance with all six after four trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, JH appeared to experience some difficulty. Two stimuli were removed (one Yaz and one Lud) and the training proceeded with four stimuli - JH attained criterion performance with four stimuli after six trial

blocks. With all six stimuli again presented simultaneously JH attained criterion performance after fifteen trial blocks.

Grouping

Stimulus Set One

JH attained criterion performance in the stimulus grouping task after six trial blocks.

Stimulus Set Two

With the second stimulus set JH attained criterion performance in the grouping task after six trial blocks.

Total

In phase two JH required a total of 55 trial blocks; in phase four he required a total of 39 trial blocks yielding a grand total of 94.

Phase Three: Training and Testing Name-Taste Relations

This data is presented graphically in Figure 4.3.

HH

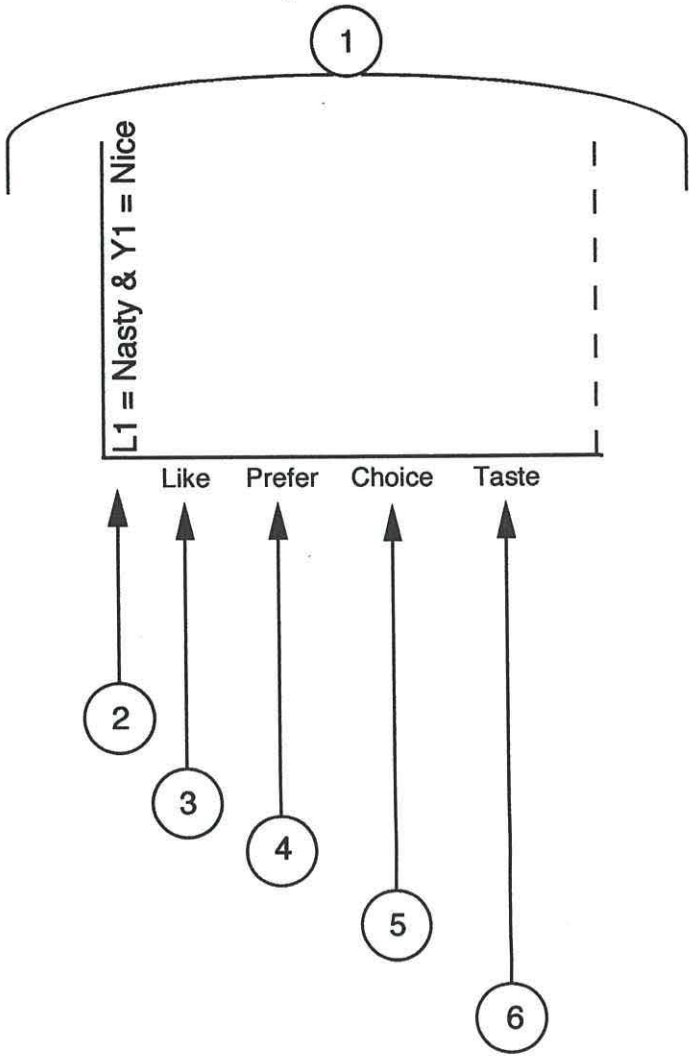
On the first trial, prior to any tasting, HH said he liked both stimuli (L1 and Y1) but proceeded to say that he preferred the Yaz. Thus, even before tasting HH expressed a preference for the Yaz stimuli.

He chose to taste both the Lud and the Yaz. After tasting the Lud on this first trial he said "that one makes me sick". On the second trial he said he didn't like either of the stimuli but proceeded to state a preference for the Yaz and to taste it. He did not elect to taste the Lud saying "it gives me a headache". On the final trial he said he liked both stimuli but preferred the Yaz - he proceeded to taste both stimuli but, after tasting the Lud commented "that gave me a belly ache". Interestingly, he commented little about his experience of the positive tastes.

AN

On the first trial AN said he liked the Lud (L1) and preferred it to the Yaz (Y1). He proceeded to taste both stimuli. On the second trial he said he liked neither food but proceeded to express a preference for the Yaz and to chose only the Yaz to taste. On the third trial he again said he liked neither food but chose both to taste. At the end of this trial he spontaneously said "the Yazs are the nicest".

Reading The Graphs From Phase Three & Phase Five In Experiment Four



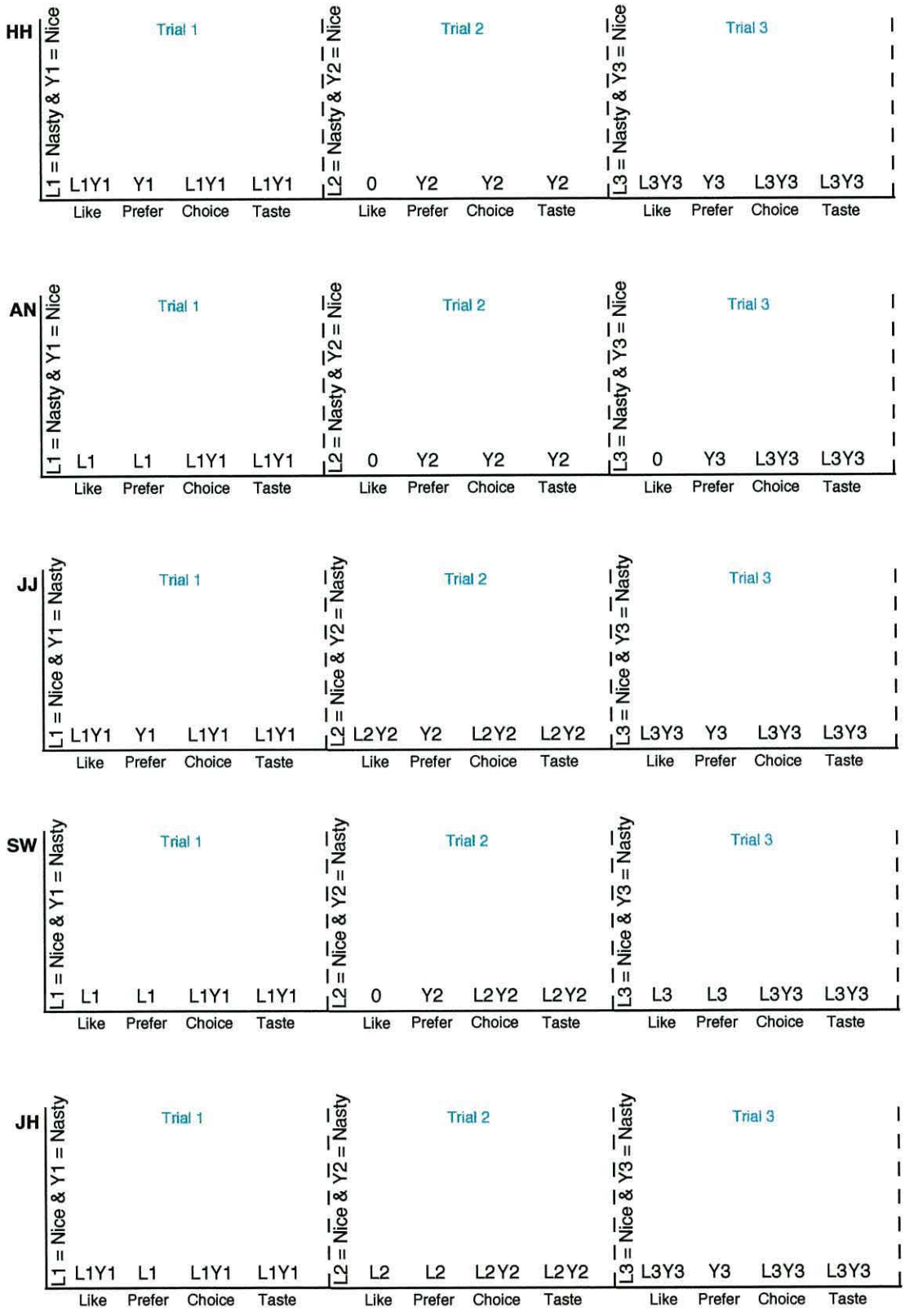
1. Each frame represents a single trial, as numbered in sequence.
2. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, four separate response components are displayed as follows: (3) the stimulus presented above 'like' represents that indicated as being liked by the subject before tasting, (4) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (5) the stimulus presented above 'choice' represents that that the subject elected to taste, and (6) the stimulus presented above 'taste' represents that/those actually tasted by the subject (or refused, as indicated) - see text for detail.

Figure 4.3

Training Name-Taste Relations

The graph shows the data for all five subjects - HH, AN, JJ, SW, and JH in each of the three trials completed to train name - taste relations. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, four separate response components are displayed as follows: (i) the stimulus presented above 'like' represents that indicated as being liked by the subject before tasting, (ii) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (iii) the stimulus presented above 'choice' represents that that the subject elected to taste, and (iv) the stimulus presented above 'taste' represents that/those actually tasted by the subject (or refused, as indicated) - see text for detail.

Figure 4.3: Training Name-Taste Relations



JJ

On the first trial, prior to tasting, JJ said she liked both stimuli and although she expressed a preference for the Yaz (Y1) she proceeded to taste both stimuli. On trial two and three she again expressed a liking for both stimuli, stated a preference for the Yaz, and proceed to taste both foods. Interestingly, a close inspection of the data reveals that after the first trial this subject always stated a preference for, and chose first to consume the stimulus that was in the position (i.e. left or right) that the positive stimulus had been in the preceding trial. Thus this subjects responding may have been contingency shaped (attempting to avoid the negatively flavoured foods dependent on stimulus position) rather than rule-governed - a factor which will be discussed later.

SW

SW was avoidant of tasting in this phase although she did proceed to taste the foods with prompting. In the first session in this phase when asked about her preference for the foods prior to tasting she said "not any kind" and sat well back in her chair and blocked her mouth. She proceeded to refuse to taste any foods saying "No, I don't want it...I'm not hungry". An explanation for such refusal may be found by referring back to her preference data where SW was the subject who most often rated the food presented then as being negative. In a second session she did comply with the procedure but without enthusiasm or comment. On the first trial, prior to tasting, SW said she liked the Lud (L1) and proceeded to state a preference for it. She proceeded to taste both stimuli. On trial two she said she liked neither food, preferred the Yaz, but again proceeded to taste both stimuli. On the third trial she said she liked the Lud, stated a preference for it but again proceeded to taste both foods.

JH

On the first trial JH said she liked both stimuli but stated a preference for the Lud. She proceeded to taste both stimuli. On the second trial she said she liked the Lud, stated a preference for it, and proceeded to taste both stimuli. On the third trial she said she liked both stimuli, preferred the Yaz, but again tasted both stimuli. This undifferentiated response to the food tastes may show that this subject appears not to have learnt any real distinction between the two named categories. It will be recalled that this subject's preference data was the least reliable recorded in the study and it is

perhaps in this that we may find the best explanation of the undifferentiated responding.

Phase Five: Testing Extension of Naming to the Novel Foods
These data is presented graphically on pages 352 and 354.

HH

On the first trial HH said he liked neither stimulus (referring to the Lud he said "I hate that one") but preferred the Yaz and chose only the Yaz to taste. On the second trial he said he liked both stimuli when asked but proceeded to chose only the Yaz to taste. Subsequently he spontaneously said "I don't like that one" indicating the Lud and, conversely, "I like that one" while indicating the Yaz. On the final trial HH again said he liked both stimuli when asked but proceeded to taste the Yaz exclusively after which he said "I like that one my best". Again, he subsequently commented "I hate them ones, I've tried it before" while pointing toward the Lud. Thus is interesting in that he had not actually tasted that stimulus before but did, of course, taste Luds in Phase Three, thus he must have been using the name to govern his avoidance of taste at this point. Thus HH only consumed the stimuli in his 'positive' category (i.e. the Yazs) and it was clear from his spontaneous comments that he had come to divergent preferences for the two named stimulus sets.

AN

On the first trial AN said he liked both stimuli but preferred the Yaz, he proceeded, however, to taste both stimuli. On the second trial he said he liked both stimuli, preferred the Yaz, but proceeded to taste both stimuli. On the final trial AN again said he liked both stimuli, preferred the Yaz, but tasted both stimuli. Thus while there clearly seems to be an effect on verbal statements of preference this does not extend to differential consumption patterns for the named foods.

JJ

On the first trial JJ said she liked both stimuli, preferred the Yaz (Y4) but proceeded to chose both stimuli to taste. On trial two and three she said she liked both stimuli, preferred the Lud, but again proceeded to taste both stimuli. Thus JJs verbal statements of preference seemed to have shifted somewhat from those seen in Phase Three. Unfortunately, unlike HH and

AN, JJ made no spontaneous verbal comments while tasting in Phase Three or Five which makes it more difficult to assess the precise origin of control over her behaviour.

SW

In this phase, as in phase three, SW was extremely avoidant of interacting with the foods. In a second session, when asked her preference, she stated "Not any, not one". When questioned about her subsequent refusal to try the foods she replied "I don't like the taste of them". Given the subject's largely negative responding to the foods featured in the preference test (although she did like some of the foods - vinegar was reliably rated positively) she perhaps learned that she would dislike some, if not many, of the foods she would be presented with in the context of the experiment. In phase three this was confirmed as she overcame her reluctance and tasted the food presented then. Her avoidance of any taste experiences in phase five, despite the fact that the foods were entirely novel to her, may, perhaps, best be characterised as an overgeneralisation of her earlier taste-avoidant responding.

Figure 4.4

Testing Extension of Naming - Summary Data

The graph shows the total percentage correct data for all five subjects - HH, AN, JJ, SW, and JH in each of the three trials completed to test extension of naming to the novel foods. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, four seperate response components are summarised and displayed as follows: (i) the histogram presented above 'like' represents the percentage total of subjects who indicated liking the 'positive' stimulus in question, before tasting, (ii) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (iii) the histogram presented above 'choice' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (iv) the histogram presented above 'taste' represents the percentage total of subjects that actually tasted *only* the 'positive' stimulus offered - see text for detail.

Figure 4.4 Testing Extension Of Naming Group Summary Data

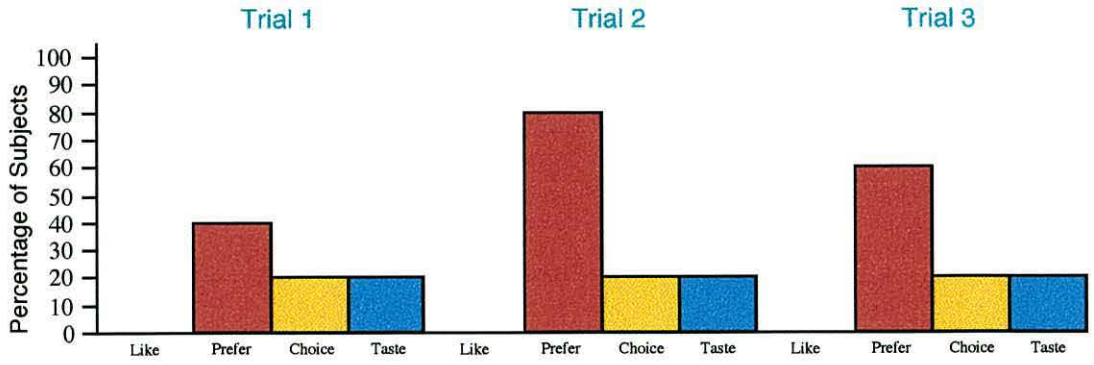
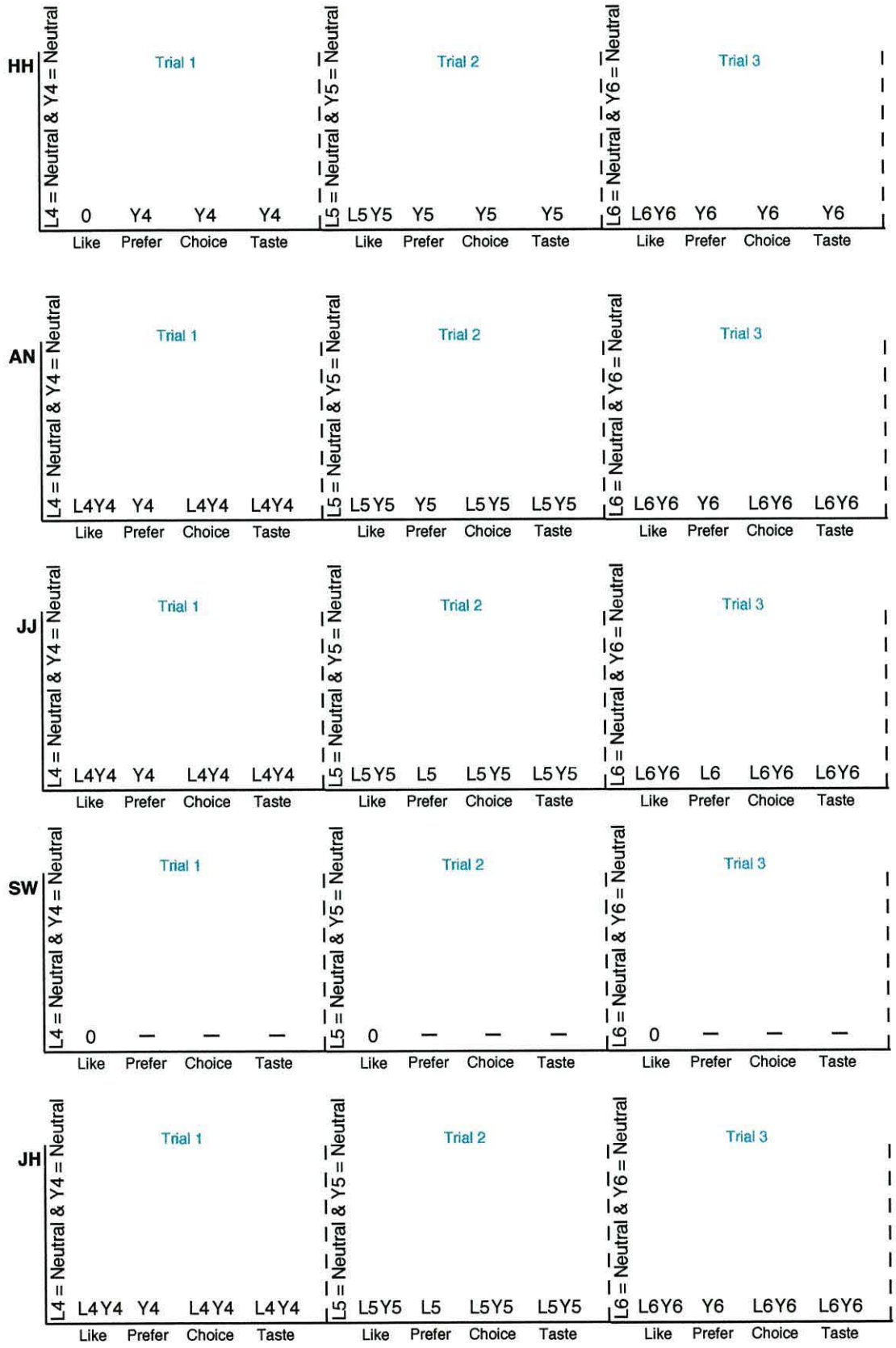


Figure 4.5

Testing Extension of Naming - Individual Data

The graph shows the data for all five subjects - HH, AN, JJ, SW, and JH in each of the three trials completed to test extension of naming to the novel foods. Each frame represents a sinlge trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, four seperate response components are displayed as follows: (i) the stimulus presented above 'like' represents that indicated as being liked by the subject before tasting, (ii) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (iii) the stimulus presented above 'choice' represents that that the subject elected to taste, and (iv) the stimulus presented above 'taste' represents thatthose actually tasted by the subject (or refused, as indicated) - see text for detail.

Figure 4.5: Testing Extension of Naming



JH

On the first trial she said she liked both stimuli, preferred the Yaz, and proceeded to taste both. On trial two she again said she liked both stimuli but stated a preference for the Lud. She proceeded to taste both stimuli. On the final trial she said she liked both stimuli, preferred the Yaz, but proceeded to taste both stimuli. This undifferentiated responding in relation to food tasting is perhaps most attributable to her extremely unreliable preference test data.

DISCUSSION

The main objective of this initial pilot study was to explore the procedures used in the various phases of the experiment with a view to informing further investigation. Each phase of the experiment will now be briefly reviewed and the major methodological findings outlined.

Phase One: Preference Testing

The most obvious characteristic of the data gained in preference testing was the considerable variability both within and between subjects. Whilst some subjects appeared reliable in their responding to particular flavours (particularly in relation to salt and sugar) other subjects - most notably JH - were quite unreliable, sometimes responding differently each time a particular flavour was tasted. This variability may be due to a number of factors. Firstly, it is widely known (see, for example, Logue, 1991) that individuals vary in their sensitivity to detecting particular chemicals in foods (e.g. PTC, Vanillin) - thus perhaps some of our subjects were simply less sensitive to the featured flavours than others. Secondly, the variability between subjects may be attributable to differences in innate or acquired preferences (as, for example, a result of historical exposure). Thirdly the flavours included may simply have been too weak in magnitude to evoke reliable divergent responses. Finally, we may have tested flavours in too narrow a range to evoke significant divergence in subjects responses. This led us to question the consequent effects in the remainder of the experiment and to ponder refinements in future investigations.

The most likely consequent effect, for those subjects whose responses were of poor reliability, was in the name-taste training phase. Naturally if a subject's responses to the 'positive' and 'negative' flavours were unreliable then their learning of what the category name signified may well have been compromised in that both category names may have become predictive of variability rather than uniquely associated with positive or negative flavours. This may well account for poor extension effects and/or 'broad' sampling of stimuli to learn which individual stimuli were positively flavoured and which negative. It will be recalled that the most 'extensive' extension was observed in the subject who also had the most reliable preference data.

Phases Two and Four: Learning Colour-Name Relations

A number of features in the data gained in phases two and four also prompted procedural refinements.

The sequence in which the colour-name training proceeded may not only have been difficult for subjects but may perhaps have influenced later effects. The subjects first learned to produce the names of the foods and their comprehension of such names was subsequently tested extensively. After the comprehension testing the subjects returned to production training and testing with more stimuli present (initially four and then all six) and finally underwent another phase of comprehension testing. Such a heavy emphasis on comprehension may have biased the subjects performance in that direction thus inhibiting their acquisition of name production. Ultimately less production may have inhibited potential extension effects - both as production fluency may have been inhibited and also perhaps because subjects were inadvertently made more reliant upon the experimenter producing the stimuli names for them (perhaps extension tests featuring more comprehension-based measures may also have produced more systematic results). A procedure which began with comprehension testing and then progressed with more emphasis on production training may produce more robust effects.

A second major observation was that some subjects appeared to experience difficulty in discriminating the colours of different stimuli. One subject, for example, when clearly experiencing difficulty discriminating two stimuli reported "They're the same but different" in response to two green coloured stimuli. Due to the limitations imposed in using small amounts of food colouring some stimuli necessarily shared a colour albeit the colours did vary considerably in intensity. Thus a subject may have a light green coloured Yaz and a dark green coloured Lud - naturally a subject might differentiate these two if they were presented as a pair responding to the dimensional difference in colour (the same coloured stimuli could not be placed in the same named categories as this may have biased category defining features along non-arbitrary, i.e. colour, features). This may have resulted not only in difficulty recognising the stimuli and thus naming them appropriately but may have further confounded effects due to second-order naming. It has been reported elsewhere (see, for example, Dugdale and Lowe, 1990) that subjects often use intraverbal strategies when regulating behaviour. Thus a subject in the current experiment may have referred to the different stimuli with covert colour names as well as the stimulus' assigned name. This could result in a subject saying, for example, "green-Lud-nice" and "green-Yaz-nasty" which is not only a more difficult thing to acquire and remember but also

more likely to ultimately lead to error in choosing stimuli to taste. This factor was taken into account in subsequent studies.

In general, subjects completed the trials required to attain criterion performance more quickly in phase four (the one exception was the subject referred to above who experienced discrimination difficulty with the second set of stimuli). This finding, of theoretical interest, may be due to the subjects acquiring a learning strategy in phase two and subsequently applying it in phase four, or perhaps learning in phase four was hastened by the reinforcement history attached to performing the same task in phase two. A combination of these two factors may also have produced the final performance differences.

Phases Three and Five: Name-Taste Relation Learning and Testing Extension of Naming to the Novel Foods

The most intriguing observation in phases three and five was that the subject who showed the greatest degree of extension was the subject who spontaneously verbalised the most throughout the study (although it will be remembered that he also had the most reliable preference test data). This again highlights the potential effect of a greater emphasis on the subject's verbal production during the procedure - this was noted for future investigations. A second observation was that the subjects were given little opportunity to express their preferences for the stimuli as a group or to nominate which stimuli they might like other than the pair currently on the table. Again, this was amended in further studies.

Conclusion

In summary then, although this pilot experiment yielded very varied results albeit with some suggestive verbal effects it served it's purpose very well indeed in charting improvements for the investigations which followed.

EXPERIMENT FIVE

The Effects of Common Naming on The Acceptability of, and Preferences for, Novel Foods in Four - Five Year Olds

Introduction

As noted in the discussion after the pilot study there were many procedural issues which suggested that a design incorporating appropriate refinements might yield more systematic effects. The refinements introduced in the following experiment are briefly outlined below.

Preference Testing

The preference testing procedure was changed in four major ways. Rather than using the array of six flavours used in the pilot study we chose the two flavours which appeared most reliably related to positive and negative responses (sugar and salt respectively) and placed each of these flavours into all food samples of a particular named class - thus, for example, all three Yazs tasted in phase three now contained sugar and all three Luds contained salt (for some subjects this was reversed to counterbalance any name-specific effects). Secondly, the number of trials in the preference testing procedure was increased. Each subject was now repeatedly tested until they showed a reliable response to the 'positively' and 'negatively' flavoured foods. Across these trials the concentrations of sugar and salt were gradually increased for each individual subject until a reasonable level of reliability was attained. The flavour concentrations subsequently used in phase three were the final concentrations employed in the preference testing. Thirdly, having established reliable differences in response to the positive and negative flavours the subjects responses to the unflavoured food was assessed to ensure it fell between these two categories. Having observed that vanilla essence seemed to evoke 'neutral' responses in the previous experiment a few drops of vanilla essence or lime juice was ultimately added to one set of foods in the extension test while the other remained unflavoured - thus there were two 'neutral' tastes in phase five. Lastly, subjects who did not attain reasonable levels of reliability were discarded from further participation.

Training and Testing Colour-Name Relations

The training and testing of colour-name relations was changed - the procedure now began with comprehension and progressed to production training. The criterion for adequate performance in the production stage was also increased. Criteria for each of these components (comprehension and production) were now the reverse of those used in Phase Three in Experiment Four i.e. comprehension training now comprised a minimum of

three blocks and production now comprised a minimum of nine blocks - thus the emphasis was shifted to verbal production responding.

A second major refinement was in the food colouring - all food colours were intensified (additional colouring was added to the level used in each sample in the pilot study) in the hope of enhancing the discriminability of the stimuli.

Training Name-Taste Relations and Testing Extension of Naming

These phases were extensively revised in light of the results of Experiment Four. Additional instructions were added and the verbal content of the existing instructions was refined. Firstly, the subjects were required to name each stimulus at the beginning of each trial - thus the experimenter was sure that the stimuli had been correctly identified. Additionally, this increased the amount of verbal production on the subject's part which was noted to be a predictor of greater extension in the pilot experiment. Secondly, subjects were now asked which stimulus they *liked the best* rather than which one they preferred which may have been a more difficult word for our young subjects to understand. Thirdly, the subjects were asked would they like to *try* one rather than *eat* one - the latter word implied that the subject would have to consume all of the food sample which may have met with some reluctance as the subjects had already sampled some foods they did not like in the experiment. A fourth refinement was the addition of the instruction "Which others would you like to try?" - this allowed a rapid analysis of which other named stimulus class members were affected after each tasting i.e. within-class generalisation was assessed trial by trial. Finally, after tasting, the subjects were asked "Which one tastes the best?" This instruction was inserted with the aim of increasing the emphasis on the stimulus chosen.

With these methodological refinements in place Experiment Five began.

Method

Subjects

Three subjects completed this experiment. They were recruited from a Primary One school class at a local primary school. They were chosen from a large group of children whose parents had granted permission for them to participate having received a letter summarising the study. The children

ranged in age from 5 years 1 month to 5 years 3 months. There were two boys and one girl.

Table 5.1
Experiment Five
Age of Subjects

Subject	Age at Start
GM	5 yrs 1 mth
JD	5 yrs 3 mths
TJ	5 yrs 2 mths

Mean age of subjects at start = 5 yrs 2 mths

Setting and Apparatus

The experiment was conducted in a quiet room adjacent to one of the classrooms in the school. The room was ordinarily used as a small library. The subject was seated across a table from the experimenter. All experimental sessions were video-recorded using a Panasonic M7 video recorder.

Materials

1. The Foods

During all phases of the experiment the 'novel food' employed was Fromage Frais.

Flavours

150ml of icing sugar was added to 250mg of Fromage Frais to produce a 'nice' flavour, 15ml salt was added to produce an unpleasant flavour, and 5ml of vanilla essence or lime juice was added to produce a 'neutral' flavour.

Colours

Twelve different colours of Fromage Frais were produced. To produce the colours food colouring was added to 10ml portions of Fromage Frais in the following manner:

White - no additional colour
Blue - 10 units blue
Yellow - 15 units yellow
Green - 30 units green

Red	- 20 units red
Lilac	- 10 blue + 25 red
Purple	- 20 blue + 30 red
Orange	- 20 red + 15 yellow
Brown	- 10 green + 10 yellow + 25 red + 5 blue
Turquoise	- 23 blue + 10 green
Lime	- 10 green + 35 yellow
Dark orange	- 45 red + 15 yellow

2. Other items

Plastic tubs of 12cm in diameter in which to present the foods.

A blindfold for use in the preference testing.

Response sheets upon which to record subjects responses.

Experimental Design

After an initial familiarisation phase the experiment proceeded in five phases as outlined below.

Phase One

Preference Testing

During this phase subjects tasted positive, neutral, and negative food samples whilst blindfolded. Each food sample was tasted at least three times to assess response reliability. After tasting each food sample the blindfold was removed and the child indicated their preference for the taste by indicating a face on the response sheet (see below). Any subject who did not attain reasonable reliability in their responses in this phase were removed from further participation.

Phase Two

Training and Testing Colour-Name Relations I

During this phase subjects were trained to name six food stimuli (S1 - S6). All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Three

Training and Testing Name-Taste Relations

During this phase subjects tasted the food stimuli. A 'positive' (i.e. a flavour which elicited a positive response) flavour (sugar) was assigned to one named category and a 'negative' (i.e. a flavour which elicited a negative response) flavour (salt) was assigned to the other named category.

Phase Four

Training and Testing Colour-Name Relations II

Six new food stimuli were introduced (S7 - S12). During this phase subjects were trained to name these stimuli. All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Five

Testing Extension of Naming to the Novel Foods

The subjects were offered the opportunity to taste S7 - S12 and verbalise their preferences for the stimuli. These six stimuli all tasted 'neutral'. The extension of naming to the novel foods was assessed.

PROCEDURE

Familiarisation Phase

This was conducted in an identical manner to the familiarisation phase described in Experiment Four above.

Phase One

Preference Testing

The experimenter sat at a table opposite the subject and placed the Faces Response Sheet on the table facing the subject. The experimenter proceeded to repeat the instructions issued at the end of the second familiarisation session saying...

> "Today we are going to play a new game. Look at this (the experimenter indicates the faces response sheet). This face looks sad because she/he's just tasted something really horrible (experimenter indicates frowning face); this one looks okay because she/he's just tasted something that was okay (experimenter indicates neutral face); this one looks happy because she/he's just tasted something really nice (experimenter indicates smiling face). I want you to taste some foods and point to this face if it's horrible (experimenter indicates frowning face), this face if it's nice (experimenter indicates smiling face), and this face if it's just okay (experimenter indicates neutral face). To show how good you are at tasting I'm going to blindfold you with these special goggles".

When it was clear that the subject had understood the instructions the testing proceeded. The subject was blindfolded and presented with the first food sample (the first sample was always positively flavoured to prevent subject attrition). After each taste the blindfold was removed and the subject was requested to point to whichever face they felt best indicated

their preference for the flavour. The subjects were encouraged to take a drink of water between trials to cleanse the palette before experiencing the next taste thereby preventing contamination of the taste perception. All trials were randomised with the following constraints: (i) the first food stimulus presented in the experiment was always positively flavoured, (ii) each food stimulus was presented at least three times, (iii) no particular food stimulus appeared twice in succession, (iv) trials proceeded until the reliability of the subject's response was satisfactory (operationally defined as a consistent 2/3 responses had to be identical to the sample - more stringent crtieria excluded too many potential subjects). Throughout the preference testing the food samples were kept under the table so that the subject could not see the colour of the food at any time. If the preference testing of any particular subject extended over more than one session (which was almost invariably the case for all subjects in the present experiment) the experimenter began each new session by placing the Faces response Sheet on the table and saying...

> "Do you remember these faces?
> Which one should you point to if you like the food?
> Which one should you point to if you don't like the food?
> Which one should you point to if it's just OK?"

When it was clear that the subject had understood the instructions the testing proceeded as above. Preference testing continued until reliable and stable divergence emerged with subjects showing differential responses to the positive, negative, and neutral stimuli.

Phase Two

Training and Testing Colour-Name Relations

Six food stimuli were introduced to each subject. Each of the six stimuli was coloured differently. Subjects were trained to name three of the novel stimuli 'Yaz' and the remaining three stimuli 'Lud' (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were discriminable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation. This training proceeded in three stages.

Stage One: Colour-Name Comprehension Training and Testing

The experimenter placed two foods, L1 (Lud 1) and Y1 (Yaz 1), in clear round plastic bowls, on the table. The experimenter then said

"I've got some special foods here and I want you to learn what they are called".

The experimenter then proceeded to model the correct response saying

"This is called a 'Lud' (indicating L1) and this one is called a 'Yaz' (indicating Y1)".

The experimenter then said

"Can you point to the Lud/Yaz?"

If the subject responded correctly the experimenter said

"Clever girl/boy"

If the subject responded incorrectly the experimenter said

"This is a 'Lud/Yaz' - Can you give me the 'Lud/Yaz'?"

The four trial types (as above in Experiment Four) were presented with the same constraints until the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. Thus a subject could attain criterion performance in a minimum of three trial blocks. When a subject did attain criterion performance - by responding correctly on seven out of eight trials for each stimulus pair - the stimuli were presented in random pairs for at least one trial block to test that each stimulus was reliably identified outside of the context of the original presentation pair.

Stage Two: Colour-Name Production Training and Testing

The experimenter placed two foods, L1 and Y1, in clear round plastic bowls, on the table. The experimenter then said

"I want you to learn what these foods are called. When you can tell me their names I'll give you a star to show how good you are"

The experimenter then pointed to one of this first pair and said

"Can you tell me what this is?"

If the subject responded correctly the experimenter said

"Clever girl/boy"

If the subject responded incorrectly the experimenter said

"This is a 'Lud/Yaz' - Can you say 'Lud/Yaz'?"

The four trial types (as above) were presented with the same constraints until the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. After these three pairs were taught the stimulus pairs were mixed so that all Lud stimuli appeared with all Yaz stimuli - each Lud appeared with each Yaz for at least one block of trials and trials were repeated until criterion performance was attained.

Stage Three: Family Category Test

This stage occurred in two sub-stages.

(i) Naming

All six stimuli were placed on the table simultaneously.

Each stimulus was indicated in turn by the experimenter and the subject was required to produce the appropriate name for it.

The foods were randomly mixed between trials to ensure that the subjects were naming the foods by their colour and not being cued by the position of the foods. If a subject failed to perform this task adequately two stimuli were removed (one Lud and one Yaz) and the subject continued to perform the task until criterion performance was attained with four stimuli at which time the remaining two stimuli were re-introduced and the task continued until the subject attained criterion performance with all six stimuli simultaneously present.

(ii) Grouping

The subjects were asked to place all of the Luds or the Yazs to one side in a group. This substage ended when subject attained criterion performance.

Phase Three

Training and Testing Name-Taste Relations

The subjects stimuli foods were flavoured in accordance with their individual taste preferences as recorded in the taste preference test i.e. if a subject indicated a positive face in response to tasting sugar then sugar was added to one stimulus set (e.g. the Yazs); conversely, if a subject indicated a negative response to salt then salt was added to flavour the 'negative' stimuli (the remaining stimulus set).

The experimenter then presented L1 and Y1 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject elected to taste both) she selected from this first pair. With this first pair of stimuli (L1 and Y1) the subject was encouraged to taste both foods and were prompted to do so if they appeared reluctant. After tasting the subject was asked

"Which one tastes the best?"

Then the second pair of foods (L2 and Y2) were placed on the table and the questions outlined above (questions 1 - 5) were posed. Finally the third stimulus pair were presented (L3 and Y3) and the questions outlined above

(questions 1 - 5) were again posed. When the second and third stimulus pairs were presented the subjects were not encouraged to taste them but were allowed to taste none/either/both foods from each stimulus pair if they elected to do so - thus we were able to assess the immediate effect of the first name-taste link on the remaining members of each named class. The subject's responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

Phase Four

Training and Testing Colour-Name Relations II

A second set of six novel stimuli were introduced. Subjects were trained to name three of the novel stimuli "Yaz" and the remaining three stimuli as "Lud" (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were distinguishable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation through training in three stages - comprehension, production, and family categorisation training as in Phase Two. The same constraints on trials applied as did the criterion of seven out of eight consecutive correct responses before subjects proceeded to phase five.

Phase Five

Testing Extension of Naming to the Novel Foods

The second set of stimulus foods were all 'neutrally' flavoured. The novel set of six stimuli (L4, Y4, L5, Y5, L6, Y6) were presented. The experimenter presented L4 and Y4 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject elected to taste both) she selected from the presented pair. The subject was then asked

"Which one tastes the best?"

Then the second pair of foods (L5 and Y5) were placed on the table and the questions outlined above (questions 1 - 5) were posed. Finally the third stimulus pair were presented (L6 and Y6) and the questions outlined above (questions 1 - 5) were again posed. The subjects' responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

RESULTS

Phase One: Preference Testing

Note: Please refer to the graphical display of these data overleaf in Figure 5.1. The data graphed represents the final three data points (after the concentrations of added sugar and salt were adjusted upward to elicit reliable responding from each subject) in preference testing with each subject.

GM

GM responded positively to sugar and negatively to salt reliably.

JH

JH responded positively to sugar and negatively to salt reliably.

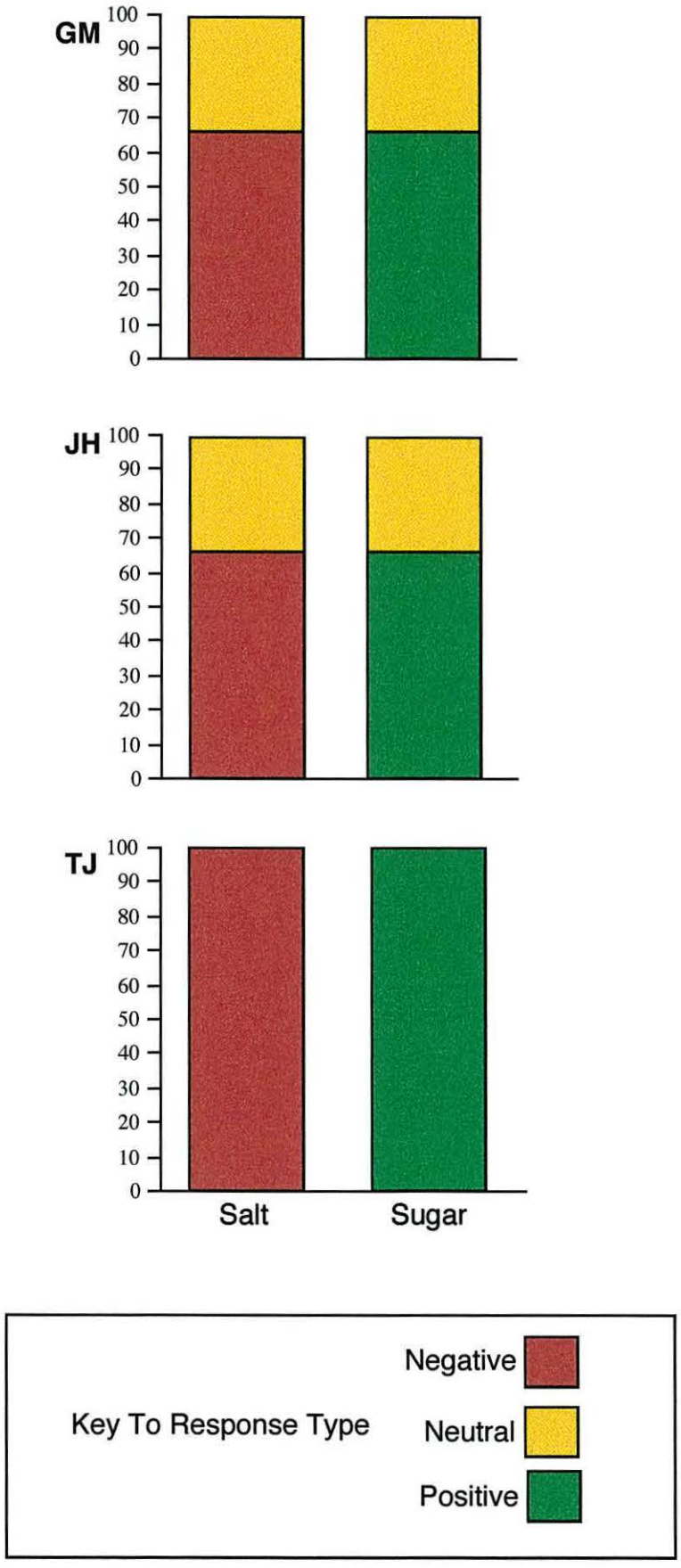
TJ

TJ responded positively to sugar and negatively to salt with perfect reliability.

Figure 5.1

Preference test response data for all three subjects - GM, JH, and TJ. Note that the green shading indicates a positive response, the yellow shading indicates a neutral response, and the red shading indicates a negative response. The data plotted include the three final preference trials for each particpants, featuring both foods - sugar and salt, these foods were then at their final concentration levels for each subject (the level concentration level utilised in all subsequent phases). The overall response to each of the foods can be observed by noting the proportion of each colour featured in the histogram for each food.

Figure 5.1: Preference Test



Phase Two: Training and Testing Colour-Name Relations

These data are presented graphically overleaf in Figure 5.2.

GM

Comprehension

Stimulus Set One

GM required a total of three trial blocks to attain criterion performance in comprehension. GM attained criterion performance with each of the three stimulus pairs (L1 and Y1, L2 and Y2, L3 and Y3) in the minimum possible of one trial block each.

Stimulus Set Two

GM required the minimum possible number of trial blocks necessary to complete comprehension training with the second set of stimuli i.e. three blocks.

Production

Stimulus Set One

GM required ten blocks of trials to attain criterion performance in the production training phase. Criterion performance was attained in the minimum possible number of trial blocks (i.e. one) with all but one of the stimulus pairs.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, GM attained criterion performance in the production phase in the minimum possible number of trials blocks i.e. nine.

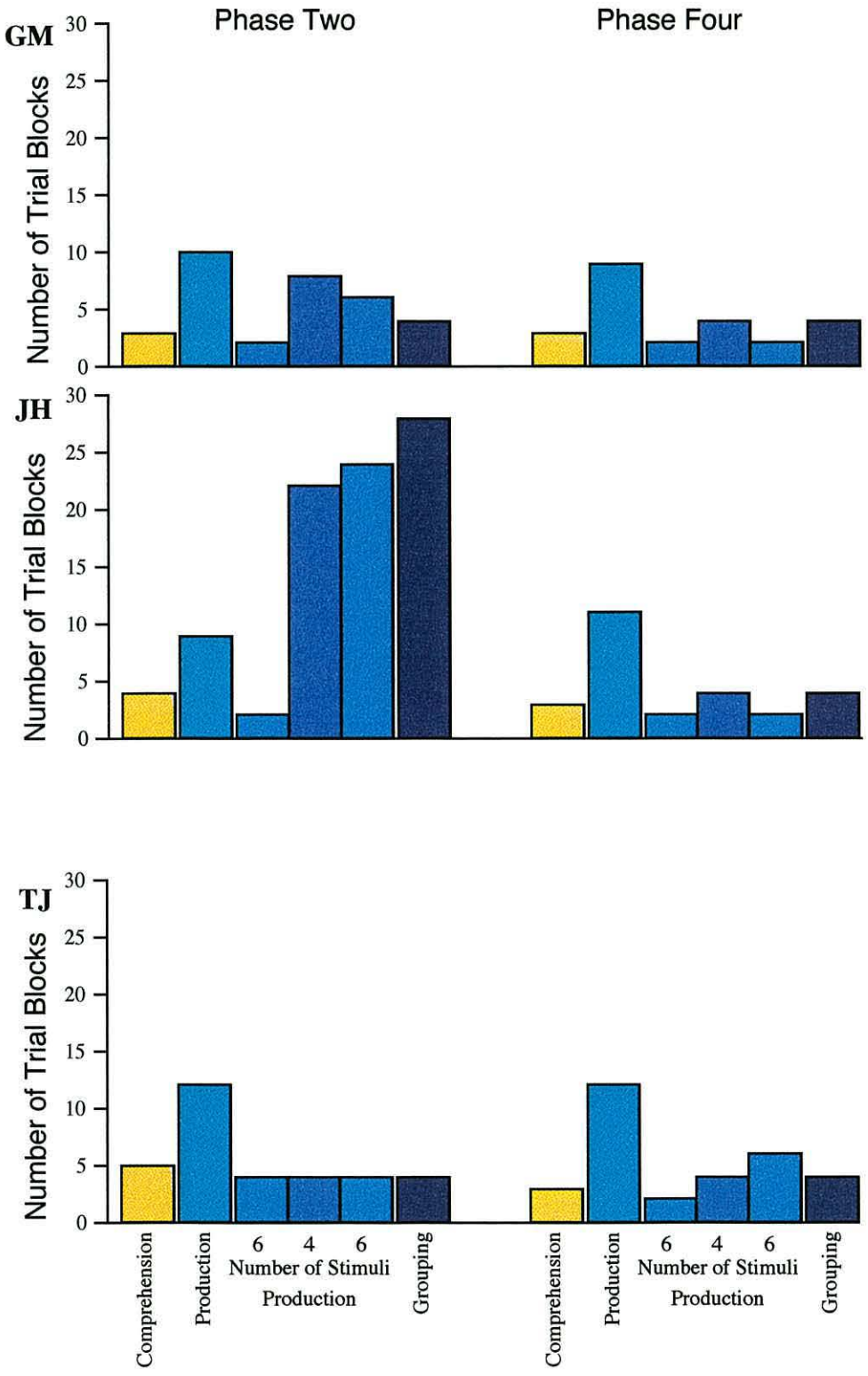
Figure 5.2

Training and Testing Colour Name Relations

Data are shown for all three subjects - GM, JH and TJ.

Total number of trial blocks completed during the comprehension (minimum trials blocks = 3) and production phases (minimum trial blocks = 9); (production phase including performance when four, or all six stimuli - three from each stimulus set - were simultaneously presented; the number of stimuli presented was adjusted depending upon the subjects performance - see text for detail) and in the grouping task in Phase Two (Stimulus Set One) and Phase Four (Stimulus Set Two). The data was calculated by totalling block numbers performed until criterion performance was observed (see text for detail).

Figure 5.2: Training Name - Colour Relations



Family Category Testing

Naming

Stimulus Set One

Initially GM was presented with all six stimuli simultaneously. After two trial blocks it was evident that GM was having difficulty - thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. GM attained criterion performance with these four stimuli after eight trial blocks. All six stimuli were then simultaneously presented and GM attained criterion performance with all six after six trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, GM again appeared to have some difficulty. After completing two trial blocks with all six stimuli, two stimuli were removed and GM continued with four stimuli until criterion performance was attained after four trial blocks. When all six stimuli were again simultaneously presented GM attained criterion performance after two trial blocks.

Grouping

Stimulus Set One

GM attained criterion performance in the stimulus grouping task after four trial blocks.

Stimulus Set Two

With the second stimulus set GM attained performance in the grouping task after four trial blocks.

Total

In phase two GM required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

JH

Comprehension

Stimulus Set One

JH required a total of four trial blocks to attain criterion performance in comprehension. JH attained criterion performance with two of the stimulus pairs (L1 and Y1, L3 and Y3) in the minimum possible of one trial block each. The second pair (L2 and Y2) required two blocks before criterion performance was attained.

Stimulus Set Two

JH required the minimum possible number of trial blocks necessary to complete comprehension training with the second set of stimuli i.e. three blocks.

Production

Stimulus Set One

JH required nine blocks of trials to attain criterion performance in the production training phase. Criterion performance was attained in the minimum possible number of trial blocks (i.e. one) with each of the stimulus pairs.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, JH attained criterion performance in the production phase after eleven trial blocks.

Family Category Testing

Naming

Stimulus Set One

Initially JH was presented with all six stimuli simultaneously. After two trial blocks it was evident that JH was having difficulty - thus, two stimuli were removed (one Yaz and one Lud) and training continued with four stimuli. JH attained criterion performance with these four stimuli after twenty-two trial blocks. All six stimuli were then simultaneously presented and JH attained criterion performance with all six after twenty-four trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, JH again appeared to have some difficulty. After completing two trial blocks with all six stimuli, two stimuli were removed and JH continued with four stimuli until criterion performance was attained after four trial blocks. When all six stimuli were again simultaneously presented JH attained criterion performance after two trial blocks.

Grouping

Stimulus Set One

JH attained criterion performance in the stimulus grouping task after twenty-eight trial blocks.

Stimulus Set Two

With the second stimulus set JH attained performance in the grouping task after four trial blocks.

Total

In phase two JH required a total of 89 trial blocks; in phase four he required a total of 26 trial blocks yielding a grand total of 115.

TJ

Comprehension

Stimulus Set One

TJ required a total of five trial blocks to attain criterion performance in comprehension. TJ attained criterion performance with two of the stimulus pairs (L1 and Y1, L2 and Y2) in the minimum possible of one trial block each. The third pair (L3 and Y3) required three blocks before criterion performance was attained.

Stimulus Set Two

TJ required the minimum possible number of trial blocks necessary to complete comprehension training with the second set of stimuli i.e. three blocks.

Production

Stimulus Set One

TJ required twelve blocks of trials to attain criterion performance in the production training phase. Criterion performance was attained in the minimum possible number of trial blocks (i.e. one) with all but two of the stimulus pairs.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, TJ again required twelve trial blocks before criterion performance was attained.

Family Category Testing

Naming

Stimulus Set One

Initially TJ was presented with all six stimuli simultaneously. After four trial blocks it was evident that TJ was having difficulty - thus, two stimuli were removed (one Yaz and one Lud) and training continued with four

stimuli. TJ attained criterion performance with these four stimuli after four trial blocks. All six stimuli were then simultaneously presented and TJ attained criterion performance with all six after four trial blocks.

Stimulus Set Two

With the second set of six stimuli, when all six were presented simultaneously, TJ again appeared to have some difficulty. Two trial blocks were completed with all six stimuli then two stimuli were removed and TJ continued with four stimuli - criterion performance was attained after four trial blocks. When all six stimuli were again simultaneously presented TJ attained criterion performance after six trial blocks.

Grouping

Stimulus Set One

TJ attained criterion performance in the stimulus grouping task after four trial blocks.

Stimulus Set Two

With the second stimulus set TJ attained performance in the grouping task after four trial blocks.

Total

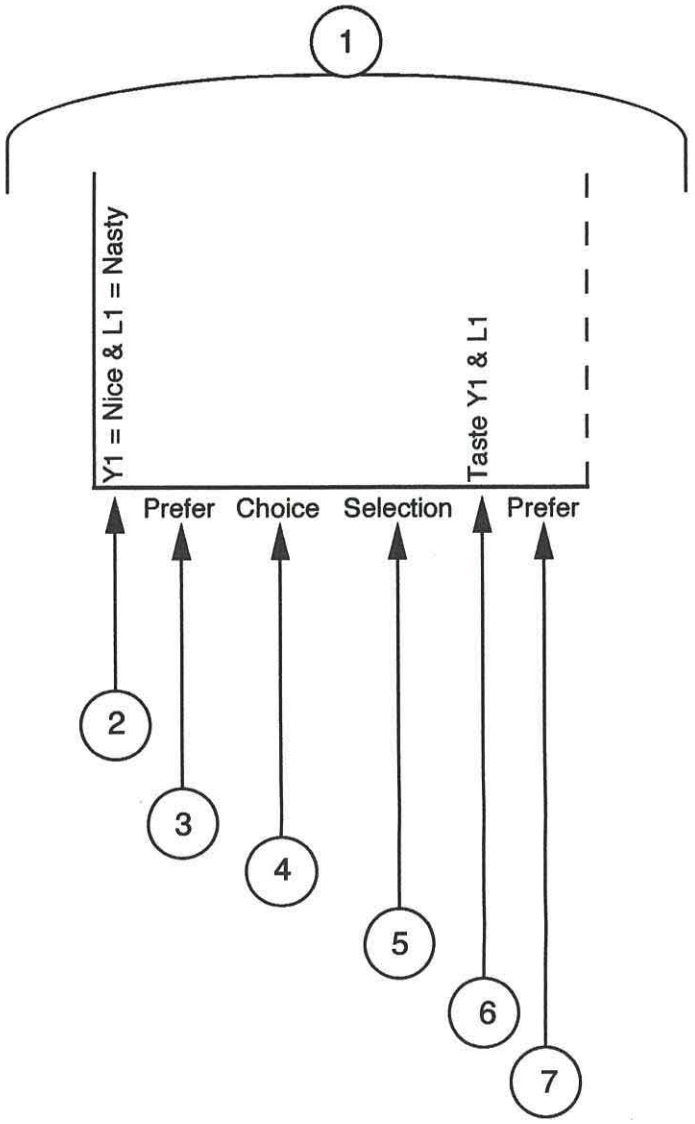
In phase two TJ required a total of 33 trial blocks; in phase four he required a total of 31 trial blocks yielding a grand total of 64.

Phase Three: Training and Testing Name-Taste Relations

These data are presented graphically in Figure 5.3.

GM

On the first trial, prior to tasting, GM stated a preference for the Yaz (Y1). He elected to taste both and when asked which others he would like to try he selected one other Lud (L2) and one other Yaz (Y3). After tasting he indicated a preference for the Yaz. On the second trial, before tasting, he said he preferred the Lud but elected to taste only the Yaz (Y2). He selected one other Yaz (Y3) and one other Lud (L3) as foods he would like to try - interestingly these were the two remaining stimuli which he had not yet been offered for tasting. After tasting the Yaz he indicated that he preferred it to the Lud. On the third trial, before tasting, he stated a preference for the Yaz (Y3) and also elected to taste it. He selected, as others he would like to try, Y2 (which he had tasted on the preceding trial) and L1. After tasting the Yaz (Y3) he indicated a preference for it over the Lud.



1. Each 'box' like the one above represents one trial

2. The vertical statement inside the bar tells which stimulus was 'positive' (+ sugar) and which was ' negative' (+salt)

3. The stimulus/stimuli listed above 'Prefer' represent that/ those the subject liked before tasting

4. The stimulus/stimuli listed above 'Choice' represent that/those the subject elected to taste.

5. The stimuli listed above 'Selection' represent those others the subject said she/he would also like to try.

6. The vertical statement above 'Taste' represents the stimulus/stimuli actually tasted by the subject.

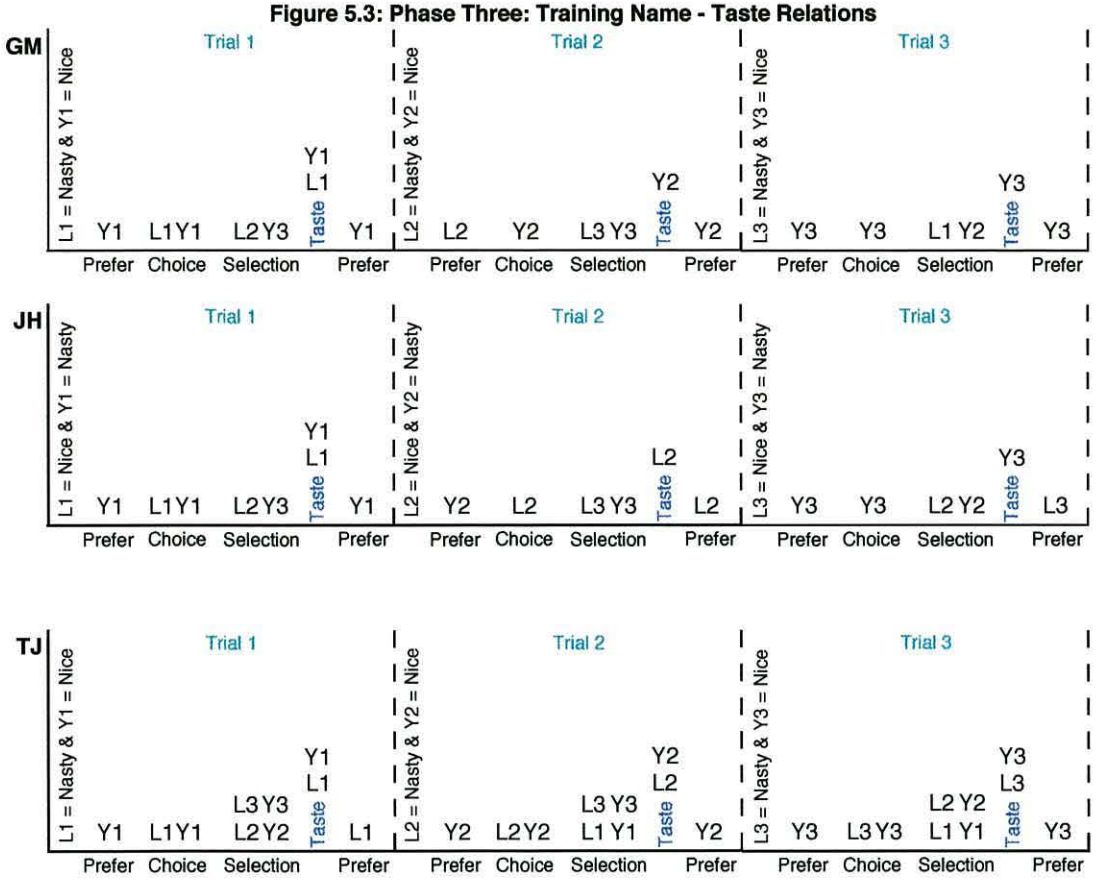
7. The stimulus listed above the final 'Prefer' represents that the subject preferred after tasting.

Figure 5.3

Training Name-Taste Relations

The top panel of the graph depicts performance by Subject GM, the middle panel performance by Subject JH, and the bottom panel performance by Subject TJ, in each of the three trials completed to train name-taste relations. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 5.3: Phase Three: Training Name - Taste Relations



JH

On the first trial, before tasting, JH stated a preference for the Yaz (Y1) but proceeded to taste both stimuli. He selected L2 and Y3 as other stimuli he would like to try. After tasting both stimuli he stated a preference for Y1. On the second trial he stated a preference for the Yaz (Y2) but elected to taste only the Lud (L2). He selected L3 and Y3 as others he would like to try and, after tasting, stated a preference for the Lud. On the third trial he again stated a preference for the Yaz (Y3) prior to tasting - he also elected to taste only the Yaz. He selected L2 and Y2 (which had featured in the preceding trial) as other stimuli he would like to try. After tasting he stated a preference for the Lud.

TJ

On the first trial TJ stated a preference for the Yaz (Y1) before tasting but proceeded to taste both stimuli. She selected all the remaining stimuli (L2, Y2, L3, and Y3) as others she would like to try. After tasting she stated a preference for the Lud. After completing the first trial she said that she was "going to eat all the Yazs because they are nice" and although this did seem predictive of her subsequent verbal statements of preference (as can be seen below) it did not seem to be predictive of her actual consumption.
On the second trial TJ again stated a preference for the Yaz but proceeded to taste both stimuli. She again selected all the remaining stimuli (L1, Y1, L3, and Y3) as others she would like to try. After tasting she indicated a preference for the Yaz. On the third trial TJ again stated a preference for the Yaz but elected to taste both stimuli. Further, she again selected all the remaining stimuli as others she would like to try (she had, in fact tasted all of these by now). After tasting L3 and Y3 she stated a preference for Y3. It is interesting to note that TJ selected all remaining stimuli on each trial as stimuli she would also like to try - also of note is that fact that she invariably tasted both stimuli on every trial - these points will be discussed later.

Phase Five - Testing Extension of Naming

These data are presented graphically in Figure 5.4.

GM

On the first trial GM stated a preference for the Lud (L4) but chose to taste both stimuli (L4 and Y4). He selected L5 and Y6 as others he would like to try. After tasting he again indicated preferring the Lud. On the second trial

he stated a preference for the Yaz (Y5) but elected to taste the Lud (L5). He selected L4 (which he had tasted in the preceding trial) and Y6 as others he would like to try. After tasting L5 he stated a preference for Y5 (which he hadn't tasted). On the final trial GM stated a preference for the Lud (L6) but elected to taste both stimuli. He selected L4 and Y4 as others he would like to try (he had previously tasted both of these on the first trial). After tasting the stimuli (L6 and Y6) he stated a preference for the Lud. Thus there was no systematic evidence of an extension of naming. The picture clarifies considerably, however, when the spontaneous comments of GM are considered. Although he made few comments throughout the procedure, upon completing the extension of naming test he proudly announced that he "knew the differences [between the Yazs and the Luds] because of the lumps". Obviously the stimuli could not be discriminated in this manner but naturally, given that the subject chose this basis for his performance in this task it is hardly surprising that the resulting data are rather unsystematic.

JH

On the first trial JH stated a preference for the Yaz (Y4) but elected to taste both stimuli. He selected L5 and Y6 as stimuli he would also like to try. After tasting both he expressed a preference for the Yaz. On the second trial he stated a preference for the Lud (L5) but elected to taste the Yaz (Y5) exclusively. He selected Y6 and L6 (the only stimuli remaining to be offered for tasting) as others he would like to try. After tasting Y5 he stated a preference for L5. On the final trial JH stated a preference for Y6 but elected to taste L6. He selected Y5 and L5 (the stimuli featured in the preceding trial) as others he would like to try. After tasting L6 he expressed a preference for it.

TJ

At the beginning of the extension of naming testing session TJ stated "I am going to eat all the Yazs first" clearly confirming her spontaneous verbal comments about these stimuli in phase three.

On the first trial TJ stated that she didn't prefer either stimulus but elected to taste both. She selected the remaining Yazs (Y5 and Y6) as others she would like to try clearly including these among the preferred stimuli *before having tasted any of the foods.* After tasting she stated a preference for the Yaz (Y4). After this first trial she appeared surprised and said "Hmmm, this time the Luds are also nice". This perhaps illustrates the

beginning of her 'Yaz rule' breaking down and although she proceeded to state a verbal preference for the Yazs this did not affect her consumption pattern (see below).

Figure 5.4

Testing Extension of Naming - Summary Data

The graph shows the total percentage correct data for all three subjects - GM, JH, and TJ in each of the three trials completed to extension of naming to the novel foods. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, five separate response components are summarised and displayed as follows: (i) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (ii) the histogram presented above 'choice' represents the percentage total of subjects who chose to taste *only* the positive stimulus offered, (iii) the histogram presented above 'selection' represents the percentage total of subjects who selected *all* of the remaining 'positive' stimuli (and none of the remaining 'negative' stimuli) as those others that he/she would also like to try, (iv) the histogram presented above the vertical 'taste' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (v) the histogram presented above the final 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question after tasting.

Figure 5.4 Testing Extension Of Naming Group Summary Data

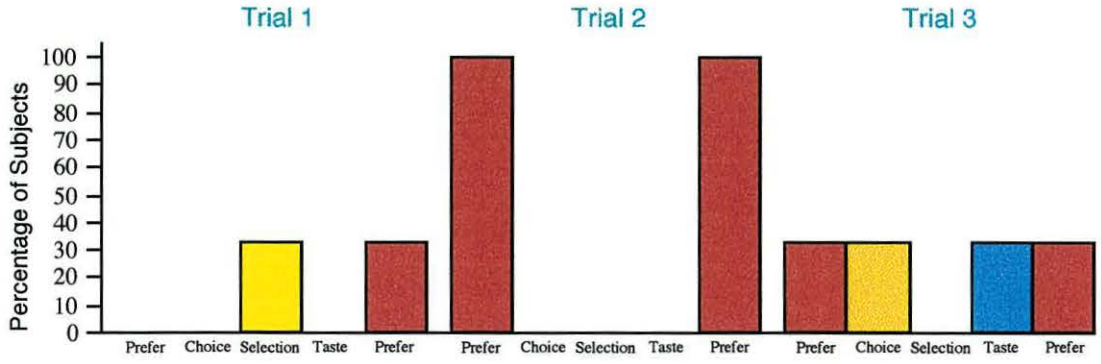
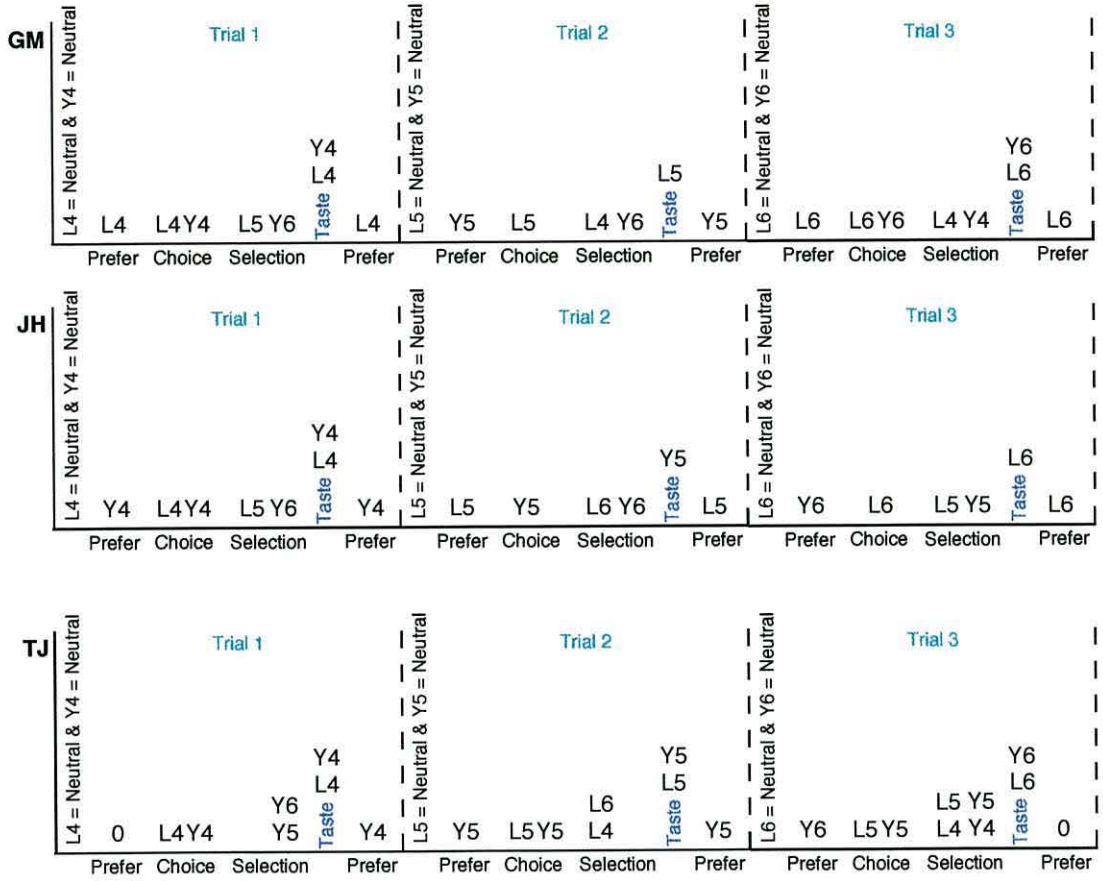


Figure 5.5

Testing Extension of Naming - Individual Data

The top panel of the graph depicts performance by Subject GM, the middle panel performance by Subject JH, and the bottom panel performance by Subject TJ, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 5.5: Phase Five: Testing Extension of Naming



On the second trial she stated a preference for the Yaz but elected to taste both stimuli (L5 and Y5). She selected all the remaining Luds (L4 and L6) as others she would like to try. After tasting she stated a preference for the Yaz (Y5). On the final trial TJ stated that she didn't prefer either stimulus but elected to taste both. She selected all the remaining stimuli as others she would like to try (she had, in fact tasted all of these by now in the preceding trials). After tasting both stimuli (Y6 and L6) she said she preferred neither.

DISCUSSION

Although there is clearly some evidence of performance changes in Experiment Five, particularly within-class generalisation in relation to verbal statements about the food samples, there remains little clear systematic evidence that the naming intervention was increasing its impact on consumption patterns.

An interesting observation, noted in phase five during the Extension Of Naming Test, is that two of the three participants spontaneously verbalised about the featured food samples. GM stated that the stimuli were discriminable on the basis of their "lumpiness", and TJ also explicitly stated an intention about which samples she was going to taste *before* the opportunity to taste arose - subsequently, she overtly expressed surprise and re-categorised the Luds as "also nice".

These examples of spontaneous verbal behaviour are instructive in two ways.

Firstly it clearly shows, albeit an inadvertent observation, that the verbal behaviour generated in this context was almost entirely relevant to the task at hand. Returning to Horne and Lowe's assertion that subjective behaviour features "ever afterwards responding to those categorizations as much as to the world itself" (Horne and Lowe, in press, p.3) and that the experimental situation is "substantially verbal" (see Horne and Lowe, 1997), Experiment Five does indeed show that the children's verbal behaviour appeared to take precedence over other contextual cues (such as, for example, the foods' colours).

Secondly, most subjective verbalisation was about the foods, their names, and their being favoured or unfavoured by the speaker. This is a fascinating window potentially catching rules 'in the making' and the import of such opportunities will be discussed more fully later.

Bearing in mind that this amount of verbal behaviour was not demanded by any feature of the design - it was not, for example, in response to any of the experimenter presented questions - it is an even more powerful example of self-generated verbal behaviour and it's potential effects and is interesting in that it again demonstates Horne and Lowe's analysis of behaviour in an environmental situation being perhaps as important as the situation itself.

Once again methological considerations emerged. Bearing in mind the refined preference testing procedure - which clearly did enhance the reliability of the preference test results - how else might the lack of impact upon consumption patterns be explained? Perhaps the most obvious solution is that the subjects simply did not have enough name-taste trials to establish an adequate link between the two. Even with clearer 'negative' and 'positive' tastes perhaps the brief number of exposure trials was insufficient. It is notable that subjects in this experiment selected a lot of other stimuli as those they would also like to try - perhaps this also reflected simply being unsure on the basis of the brief number of exposures they had experienced.

Another factor to consider is the considerable amount of time which had elapsed between the training in Phase Three and the testing in Phase Five - perhaps subjects had forgotten the salient aspects of training in Phase Three and again needed to re-test the food in Phase Five to establish whether or not they would like it. Two other factors are pertinent here. Firstly, it is known that older children are more likely 'explore' novel foods - thus our subjects may have had little reluctance to exploring the new stimulus set especially given the short duration of name-taste training noted above. Secondly, having tasted the 'neutral' flavoured food in Phase Five, the subjects may well have unsystematically proceeded through the remaining trials - after all they now perceived that , even if they had previously established a name-taste relation, that this no longer applied in the current context. We may simply have been observing a rapid reversal of the rule which went uncaptured. These observations informed our progress in Experiment Six.

CHAPTER SIX

EXPERIMENT SIX

The Effects of Common Naming on The Acceptability of, and Preferences for, Novel Foods in Four - Five Year Olds

Introduction

Although there is clearly some evidence of performance changes in Experiment Five, particularly in relation to verbal statements about the food samples, there remains little clear systematic evidence that the naming intervention was affecting consumption patterns.

We again closely inspected the procedure and decided upon the following refinements.

Phase Two and Four: Training and Testing Colour-Name Relations

Evidently the re-sequencing of comprehension and production training in Experiment Five appeared to accelerate the acquisition of name-colour relations. There remained, however, some issues regarding potential refinement of procedures in this phase.

Firstly, it seemed that subjects still experienced difficulty in attempting to name the stimuli when all six appeared on the table concurrently. It will be recalled that in Experiments Four and Five all six stimuli were placed on the table initially and then, if the subject exhibited any difficulty, two stimuli were removed - these stimuli were subsequently replaced when the subject exhibited fluent responding with four stimuli. On inspecting the data it can be seen that the majority of subjects did experience difficulty when the stimuli were presented in this manner. Further, when the six stimuli were initially presented subjects may have found it a little distressing to then return to four stimuli. Thus we expected to improve learning performance and simultaneously decrease any frustration or avoidance which may have been induced by poor performance. Consequently the design for Experiment Six was altered - this part of the procedure now began with the presentation of four stimuli (two Yazs and two Luds) and progressed to presenting six when subjects had attained criterion performance.

Secondly, the instruction and sequencing of training in the family categorisation test were also altered. The instruction used was "Can you tell me which are the Yazs/Luds?" but the subjects *did not have to move or group the stimuli* in any way. The aim here was to reduce any potential cueing that such grouping may have inadvertently induced.

Phase Three - Training and Testing Name-Taste Relations

As noted in the discussion after Experiment Five one possible explanation for the unsystematic extension results may be that subjects did

not have enough name-taste trials to establish an adequate link between the two. Consequently, the amount of trials in this phase were (i) extended, and (ii) criterion led, in Experiment Six. Rather than conducting a fixed number of trials with each subject it was decided to run the trials until each subject had exhibited a criterion of six identical consecutive responses i.e. shown stability in responding to the name-taste relations.

One further change was made in this phase. It was observed that some subjects, when asked *"Which one tastes the best?"* after tasting indicted their preference by pointing - it was decided that if the subject indicated a preferred stimulus without producing the name (by merely pointing, for example) the subject was prompted with the instruction *"What is it called?"* This refinement was introduced during Phase Three and as will be seen later, this had a dramatic effect on the behaviour of the participants.

Phase Five - Testing Extension of Naming

It was also noted in the previous discussion that subjects may well have experienced some difficulty remembering the name-taste relations by the time they got to Phase Five due to (i) the comparatively short duration of training dedicated to these relations, and, most likely (ii) the considerable amount of time which had elapsed between Phase Three and Phase Five which may have compromised memory for this aspect of their learning. Two modifications were introduced to overcome these potential detrimental influences.

Firstly, after Phase Four training had been completed (i.e. when the subjects had learnt the colour-name relations with the second set of stimuli) they were briefly reintroduced to the first set of stimuli and their preference responses to this first set of stimuli were again recorded. In a subsequent session (which always occurred on a different day) the second set of stimuli were then presented and extension of naming in relation to these was tested.

Secondly, as outlined above, we altered the criterion for responding in Phases Two and Four, particularly the sequencing of trials in the family categorisation component of these phases - it was hoped that this might also decrease the amount of time these phases were taking.

With confidence that the above changes would strengthen the design we proceeded.

Method

Subjects

Three children completed this experiment. They were recruited from the Pooh Bear day-care nursery in Bangor, North Wales. All of the subjects were chosen from a group of children whose parents had granted permission for them to participate having received a letter summarising the study. The children ranged in age from 4 years 6 months to 5 years 6 months. There were two boys and one girl.

Table 6.1
Experiment Six
Age of Subjects

Subject	Age at Start
CJ	4 yrs 6 mths
MB	5 yrs 1 mth
JW	5 yrs 6 mths

Mean age of subjects at start = 5 yrs 1 mth

Setting and Apparatus

The experiment was conducted in a small room at the Pooh Bear nursery, the room was not ordinarily used by the nursery. The subject was seated across a table from the experimenter. All experimental sessions were video-recorded using a Panasonic M7 video recorder.

Materials

1. The Foods

During all phases of the experiment the 'novel food' employed was Fromage Frais.

Flavours

150ml of icing sugar was added to 250g of Fromage Frais to produce a 'nice' flavour, 15ml salt was added to produce an unpleasant flavour, and 5ml of vanilla essence or lime juice was added to produce a 'neutral' flavour.

Colours

Twelve different colours of Fromage Frais were produced. To produce the colours food colouring was added to 10ml portions of Fromage Frais in the following manner:

White	- no additional colour
Blue	- 10 units blue
Yellow	- 15 units yellow
Green	- 30 units green
Red	- 20 units red
Lilac	- 10 blue + 25 red
Purple	- 20 blue + 30 red
Orange	- 20 red + 15 yellow
Brown	- 10 green + 10 yellow + 25 red + 5 blue
Turquoise	- 23 blue + 10 green
Lime	- 10 green + 35 yellow
Dark orange	- 45 red + 15 yellow

2. Other items

Plastic tubs of 12cm in diameter in which to present the foods.

A blindfold for use in the preference testing.

Response sheets upon which to record subjects responses.

Experimental Design

After an initial familiarisation phase the experiment proceeded in five phases as outlined below.

Phase One

Preference Testing

During this phase subjects tasted positive, neutral, and negative food samples whilst blindfolded. Each food sample was repeatedly tasted and concentrations of sugar and slat increased until reliable responding was evident. After tasting each food sample the blindfold was removed and the child indicated their preference for the taste by indicating a face on the response sheet (see below). Any subject who did not attain reasonable reliability in their responses in this phase were removed from further participation.

Phase Two

Training and Testing Colour-Name Relations I

During this phase subjects were trained to name six food stimuli (S1 - S6). All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Three

Training and Testing Name-Taste Relations

During this phase subjects tasted the food stimuli. A 'positive' (i.e. a flavour which elicited a positive response) flavour (sugar) was assigned to one named category and a 'negative' (i.e. a flavour which elicited a negative response) flavour (salt) was assigned to the other named category.

Phase Four

Training and Testing Colour-Name Relations II

Six new food stimuli were introduced (S7 - S12). During this phase subjects were trained to name these stimuli. All six stimuli were coloured differently. Three stimuli were referred to with the name "Yaz" and three were referred to with the name "Lud".

Phase Five

Testing Extension of Naming to the Novel Foods

The subjects were offered the opportunity to taste S7 - S12 and verbalise their preferences for the stimuli. These six stimuli all tasted 'neutral'. The extension of naming to the novel foods was assessed.

PROCEDURE

Familiarisation Phase

As decribed in Experiment Four above.

Phase One

Preference Testing

The experimenter sat at a table opposite the subject and placed the Faces Response Sheet on the table facing the subject. The experimenter proceeded to repeat the instructions issued at the end of the second familiarisation session saying...

> "Today we are going to play a new game. Look at this (the experimenter indicates the faces response sheet). This face

looks sad because she/he's just tasted something really horrible (experimenter indicates frowning face); this one looks okay because she/he's just tasted something that was okay (experimenter indicates neutral face); this one looks happy because she/he's just tasted something really nice (experimenter indicates smiling face). I want you to taste some foods and point to this face if it's horrible (experimenter indicates frowning face), this face if it's nice (experimenter indicates smiling face), and this face if it's just okay (experimenter indicates neutral face). To show how good you are at tasting I'm going to blindfold you with these special goggles".

When it was clear that the subject had understood the instructions the testing proceeded. The subject was blindfolded and presented with the first food sample (the first sample was always positively flavoured to prevent subject attrition). After each taste the blindfold was removed and the subject was requested to point to whichever face they felt best indicated their preference for the flavour. The subjects were encouraged to take a drink of water between trials to cleanse the palette before experiencing the next taste thereby preventing contamination of the taste perception. All trials were randomised with the following constraints: (i) the first food stimulus presented in the experiment was always positively flavoured, (ii) each food stimulus was presented at least three times, (iii) no particular food stimulus appeared twice in succession, (iv) trials proceeded until the reliability of the subjects response was satisfactory (operationally defined as a consistent 2/3 responses had to be identical to the sample - more stringent crtieria excluded too many potential subjects).

Throughout the preference testing the food samples were kept under the table so that the subject could not see the colour of the food at any time. If the preference testing of any particular subject extended over more than one session (which was almost invariably the case for all subjects in the present experiment) the experimenter began each new session by placing the Faces response Sheet on the table and saying...

"Do you remember these faces?
Which one should you point to if you like the food?
Which one should you point to if you don't like the food?
Which one should you point to if it's just OK?"

When it was clear that the subject had understood the instructions the testing proceeded as above. Preference continued until reliable and stable

divergence emerged with subjects showing differential responses to the positive, negative, and neutral stimuli.

Phase Two

Training and Testing Colour-Name Relations

Six food stimuli were introduced to each subject. Each of the six stimuli was coloured differently. Subjects were trained to name three of the novel stimuli 'Yaz' and the remaining three stimuli 'Lud' (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were discriminable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation. This training proceeded in three stages.

Stage One: Colour-Name Comprehension Training and Testing

The experimenter placed two foods, L1 (Lud 1) and Y1 (Yaz 1), in clear round plastic bowls, on the table. The experimenter then said

> "I've got some special foods here and I want you to learn what they are called".

The experimenter then proceeded to model the correct response saying

> "This is called a 'Lud' (indicating L1) and this one is called a 'Yaz' (indicating Y1)".

The experimenter then said

> "Can you point to the Lud/Yaz?"

If the subject responded correctly the experimenter said

> "Clever girl/boy"

If the subject responded incorrectly the experimenter said

> "This is a 'Lud/Yaz' - Can you give me the 'Lud/Yaz'?"

The four trial types (as above in Experiment Four) were presented with the same constraints until the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food

stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. Thus a subject could attain criterion performance in a minimum of three trial blocks. When a subject did attain criterion performance - by responding correctly on seven out of eight trials for each stimulus pair - the stimuli were presented in random pairs for at least one trial block to test that each stimulus was reliably identified outside of the context of the original presentation pair.

Stage Two: Colour-Name Production Training and Testing

The experimenter placed two foods, L1 and Y1, in clear round plastic bowls, on the table. The experimenter then said

> "I want you to learn what these foods are called. When you can tell me their names I'll give you a star to show how good you are"

The experimenter then pointed to one of this first pair and said

> "Can you tell me what this is?"

If the subject responded correctly the experimenter said

> "Clever girl/boy"

If the subject responded incorrectly the experimenter said

> "This is a 'Lud/Yaz' - Can you say 'Lud/Yaz'?"

The four trial types (as above) were presented with the same constraints until the subject consistently named each food in pair one correctly on seven out of eight successive trials, the second pair of food stimuli was introduced and, when the criterion level was reached with pair two (again seven out of eight consecutive correct responses), the process was repeated with pair three. After these three pairs were taught the stimulus pairs were mixed so that all Lud stimuli appeared with all Yaz stimuli - each Lud appeared with each Yaz for at least one block of trials and trials were repeated until criterion performance was attained.

Stage Three: Family Categorisation

Two pairs of foods were presented on the table simultaneously (two Yazs and two Luds). The experimenter then said

"Can you tell me which are the Yazs/Luds?"

Subjects were required to point to the appropriate stimuli. If the subject responded correctly the stimuli were removed from the table, replaced in different positions, and the next trial began. Once subjects had attained criterion performance of seven out of eight consecutive correct responses the categorisation task was repeated with all six stimuli simultaneously on the table until criterion performance (again seven out of eight consecutive correct responses) with all six was attained.

Phase Three

Training and Testing Name-Taste Relations

The subjects stimuli foods were flavoured in accordance with their individual taste preferences as recorded in the taste preference test i.e. if a subject indicated a positive face in response to tasting sugar then sugar was added to one stimulus set (e.g. the Yazs); conversely, if a subject indicated a negative response to salt then salt was added to flavour the 'negative' stimuli (the remaining stimulus set).

The experimenter then presented L1 and Y1 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject

elected to taste both) she selected from this first pair. With this first pair of stimuli (L1 and Y1) the subject was encouraged to taste both foods and were prompted to do so if they appeared reluctant. After tasting the subject was asked

"Which one tastes the best?"

It was noted during the course of the experiment that the children varied in the topography of their response to this final question - some children pointed toward their preferred food while others named the food - thus it was decided to add in a prompt question (see detail in the Results section) : If a subject didn't respond by naming the food she/he was prompted with the question

"What is it called?"

Then the second pair of foods (L2 and Y2) were placed on the table and the questions outlined above (questions 1 - 5) were posed. Finally the third stimulus pair were presented (L3 and Y3) and the questions outlined above (questions 1 - 5) were again posed. When the second and third stimulus pairs were presented the subjects were not encouraged to taste them but were allowed to taste none/either/both foods from each stimulus pair if they elected to do so - thus we were able to assess the immediate effect of the first name-taste link on the remaining members of each named class. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns. This procedure was repeated with pairs of stimuli (randomly selected Yazs and Luds) until the subject exhibited differential responses to the named foods i.e. responded to the questions with the category name of their positively flavoured food on six consecutive trials.

Phase Four

Training and Testing Colour-Name Relations II

A second set of six novel stimuli were introduced. Subjects were trained to name three of the novel stimuli "Yaz" and the remaining three stimuli as "Lud" (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were distinguishable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation

through training in three stages - comprehension, production, and family categorisation training as in Phase Two. The same constraints on trials applied as did the criterion of seven out of eight consecutive correct responses before subjects proceeded to phase five.

Phase Five

Testing Extension of Naming to the Novel Foods

The second set of stimulus foods were all 'neutrally' flavoured. Before testing subjects responses to the novel set of six stimuli (L4, Y4, L5, Y5, L6, Y6) subjects underwent one session in which they were reintroduced to the first six stimuli (L1, Y1, L2, Y2, L3, Y3).

The experimenter presented L1 and Y1 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject elected to taste both) she selected from the presented pair. The subject was then asked

"Which one tastes the best?"

If a subject didn't respond to this question by naming the food she/he was prompted with the question

"What is it called?"

Then the second pair of foods (L2 and Y2) were placed on the table and the questions outlined above (questions 1 - 5) were posed. Finally the third stimulus pair were presented (L3 and Y3) and the questions outlined above (questions 1 - 5) were again posed. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

In a subsequent session the novel set of six stimuli (L4, Y4, L5, Y5, L6, Y6) were presented. The experimenter presented L4 and Y4 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject elected to taste both) she selected from the presented pair. The subject was then asked

"Which one tastes the best?"

If a subject didn't respond to this question by naming the food she/he was prompted with the question

"What is it called?"

Then the second pair of foods (L5 and Y5) were placed on the table and the questions outlined above (questions 1 - 5) were posed. Finally the third stimulus pair were presented (L6 and Y6) and the questions outlined above (questions 1 - 5) were again posed. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

RESULTS

Phase One: Preference Testing

Note: Please refer to Figure 6.1 overleaf to inspect this data. The data graphed represents the final three data points (after the concentrations of added sugar and salt were adjusted upward to elicit reliable responding from each subject) in preference testing with each subject.

CJ

CJ responded positively with perfect reliability to sugar. He responded negatively with high reliability to salt.

MB

MB responded negatively with perfect reliability to salt. He responded positively to sugar with high reliability.

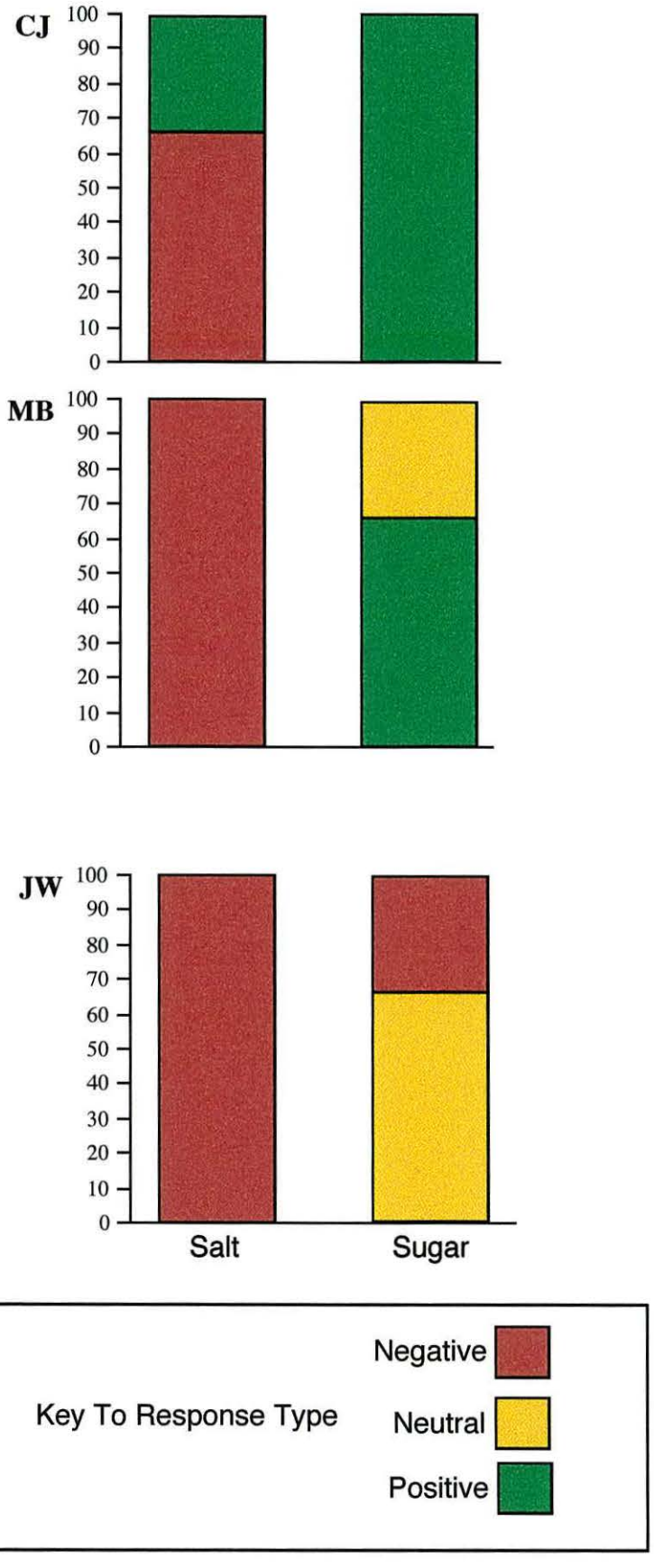
JW

JW responded with perfect reliability to salt and but with variability to sugar. It was decided to retain him in the experiment as there was good evidence of divergence between the 'positive' and 'negative' stimulus classes.

Figure 6.1

Preference test response data for all three subjects - CJ, MB, and JW. Note that the green shading indicates a positive response, the yellow shading indicates a neutral response, and the red shading indicates a negative response. The data plotted include the three final preference trials for each particpants, featuring both foods - sugar and salt, these foods were then at their final concentration levels for each subject (the level concentration level utilised in all subsequent phases). The overall response to each of the foods can be observed by noting the proportion of each colour featured in the histogram for each food.

Figure 6.1: Preference Test



Phase Two: Training and Testing Colour-Name Relations
This data is graphically displayed overleaf in Figure 6.2.

CJ
Comprehension
Stimulus Set One
CJ required a total of seventeen trial blocks to attain criterion performance in comprehension.
Stimulus Set Two
CJ required seven trial blocks to complete comprehension training with the second set of stimuli.

Production
Stimulus Set One
CJ required seventeen blocks of trials to attain criterion performance in the production training phase.
Stimulus Set Two
In Phase Four, learning the name-colour relations for the second set of stimuli, CJ attained criterion performance in the production phase in fourteen trial blocks.

Family Category Testing
Stimulus Set One
When four stimuli were presented simultaneously CJ attained criterion performance immediately i.e. in one trial block. Subsequently, when all six stimuli were presented CJ attained criterion performance in nine trial blocks.

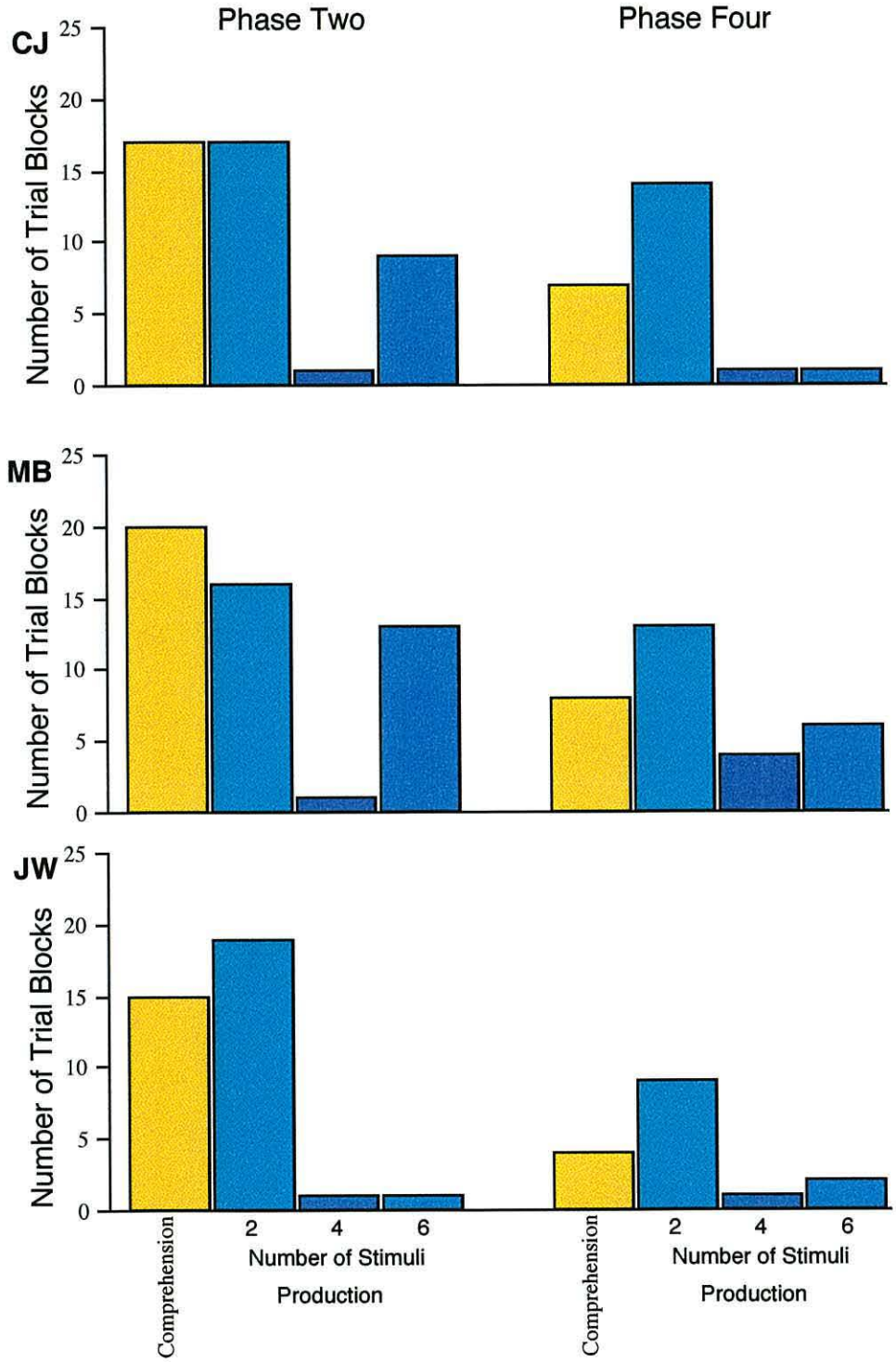
Figure 6.2

Training and Testing Colour Name Relations

Data are shown for all three subjects - CJ, MB, and JW.

Total number of trial blocks completed during the comprehension (minimum trial blocks = 3) and production phases (minimum trial blocks = 9); (production phase including performance when two, four, or all six stimuli - three from each stimulus set - were simultaneously presented) in Phase Two (Stimulus Set One) and Phase Four (Stimulus Set Two). The data was calculated by totalling block numbers performed until criterion performance was observed (see text for detail).

Figure 6.2: Phase Three: Training Colour - Name Relations



Stimulus Set Two

With the second set of six stimuli, when four stimuli were presented simultaneously, CJ again attained criterion performance in one trial block. When all six stimuli were simultaneously presented CJ attained criterion performance after one trial block.

Total

In phase two CJ required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

M B

Comprehension

Stimulus Set One

MB required a total of twenty trial blocks to attain criterion performance in comprehension.

Stimulus Set Two

MB required eight trial blocks to complete comprehension training with the second set of stimuli.

Production

Stimulus Set One

MB required sixteen blocks of trials to attain criterion performance in the production training phase.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, MB attained criterion performance in the production phase in thirteen trial blocks.

Family Category Testing

Stimulus Set One

When four stimuli were simultaneously presented MB attained criterion performance immediately i.e. in one trial block. Subsequently, when all six stimuli were presented MB attained criterion performance in thirteen trial blocks.

Stimulus Set Two

With the second set of six stimuli, when four stimuli were presented simultaneously, MB attained criterion performance in four trial blocks. When all six stimuli were simultaneously presented MB attained criterion performance after six trial blocks.

Total

In phase two MB required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

JW

Comprehension

Stimulus Set One

JW required a total of fifteen trial blocks to attain criterion performance in comprehension.

Stimulus Set Two

JW required four trial blocks to complete comprehension training with the second set of stimuli.

Production

Stimulus Set One

JW required nineteen blocks of trials to attain criterion performance in the production training phase.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, JW attained criterion performance in the production phase in nine trial blocks.

Family Category Testing

Stimulus Set One

When four stimuli were presented simultaneously JW attained criterion performance immediately i.e. in one trial block. Subsequently, when all six stimuli were presented JW again attained criterion performance in one trial block.

Stimulus Set Two

With the second set of six stimuli, when four stimuli were presented simultaneously, JW again attained criterion performance in one trial block. When all six stimuli were simultaneously presented JW attained criterion performance after two trial blocks.

Total

In phase two JW required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

Phase Three: Training and Testing Name-Taste Relations
This data are persented grahically in Figures 6.3, 6.4, and 6.5.

CJ

CJ required a total of forty trials before demonstrating stable responding. On the first trial he expressed a pre-taste preference for the Lud (L1) which he chose to taste - he maintained his preference for L1 after tasting. He selected the two remaining Luds (L2 and L3) as other stimuli he would like to try. On the second trial he stated a pre-taste preference for the Yaz (Y2) but refused to taste any stimuli and later expressed a preference for the Lud (L2). He selected L1 (which he had tasted in the previous trial) as another stimulus he would like to try. On the third trial he stated a preference for the Lud (L3) before and after tasting it; he did not select any others as stimuli he would like to try. For the next eight trials he consistently stated a pre-taste preference for the Yaz stimuli, invariably chose Yaz stimuli to taste (with the exception of one trial) but consistently stated a preference for the Lud stimuli after tasting. (Notably on trial five he tasted both stimuli and stated a post-taste preference for the Lud). He generally selected only one other stimulus as a food he would also like to try and these were generally Luds. For the next four trials (trials twelve to fifteen inclusive) his stated preferences and choices of foods to eat oscillated considerably. From trial sixteen to trial twenty-one inclusive he consistently stated a pre-taste preference for Luds and chose only Luds to taste; however, his post-taste preference statements and selection of other stimuli varied considerably. From trial twenty-two to trial twenty-seven his responding again oscillated considerably with inconsistent statements of preference and choices of stimuli to taste. The procedural refinement (refer to procedure section) was introduced on trial twenty-eight and by trial thirty-five his response pattern was more stable. From trial thirty-five onwards he invariably stated a pre-taste preference for the Luds, only chose Luds to taste, and invariably stated a preference for Luds after tasting. Interestingly, from trial twenty-eight onwards (the point at which the procedural refinement was introduced) he *never* selected any other stimuli as ones he would also like to try. Analysis of video recordings showed that CJ made very few spontaneous verbal comments throughout this phase in the experiment.

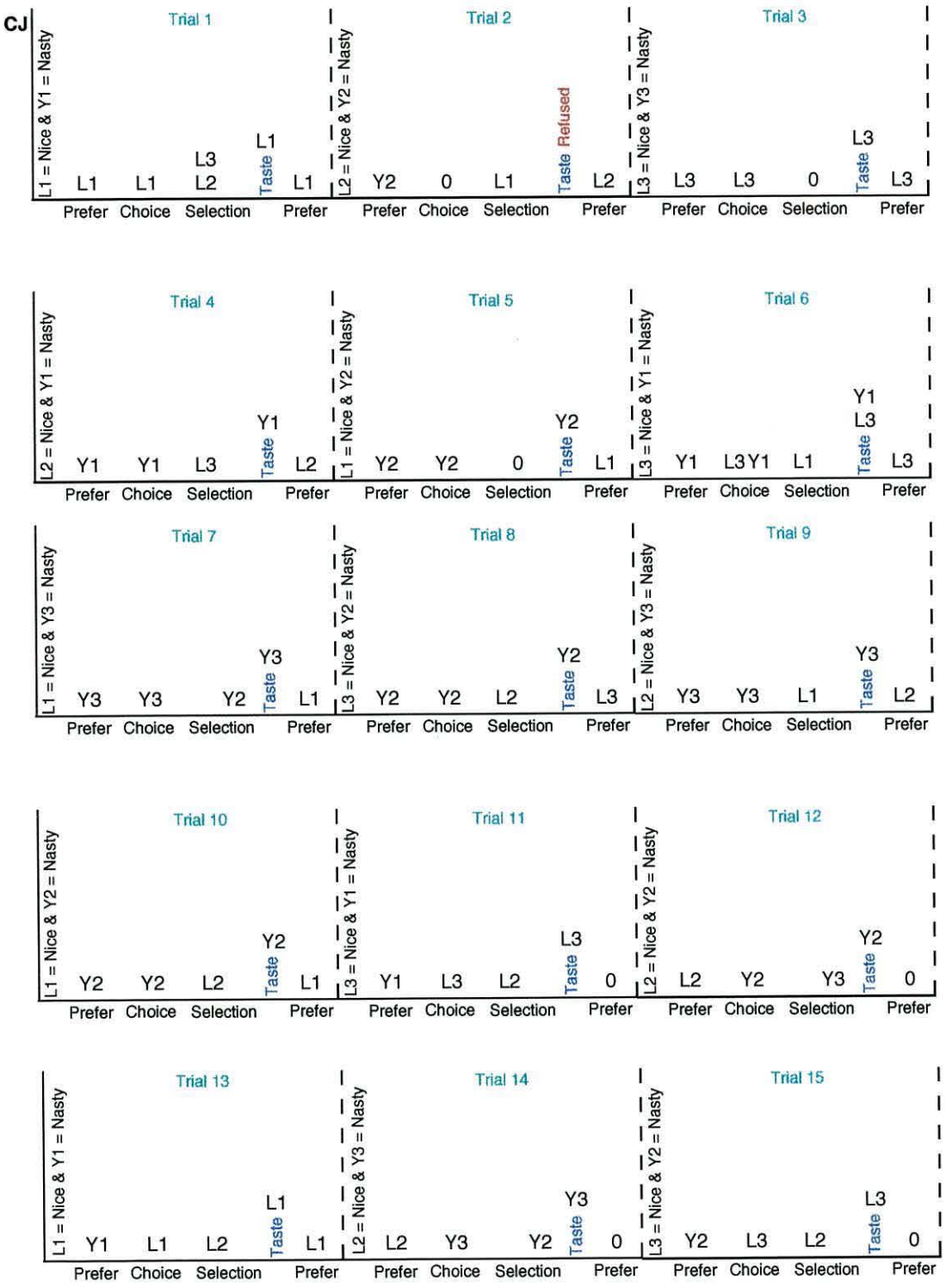
Figure 6.3.

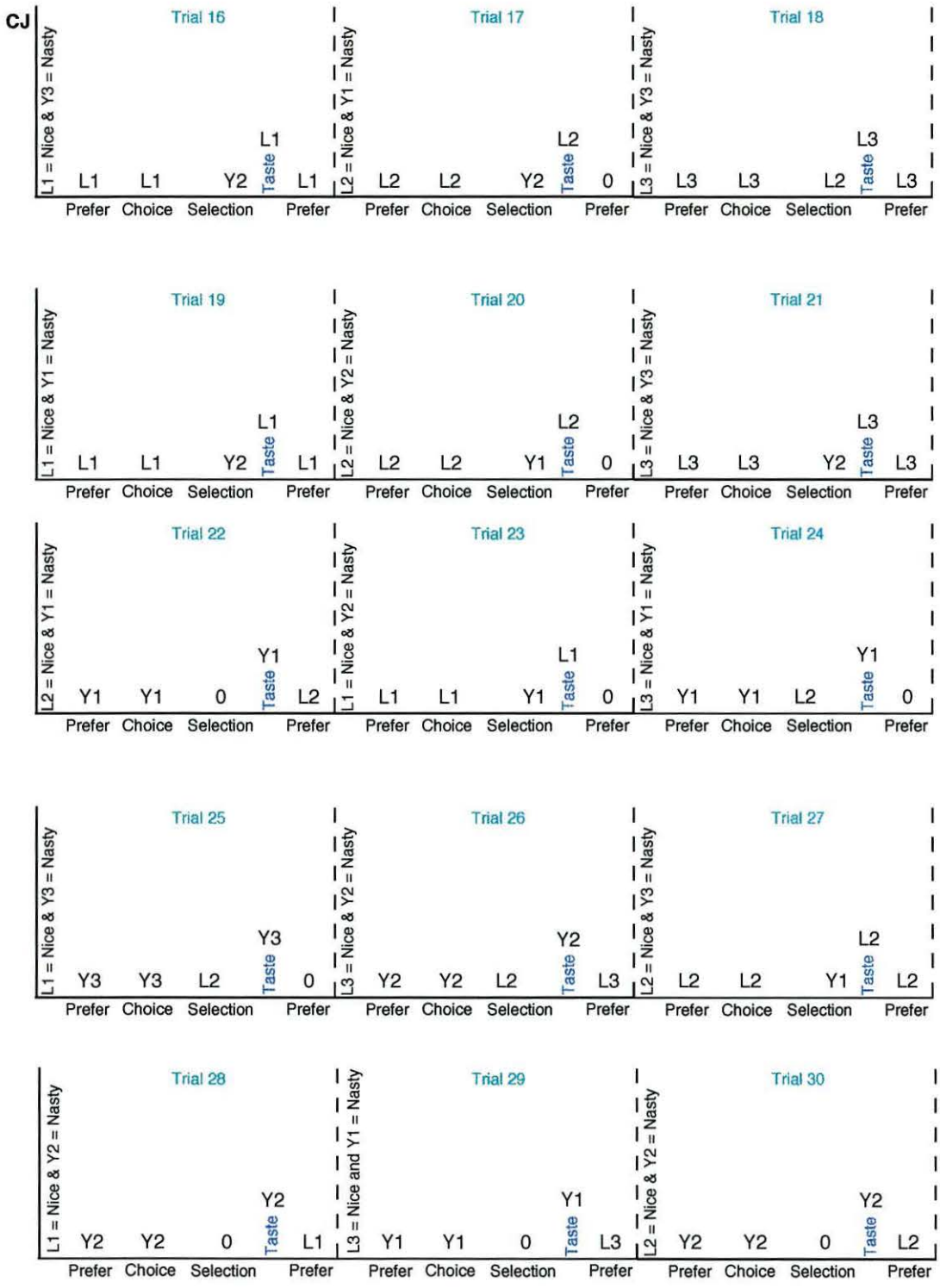
Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject CJ.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.3: Phase Three: Training Name - Taste Relations




CJ
Trial 16
L1 = Nice & Y3 = Nasty
L1 L1 Y2 L1 L1
Prefer Choice Selection Taste Prefer
Trial 17
L2 = Nice & Y1 = Nasty
L2 L2 Y2 L2 0
Prefer Choice Selection Taste Prefer
Trial 18
L3 = Nice & Y3 = Nasty
L3 L3 L2 L3 L3
Prefer Choice Selection Taste Prefer
Trial 19
L1 = Nice & Y1 = Nasty
L1 L1 Y2 L1 L1
Prefer Choice Selection Taste Prefer
Trial 20
L2 = Nice & Y2 = Nasty
L2 L2 Y1 L2 0
Prefer Choice Selection Taste Prefer
Trial 21
L3 = Nice & Y3 = Nasty
L3 L3 Y2 L3 L3
Prefer Choice Selection Taste Prefer
Trial 22
L2 = Nice & Y1 = Nasty
Y1 Y1 0 Y1 L2
Prefer Choice Selection Taste Prefer
Trial 23
L1 = Nice & Y2 = Nasty
L1 L1 Y1 L1 0
Prefer Choice Selection Taste Prefer
Trial 24
L3 = Nice & Y1 = Nasty
Y1 Y1 L2 Y1 0
Prefer Choice Selection Taste Prefer
Trial 25
L1 = Nice & Y3 = Nasty
Y3 Y3 L2 Y3 0
Prefer Choice Selection Taste Prefer
Trial 26
L3 = Nice & Y2 = Nasty
Y2 Y2 L2 Y2 L3
Prefer Choice Selection Taste Prefer
Trial 27
L2 = Nice & Y3 = Nasty
L2 L2 Y1 L2 L2
Prefer Choice Selection Taste Prefer
Trial 28
L1 = Nice & Y2 = Nasty
Y2 Y2 0 Y2 L1
Prefer Choice Selection Taste Prefer
Trial 29
L3 = Nice and Y1 = Nasty
Y1 Y1 0 Y1 L3
Prefer Choice Selection Taste Prefer
Trial 30
L2 = Nice & Y2 = Nasty
Y2 Y2 0 Y2 L2
Prefer Choice Selection Taste Prefer

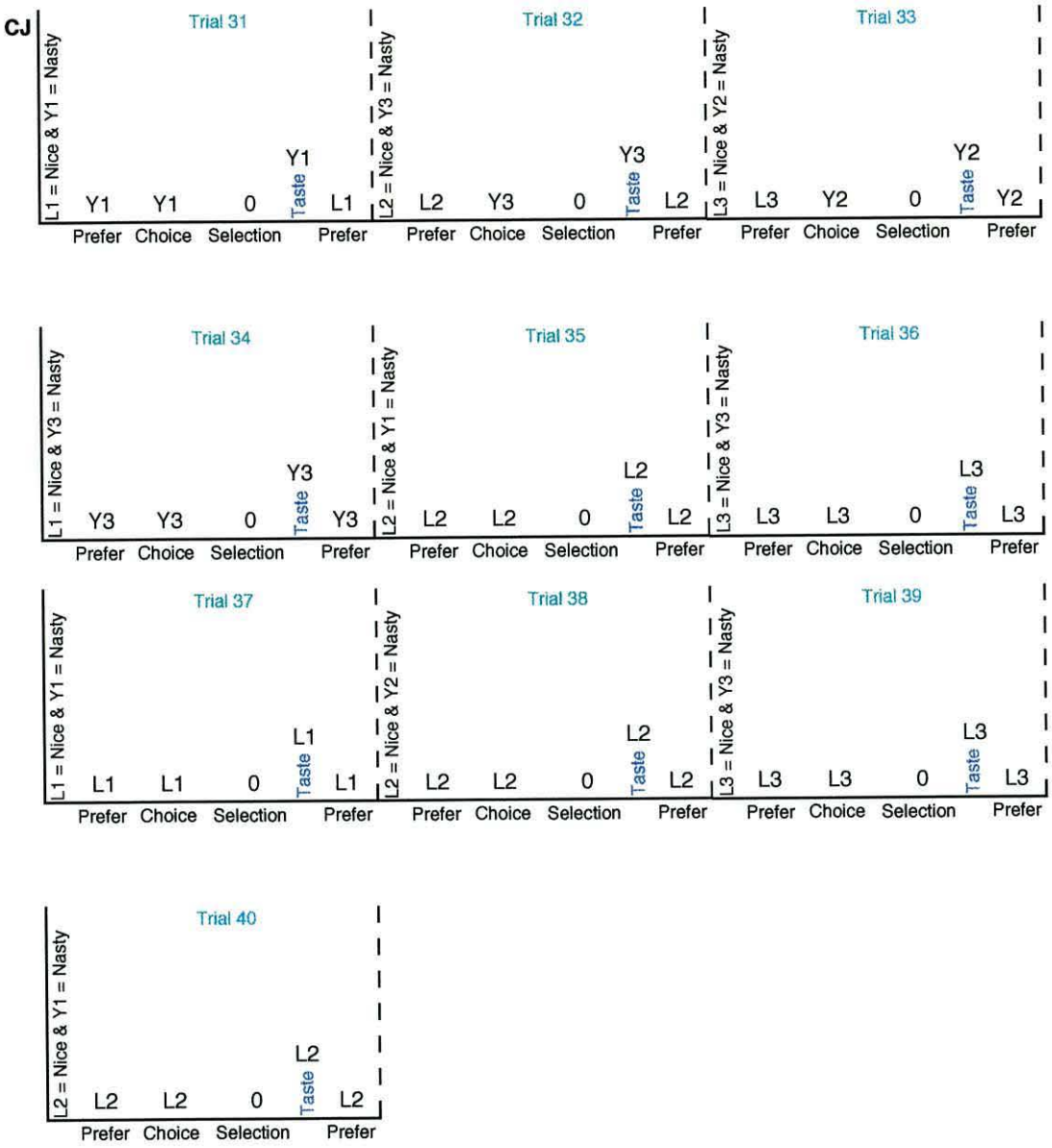

CJ
Trial 31
L1 = Nice & Y1 = Nasty
Y1 Y1 0 Y1 L1
Prefer Choice Selection Taste Prefer
Trial 32
L2 = Nice & Y3 = Nasty
L2 L2 Y3 0 Y3 L2
Prefer Choice Selection Taste Prefer
Trial 33
L3 = Nice & Y2 = Nasty
L3 L3 Y2 0 Y2 Y2
Prefer Choice Selection Taste Prefer
Trial 34
L1 = Nice & Y3 = Nasty
Y3 Y3 0 Y3 Y3
Prefer Choice Selection Taste Prefer
Trial 35
L2 = Nice & Y1 = Nasty
L2 L2 0 L2 L2
Prefer Choice Selection Taste Prefer
Trial 36
L3 = Nice & Y3 = Nasty
L3 L3 0 L3 L3
Prefer Choice Selection Taste Prefer
Trial 37
L1 = Nice & Y1 = Nasty
L1 L1 0 L1 L1
Prefer Choice Selection Taste Prefer
Trial 38
L2 = Nice & Y2 = Nasty
L2 L2 0 L2 L2
Prefer Choice Selection Taste Prefer
Trial 39
L3 = Nice & Y3 = Nasty
L3 L3 0 L3 L3
Prefer Choice Selection Taste Prefer
Trial 40
L2 = Nice & Y1 = Nasty
L2 L2 0 L2 L2
Prefer Choice Selection Taste Prefer

Figure 6.4

Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject MB.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.4: Phase Three: Training Name - Taste Relations

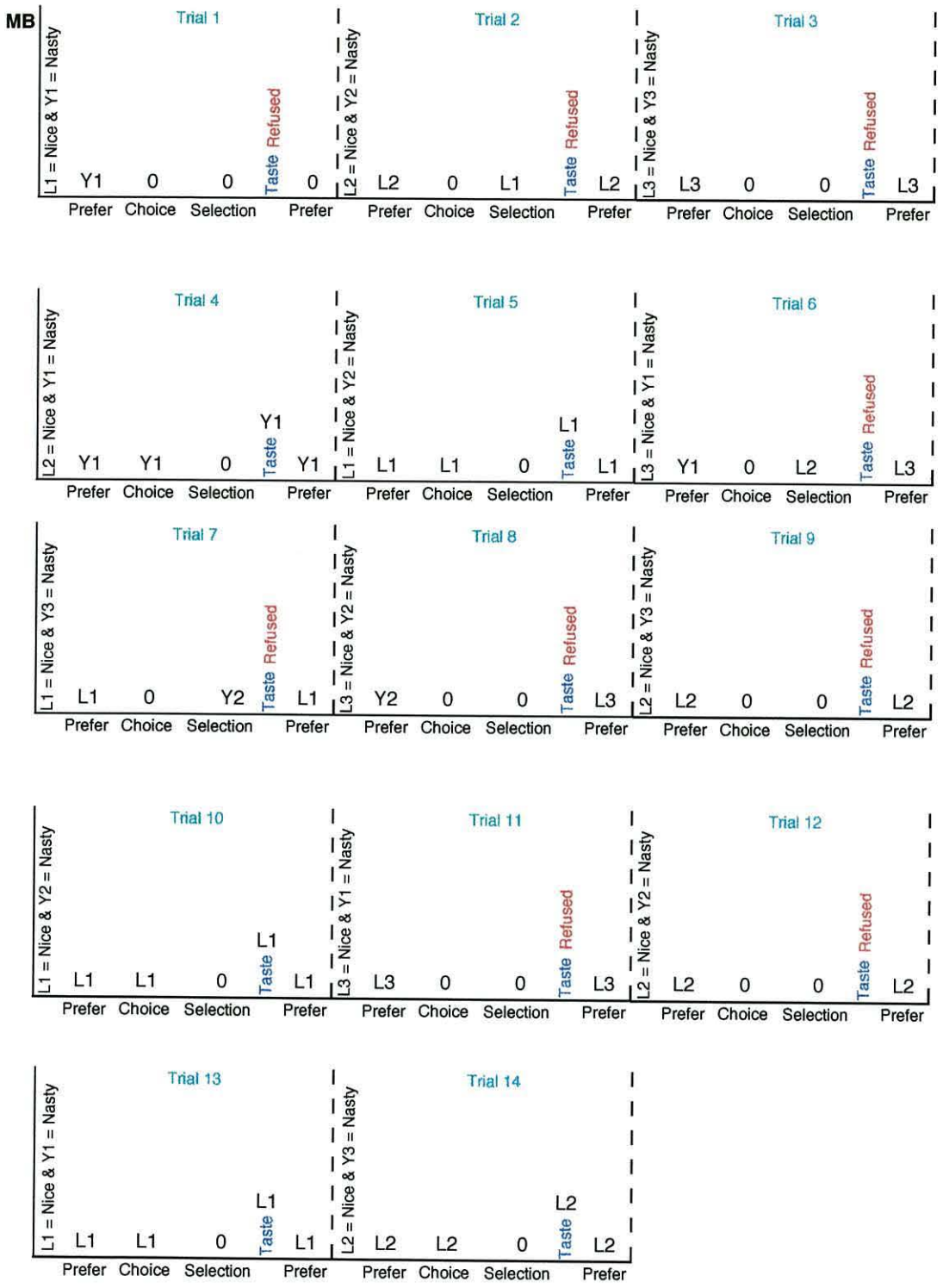


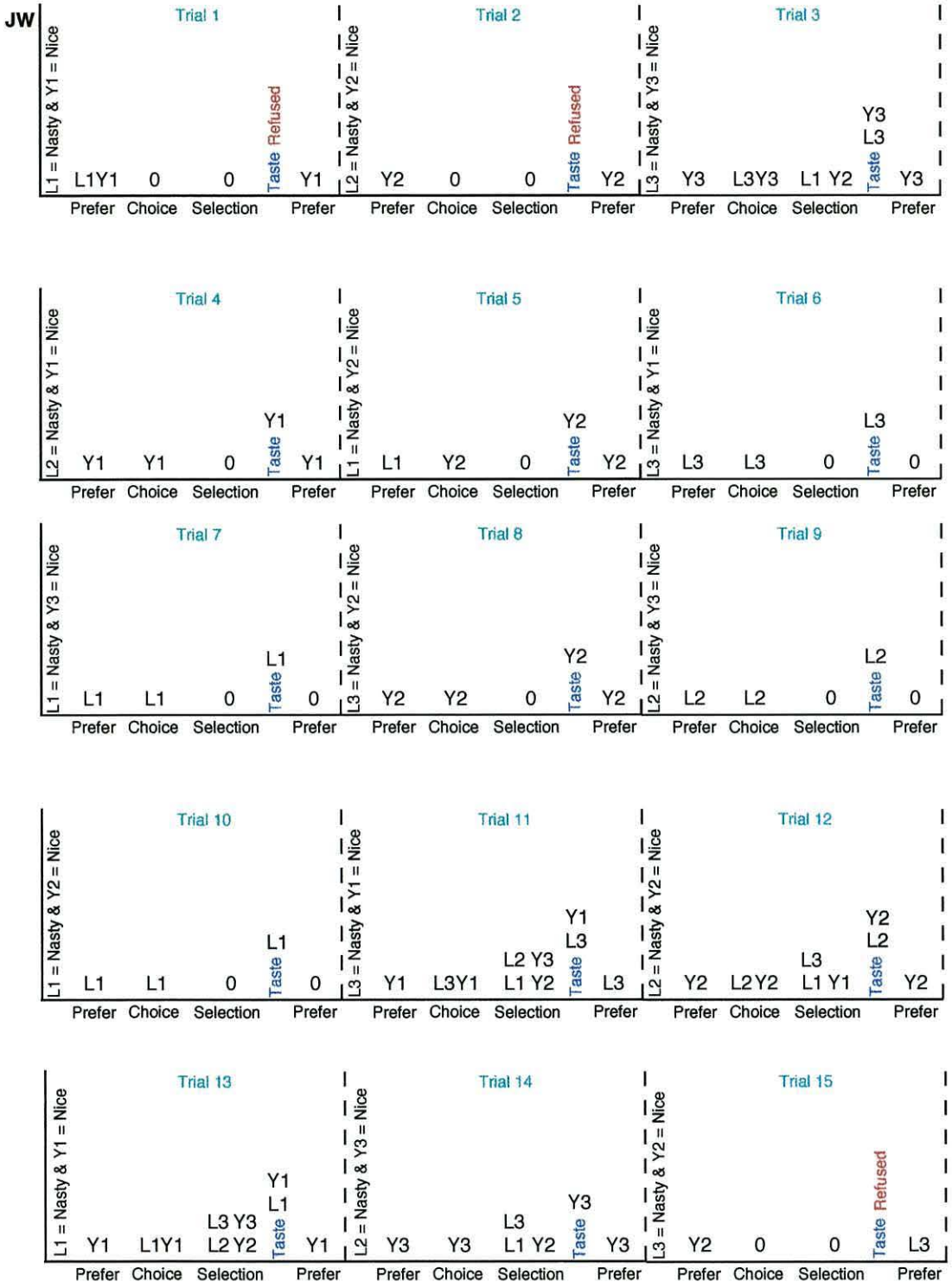
Figure 6.5

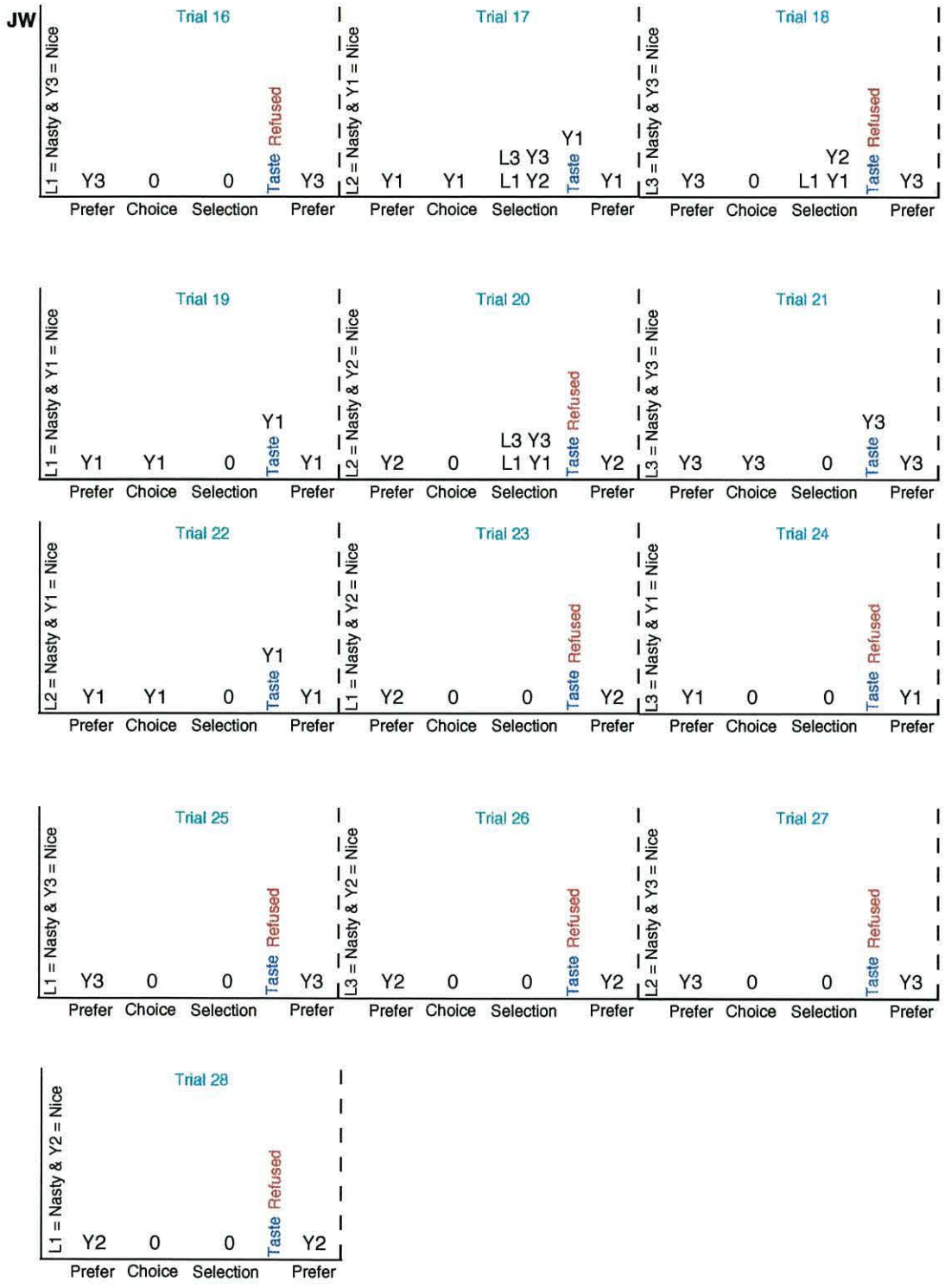
Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject JW.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.5: Phase Three: Training Name - Taste Relations




JW
Trial 16
L1 = Nasty & Y3 = Nice
Y3 0 0 Taste Refused Y3
Prefer Choice Selection Prefer
Trial 17
L2 = Nasty & Y1 = Nice
Y1 Y1 L3 Y3 L1 Y2 Taste Y1 Y1
Prefer Choice Selection Prefer
Trial 18
L3 = Nasty & Y3 = Nice
Y3 0 Y2 L1 Y1 Taste Refused Y3
Prefer Choice Selection Prefer
Trial 19
L1 = Nasty & Y1 = Nice
Y1 Y1 0 Taste Y1 Y1
Prefer Choice Selection Prefer
Trial 20
L2 = Nasty & Y2 = Nice
Y2 0 L3 Y3 L1 Y1 Taste Refused Y2
Prefer Choice Selection Prefer
Trial 21
L3 = Nasty & Y3 = Nice
Y3 Y3 0 Taste Y3 Y3
Prefer Choice Selection Prefer
Trial 22
L2 = Nasty & Y1 = Nice
Y1 Y1 0 Taste Y1 Y1
Prefer Choice Selection Prefer
Trial 23
L1 = Nasty & Y2 = Nice
Y2 0 0 Taste Refused Y2
Prefer Choice Selection Prefer
Trial 24
L3 = Nasty & Y1 = Nice
Y1 0 0 Taste Refused Y1
Prefer Choice Selection Prefer
Trial 25
L1 = Nasty & Y3 = Nice
Y3 0 0 Taste Refused Y3
Prefer Choice Selection Prefer
Trial 26
L3 = Nasty & Y2 = Nice
Y2 0 0 Taste Refused Y2
Prefer Choice Selection Prefer
Trial 27
L2 = Nasty & Y3 = Nice
Y3 0 0 Taste Refused Y3
Prefer Choice Selection Prefer
Trial 28
L1 = Nasty & Y2 = Nice
Y2 0 0 Taste Refused Y2
Prefer Choice Selection Prefer

M B

MB required a total of fourteen trials to attain stable responding in this phase of the experiment. She appeared quite anxious upon entering the experimental room and this anxiety peaked when she was offered the stimuli to taste. On the first trial she stated a pre-taste preference for the Yaz (Y1) but refused to taste either stimulus and did not respond when asked about her post-taste preference. On the second and third trials she stated pre- and post-taste preferences for the Luds (L2 and L3 respectively) but refused to taste on either occasion. On the fourth trial she stated a pre-taste preference for the Yaz, chose to taste only the Yaz despite prompting to taste both stimuli, and restated her preference for the Yaz after tasting. She did not select any other stimuli as ones she would like to try. On the fifth trial she stated a pre-taste preference for the Lud (L1), tasted it and proceeded to re-state her preference for it - oddly, she then proceeded to say that it was "horrid". On the sixth trial her pre-taste preference was for the Yaz, she selected L2 as another stimulus she would like to try but proceeded to refuse to taste the stimuli. On trial seven she stated a pre-taste preference for the Lud (L1), selected Y2 as another stimulus she would like to try but again refused to taste. The procedural refinement was introduced on trial eight. On this trial she stated a pre-taste preference for the Yaz (Y2) , refused to taste, and later stated a preference for the Lud (L3). From trial nine onwards her performance was stable. She invariably stated a pre- and post-taste preference for the Luds. She tasted only the Luds and only on three trials (trials ten, thirteen, and fourteen). She refused to taste on all other trials and appeared quite distressed when offered the foods to taste. From trial eight onwards she never selected any other stimuli as foods she would also like to try.

J W

JW completed twenty-eight trials in this phase of the experiment. On the first two trials he refused to taste the offered foods. On trial one his stated pre-taste preference was for "both" but he refused to taste either stimulus. He later said he preferred the Yaz (Y1). On the second trial his pre- and post-taste preference was for the Yaz (Y2) although he again refused to taste the stimuli. He did not select any other stimuli on either of the first two trials. On the third trial he stated a pre-taste preference for the Yaz but elected to taste both stimuli - after tasting he again stated preferring the Yaz. He selected L1 and Y2 as other stimuli he would like to try (this is interesting as he'd previously been offered both to try but refused to do so).

From trial four to trial ten his preference statements oscillated between the Yazs and Luds but he always chose to taste the stimulus he said he preferred at the beginning of the trial. He never selected any other stimuli as being ones he would like to try. He demonstrated a stable response pattern on pre- and post-taste preference statements from trial eleven onwards but continued to oscillate with regard to his choice of which food to taste. The procedural refinement was introduced on trial twenty-one. On trials eleven, twelve and thirteen he chose to taste both foods and from then on either refused to taste or chose to taste only the Yaz in any given trial. His selection of other stimuli was interesting in that he selected all, or virtually all, of the remaining stimuli as foods he would like to try in seven of the remaining trials. On the other eleven trials he selected none of the other stimuli. from trial twenty-one onwards he accompanied his choices on most trials with spontaneous verbal comments such as "Luds taste bad and Yaz taste good" - further indicating his learning about the name - taste relations.

Phase Five: Testing Extension of Naming

These data are presented graphically in Figures 6.6, 6.7, 6.8 and 6.9.

CJ

Stimulus Set One

On the first trial CJ stated a pre-taste preference for the Lud (L1) remarking "I like this one - the Lud is nice", he chose to taste it, and restated his preference for it after tasting. He did not select any other stimuli as ones he would like to try. On the second trial he stated a pre-taste preference for the Yaz (Y2) and proceeded to taste it. After tasting he said he preferred the Lud (L2) (which he hadn't tasted). On the third trial he stated a pre-taste preference for the Lud (L3), proceeded to taste it and restate his preference for it. Interestingly, throughout this trial he continually repeated "p..p..p...pink pud" rhyming this phrase with "Lud". This demonstrates a clear degree of verbal activity regarding the stimuli which may of course, depending on the content, have altered his responding. He did not select any other stimuli on trials two and three.

Stimulus Set Two

On the first trial he stated a pre-taste preference for the Yaz (Y4) commenting "I think this one tastes nice and this one tastes nasty" and proceeded to taste it. After tasting he again said he preferred the Yaz and added "it's a soft one, I haven't tasted a soft one before". He did not select any other stimuli as ones he would also like to try. On the second trial He

Figure 6.6

Testing Extension of Naming - Summary Data

The bottom panel of the graph shows the total percentage correct data for all three subjects - CJ, MB, and JW in each of the three trials completed to test extension of naming to the novel foods. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, five separate response components are summarised and displayed as follows: (i) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (ii) the histogram presented above 'choice' represents the percentage total of subjects who chose to taste *only* the positive stimulus offered, (iii) the histogram presented above 'selection' represents the percentage total of subjects who selected *all* of the remaining 'positive' stimuli (and none of the remaining 'negative' stimuli) as those others that he/she would also like to try, (iv) the histogram presented above the vertical 'taste' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (v) the histogram presented above the final 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, five separate response components are summarised and displayed as follows: (i) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (ii) the histogram presented above 'choice' represents the percentage total of subjects who chose to taste *only* the positive stimulus offered, (iii) the histogram presented above 'selection' represents the percentage total of subjects who selected *all* of the remaining 'positive' stimuli (and none of the remaining 'negative' stimuli) as those others that he/she would also like to try, (iv) the histogram presented above the vertical 'taste' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (v) the histogram presented above the final 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question after tasting.

Figure 6.6 Testing Extension Of Naming Group Summary Data

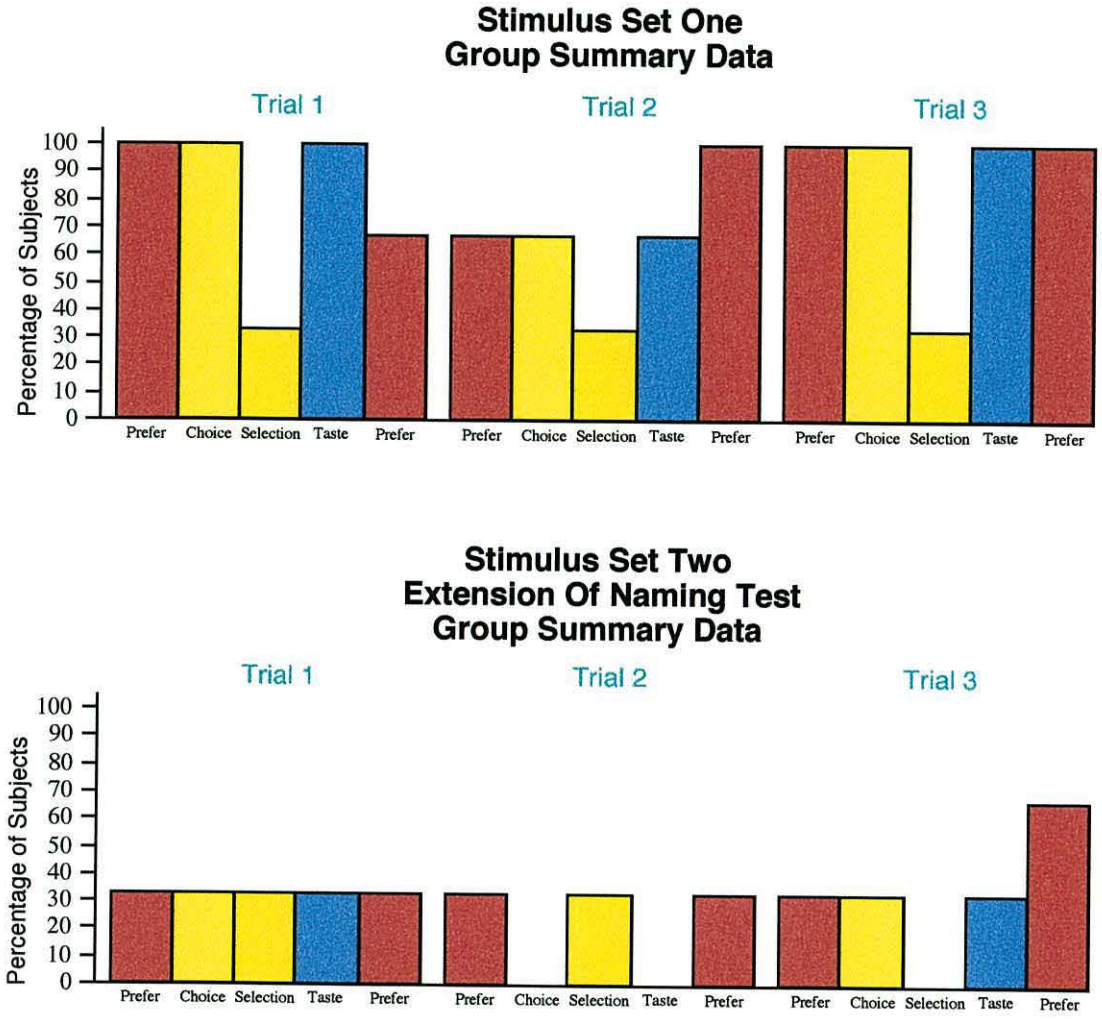
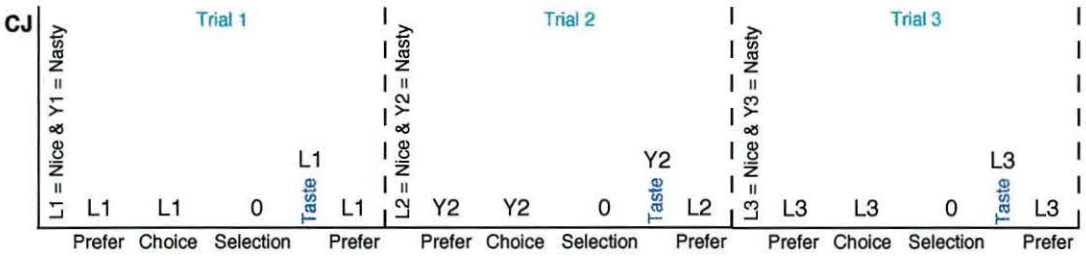


Figure 6.7

Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject CJ, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.7 : Phase Five : Testing Extension of Naming
Stimulus Set One



Stimulus Set Two
Extension of NamingTest

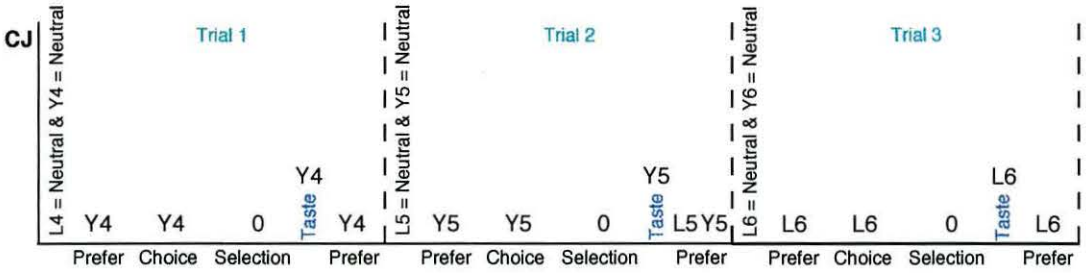


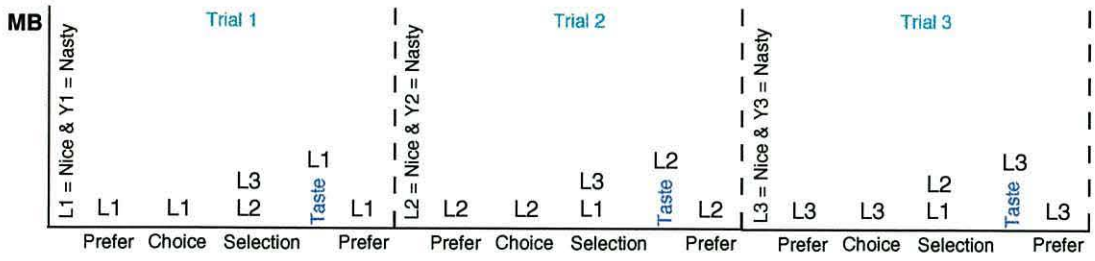
Figure 6.8

Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject MB, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste extension of namingproperty, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.8: Phase Five : Testing Extension of Naming

Stimulus Set One



Stimulus Set Two

Extension of Naming Test

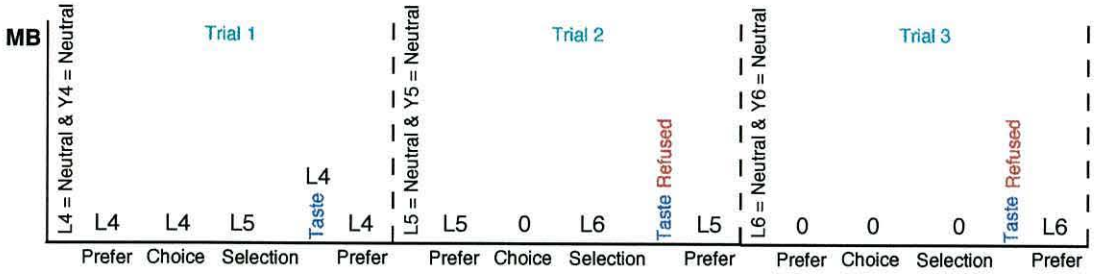
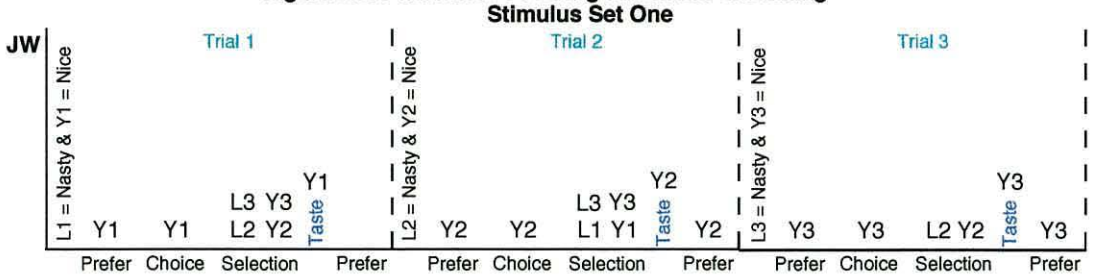


Figure 6.9

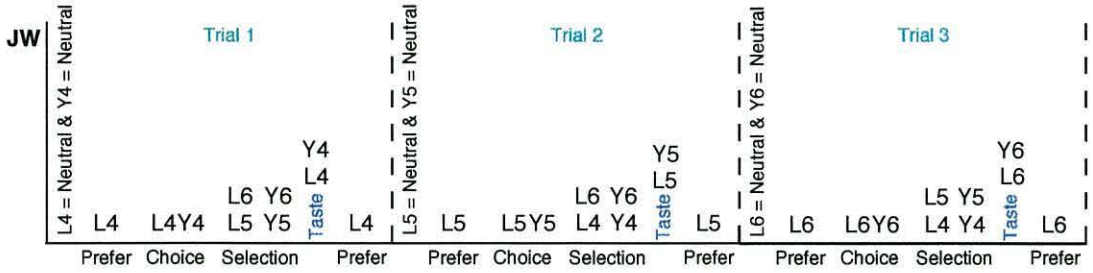
Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject JW, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 6.9: Phase Five : Testing Extension of Naming
Stimulus Set One



Stimulus Set Two
Extension of Naming Test



again stated a pre-taste preference for the Yaz (Y5) and proceeded to taste it. After tasting he said he liked both the Yaz (Y5) which he referred to as "another soft one" and the Lud (L5) {entirely consistent with his learning of both categories including the new rule breakdown}. On the final trial he stated a pre-taste preference for the Lud (L6) saying "I would like to try the Lud" and proceeded to taste it. After tasting he remarked "another soft one, I've had all soft ones today" and restated his preference for it. On trials two and three he did not select any other stimuli.

MB

Stimulus Set One

In all three trials MB stated a preference for the Lud, chose only the Lud to taste, selected the two remaining Luds as stimuli she would also like to try saying, on the first trial, "these are the nice ones" and always ended the trial stating a preference for the Lud. She referred to the Luds in the latter two trials as "nice Luds".

Stimulus Set Two

Despite appearing quite anxious and saying "I don't want to" when offered the choice of stimuli to taste on the first and second trials she proceeded to state a preference for the Lud. On the first trial she chose the Lud (L4) to taste and selected L5 as the only other stimulus he would like to try. After tasting she restated her preference for the Lud. On the second trial she stated a preference for the Lud (L5) but refused to taste either food sample. She selected L6 as the only other stimulus she would like to try. In response to the final question she restated his preference for the Lud. On the final trial she refused to state a preference, refused to try either of the food samples stating "I don't want to taste any more", and refused to select any others as those she might also like to try. She ended the trial by restating his preference for the Lud and commenting "I don't want to taste the Yaz, I like the Luds".

JW

Stimulus Set One

In all three trials JW stated a preference for the Yaz, chose only the Yaz to taste and always ended the trial stating a preference for the Yaz. In trials one and two he selected the remaining four stimuli as others he would also like to try, on the final trial he selected one Yaz (Y2) and one Lud (L2) as the others he would also like to try. After tasting on this final trial he commented "It was a nice Yaz".

Stimulus Set Two

When the new stimulus set was presented for potential tasting and JW was asked which he would like he replied "I don't know, I've never tried these ones". In all three trials JW stated a preference for the Lud but chose to taste both food samples. After tasting both in the first trial he remarked that the Lud "was nice" and the Yaz, interestingly, "was bad". In the second trial he again remarked that the Yaz was "bad" but then, after tasting the Lud, said "wrong again, I think this one tastes bad". He indicated a preference for the Luds and then said "I think it tasted bad but I don't know, I think I like the Lud - these are different Luds". In the final trial, after tasting both stimuli, he stated "Nice Lud, it was a bad Yaz, the Lud was good and the Yaz was bad". In all trials he selected all remaining four stimuli as others he would also like to try and always ended the trial stating a preference for the Lud.

DISCUSSION

A number of interesting observations were made in this experiment.

Of particular interest in this experiment is the manner in which the subjects approached the new set of stimuli in the extension test. CJ, despite clearly demonstrating and stating a preference for the Luds in the first stimulus set nonetheless proceeded to select the Yaz to taste on the first trial. On the second trial he elected again to taste the Yaz and finished the trial saying that he liked both the Yaz *and the Lud* although he had not tasted the latter. Thus one could argue that both these stimuli had now become members of his preferred category - the Lud on the basis of his past experience and the Yaz as it was no longer unpleasant tasting. On the final trial he elected to taste a Lud.

MB was entirely consistent in choosing Luds as the stimuli she preferred and wished to taste in the first stimulus set. She exhibited a complete extension of naming - all stimuli chosen in the second stimulus set were consistent with her performance in relation to the first set. Interestingly, she appeared quite anxious in relation to tasting and perhaps her extension was partially motivated by avoiding the stimuli she did not wish to taste rather than by wanting the stimuli which were named consistent with those that had been pleasant tasting in Phase Three.

JW's responses were similar to CJs although there were more spontaneous comments to track his responding to the new set of stimuli. At the outset of the extension test, when asked which stimulus he preferred he simply stated that he didn't know as he hadn't tried these yet. This is an interesting contrast with MB who clearly used the stimulus name to guide her responding. Having tasted both the Yaz and the Lud, JW stated that the former was "bad" and the latter was "nice" - the converse of his verbal statements in Phase Three. On closer examination though this responding *after tasting* makes perfect sense - after all the Yaz was no longer pleasant but neutral and the Lud was no longer unpleasant but neutral - thus both stimuli had undergone a hedonic shift in comparison to their learnt related tastes in Phase Three. JW confirmed this view when he said "These are different Luds". This, then, might be best regarded as a case of rule reversal after tasting - perhaps the most interesting features of JW's behaviour are his lack of use of the name initially to guide tasting but rather his insistence upon tasting before verbally concluding his preference. Further, it is interesting that he appeared completely unhesitant in tasting the new stimuli despite being completely reliable in disliking the salted

stimuli in the preference test and exhibiting stable behaviour to this effect in Phase Three.

Another very interesting observation concerns the participants' verbal behaviour in relation to the stimuli. All three participants spontaneously verbalised *about* the stimuli, particularly describing their palatability or otherwise. This is interesting in that it appears that subjects were not only using verbal categorisation in response to the stimuli, naming each stimulus individually, but also generating considerably more verbal behaviour describing the parameters of the stiumli encountered in the name-taste training and in the extension testing. In other words, subjects used verbal behaviour to initially learn about these novel foods (Stimulus Set One) and, having done so, again made extensive use of verbal behaviour in response to the new set of novel foods (Stimulus Set Two) encountered in the Extension of Naming Test. The amount of verbal behaviour spontaneously used during the extension tresting was perhaps enhanced by the proximity of the sessions featuring the first and second stimulus sets in phase five. Perhaps the most significant point here is not only the use of naming per se, but that there was much verbal behaviour also generated beyond that specifically used to refer to the presented stimuli.

Attention should be drawn to the fact that this capturing of spontaneous verbal comments *in vivo* was extremely illuminating in facilitating an understanding of the subjects behaviour. It has previously been observed (see Dugdale and Lowe,1990) that it may be the case that what a subject says after an experiment about their behaviour while the experiment was in progress may be quite uninformative and, indeed, potentially misleading. Presumably this may apply all the more when the participants are particularly young subjects who may simply forget what their verbal behaviour, overt or covert was during a study and consequently inadvertently misrepresent any particular strategy or strategies used while the experiment was underway.

Methodological issues were again noted in a n effort to refine the design and procedures used yet further.

It was noted that after tasting the subjects were most often simply pointing to the preferred stimulus to indicate their response to the question as to

which stimulus they "liked the best". The subsequent introduction of the procedural refinement - prompting the subjects to name the stimulus rather than merely pointing - clearly had a profound effect on the subjects' performances. Uniformly, the subjects' behaviour stabilised very quickly and remained stable throughout the remainder of this phase allowing progression to Phase Four. Why this intervention had such an effect is difficult to evaluate. One possibility is simply that subjects' memories for the stimulus names was aided and thus their subsequent behaviour was under greater verbal regulation. Another possible explanation is that subjects links between their experiences of pleasant and unpleasant tastes and the respective stimulus names were now enhanced - after all subjects were now naming the stimuli twice as frequently.

Perhaps, as they engaged in this second naming of the stimuli after tasting their naming of the stimuli was further reinforced. This could be case if, for example, after tasting a particular stimulus which was unpleasant, then naming it , it may have been easier to avoid the same - named stimulus on the next trial. It will be recalled that the subjects naming of the stimulus in this sequence (at the end of the trial) may have facilitated his use of that name in the next trial given the now greater temporal proximity of naming in each trial (i.e. naming now occurred at the end of a trial and the beginning of the next trial perhaps thereby facilitating trial to trial transfer of responding).

Another possible explanation is that the sequence of tasting and naming now facilitated learning the name-taste relation. This becomes clearer if one imagines, for example, that the child had just tasted a stimulus which was regarded as unpleasant. It may be easier to link the name with such a stimulus if naming occurs while the unpleasant taste is still in the mouth. This transfer from trial to trial might then have been heavily negatively reinforced facilitating as it did a more effective avoidance of the unpleasant food samples - this would at least partially account for the increased stability in responding.

It was also noted that two subjects had difficulties in Phase Two, during training the colour-name relations, and underwent many trials before eventually being discarded from the study; their data is not reported here as they did not proceed to furnish complete datasets. Nonetheless their difficulty in attaining accurate responding, and the subsequent necessity to undergo many trials in an attempt to attain the specified preformance criteria led to raising the issue as to whether this phase could again be

refined to reduce the time taken for completion and further prevent any needless subject attrition - a factor considered to be critically important in the next experiment, the chief objective of which was a replication of the current study with even younger subjects.

EXPERIMENT SEVEN

The Effects of Common Naming on The Acceptability of, and Preferences for, Novel Foods in Three - Four Year Olds

Introduction

As noted in the discussion after Experiment Seven, the introduction of a prompt forcing post-taste name production appeared to quickly stabilise responding in the preceding experiment thus it appeared obvious to include it in the procedure from the outset, in the experiment presented below.

Also noted was the possibility that the performance criterion in the production trials in Phase Two (Training and Testing Colour-Name Relations) was executed in such a way as to possibly inflate the number of learning trials beyond what may have been neccessary to achieve the desired learning outcome. In an attempt to conduct the training with greater time efficiency (which, it was hoped, would also reduce subject attrition) the criterion for production responding in Phases Two and Four was altered. Instead of now presenting each Yaz with each Lud in blocks repeatedly featuring the same pair we simply presented a Yaz and a Lud randomly chosen from each category and repeatedly did this until seven out of eight consecutive responses were correct. This was performed with the qualification that each Yaz-Lud combination had to appear at least three times. Thus verbal production trials were now conducted in blocks of nine, each block featuring three Yaz-Lud pairings, presented in a random sequence. This was also felt to be a more sensitive measure of response reliability in that if a subject had responded correctly on all three presentations then one could conclude that the relation had indeed been learned reliably - any further trial presentations, as dispensed in the block presentation structure in the previous studies, may have led to needlessly excessive training which has two drawbacks. Firstly, from a pragmatic point of view, it may involve risking 'on-task' attention from subjects; if the same stimuli that have already been learnt are repeatedly presented then it's not unreasonable to suppose that a subject's attention may wander and paradoxically induce the presentation of even more training trials due to inadvertent errors. Secondly, from a theoretical point of view, it may of course mean that ultimate interpretation is insensitive - featuring as it may explanation based on a higher number of trials than was actually neccessary for the outcomes observed to emerge.

An additional aim of the current experiment was the exploration of the naming intervention in a younger age group - thus the chosen

participants were between three and four years old. The cross-sectional developmental analysis that this allowed was indeed informative as will be discussed later.

Method

Subjects

Three children completed this experiment. They were recruited from the Tír Na N'Og day-care nursery. All of the subjects were chosen from a group of children whose parents had granted permission for them to participate having received a letter summarising the study. The children ranged in age from 3 years 1 month to 3 years 3 months. There were two girls and one boy.

Table 7.1
Experiment Seven
Age of Subjects

Subject	Age at Start
GJ	3 yrs 1 mth
KB	3 yrs 1 mth
KF	3 yrs 3 mths

Mean age of subjects at start = 3 yrs 2 mths

Setting and Apparatus

The experiment was conducted in a research room at the Tír Na N'Og day-care nursery. The subject was seated across a table from the experimenter. All experimental sessions were video-recorded using a Panasonic M7 video recorder.

Materials

1. The Foods

During all phases of the experiment the 'novel food' employed was Fromage Frais.

Flavours

150ml of icing sugar was added to 250g of Fromage Frais to produce a 'nice' flavour, 15ml salt was added to produce an unpleasant flavour, and 5ml of vanilla essence or lime juice, or no additional flavour was added to produce a 'neutral' flavour.

Colours

Twelve different colours of Fromage Frais were produced. To produce the colours food colouring was added to 10ml portions of Fromage Frais in the following manner:

White	- no additional colour
Blue	- 10 units blue
Yellow	- 15 units yellow
Green	- 30 units green
Red	- 20 units red
Lilac	- 10 blue + 25 red
Purple	- 20 blue + 30 red
Orange	- 20 red + 15 yellow
Brown	- 10 green + 10 yellow + 25 red + 5 blue
Turquoise	- 23 blue + 10 green
Lime	- 10 green + 35 yellow
Dark orange	- 45 red + 15 yellow

2. Other items

Plastic tubs of 12cm in diameter in which to present the foods.

A blindfold for use in the preference testing.

Response sheets upon which to record subjects responses.

Experimental Design

After an initial familiarisation phase the experiment proceeded in the five phases as outlined for Experiment Six.

PROCEDURE

All phases were identical to those described for Experiment Six above with the exception of Phases Two, Three, and Four - the featured changes are described in detail below.

Phase Two

Training and Testing Colour-Name Relations

Six food stimuli were introduced to each subject. Each of the six stimuli was coloured differently. Subjects were trained to name three of the novel

stimuli 'Yaz' and the remaining three stimuli 'Lud' (the assigning of particular names to particular colours was counterbalanced across subjects). At this stage the stimuli were discriminable by colour only (subjects had not tasted any of these novel foods) and subjects were required to learn this name-colour relation. This training proceeded in three stages.

Stage One: Colour-Name Comprehension Training and Testing

This was conducted exactly as described in Experiment Six above.

Stage Two: Colour-Name Production Training and Testing

The experimenter placed two foods, L1 and Y1, in clear round plastic bowls, on the table. The experimenter then said

> "I want you to learn what these foods are called. When you can tell me their names I'll give you a star to show how good you are"

The experimenter then pointed to one of this first pair and said

> "Can you tell me what this is?"

If the subject responded correctly the experimenter said

> "Clever girl/boy"

If the subject responded incorrectly the experimenter said

> "This is a 'Lud/Yaz' - Can you say 'Lud/Yaz'?"

Each Yaz stimulus (i.e. Y1, Y2, Y3) appeared with each Lud stimulus (L1, L2, L3) at least three times and trial were conducted in blocks of nine. Each block featured three Yaz-Lud pairings presented three times in a random sequence. Consequently, each subject could attain criterion performance in a minimum of three trial blocks.

Stage Three: Family Categorisation

Two pairs of foods were presented on the table simultaneously (two Yazs and two Luds). The experimenter then said

> "Can you tell me which are the Yazs/Luds?"

Subjects were required to point to the appropriate stimuli. If the subject responded correctly the stimuli were removed from the table, replaced in

different positions, and the next trial began. Once subjects had attained criterion performance of seven out of eight consecutive correct responses the categorisation task was repeated with all six stimuli simultaneously on the table until criterion performance (again seven out of eight consecutive correct responses) with all six was attained.

Phase Three

Training and Testing Name-Taste Relations

The subjects stimuli foods were flavoured in accordance with their individual taste preferences as recorded in the taste preference test i.e. if a subject indicated a positive face in response to tasting sugar then sugar was added to one stimulus set (e.g. the Yazs); conversely, if a subject indicated a negative response to salt then salt was added to flavour the 'negative' stimuli (the remaining stimulus set).

The experimenter then presented L1 and Y1 on the table and said

"What is this?" (indicating each one of the pair in turn)

The experimenter then asked the subject

"Which one do you like the best?"

The experimenter then asked the subject

"Would you like to try one?"

Upon recording the subjects response, the remaining four stimuli were placed on the table (thus all six were simultaneously present) and the experimenter asked the subject

"Which others would you like to try?"

The four additional stimuli were then removed from the table and the subject was allowed to taste whichever stimulus (or both if the subject elected to taste both) she selected from this first pair. With this first pair of stimuli (L1 and Y1) the subject was encouraged to taste both foods and were prompted to do so if they appeared reluctant. After tasting the subject was asked

"Which one tastes the best?"

If a subject didn't respond to this question by naming the food she/he was prompted with the question

"What is it called?"

Then the second pair of foods (L2 and Y2) were placed on the table and the questions outlined above (questions 1-5) were posed. Finally the third stimulus pair were presented (L3 and Y3) and the questions outlined above (questions 1-5) were again posed. When the second and third stimulus pairs were presented the subjects were not encouraged to taste them but were allowed to taste none/either/both foods from each stimulus pair if they elected to do so - thus we were able to assess the immediate effect of the first name-taste link on the remaining members of each named class. The subjects responses to the questions were recorded as well as their choice of foods to taste and their actual consumption patterns.

This procedure was repeated with pairs of stimuli (randomly selected Yazs and Luds) until the subject exhibited differential responses to the named foods i.e. responded to the questions with the category name of their positively flavoured food on six consecutive trials.

Phase Four

Training and Testing Colour Name Relations II

A second set of six novel stimuli was introduced and subjects were trained in verbal comprehension and production in relation to this new set of stimuli. Training proceeded as detailed in Phase Two above.

Phase Five

Testing Extension Of Naming To The Novel Foods

This phase was conducted exactly as described in Experiment Six above.

RESULTS

Phase One: Preference Testing

Note: Please refer to Figure 7.1 to see this data. The data graphed represents the final three data points (after the concentrations of added sugar and salt were adjusted upward to elicit reliable responding from each subject) in preference testing with each subject

GJ

GJ responded positively with perfect reliability to sugar. GJs response to salt was more variable but as there was clear divergence between these categories GJ proceed in the experiment.

K B

KB's response to sugar was reliable and positive. KB's response to salt was more variable but as there was clear divergence between these categories KB proceeded in the experiment.

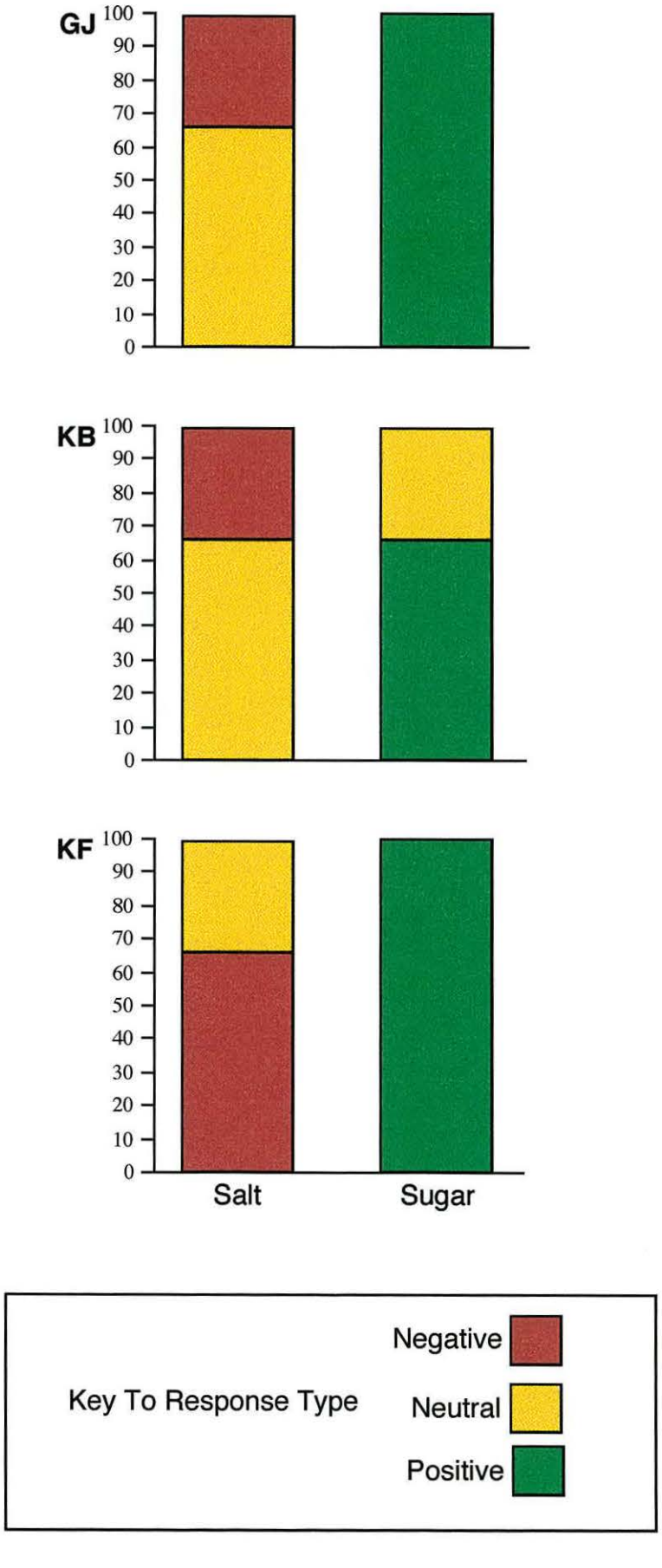
K F

KF responded positively to sugar with perfect reliability. KFs response to salt was reliably negative.

Figure 7.1

Preference test response data for all three subjects - GJ, KB, and KF. Note that the green shading indicates a positive response, the yellow shading indicates a neutral response, and the red shading indicates a negative response. The data plotted include the three final preference trials for each particpants, featuring both foods - sugar and salt, these foods were then at their final concentration levels for each subject (the level concentration level utilised in all subsequent phases). The overall response to each of the foods can be observed by noting the proportion of each colour featured in the histogram for each food.

Figure 7.1: Preference Test



Phase Two: Training and Testing Colour-Name Relations
These data is presented grpahically in Figure 7.2.

GJ
Comprehension
Stimulus Set One
GJ required a total of fourteen trial blocks to attain criterion performance in comprehension.
Stimulus Set Two
GJ required three trial blocks to complete comprehension training with the second set of stimuli.

Production
Stimulus Set One
GJ required six blocks of trials to attain criterion performance in the production training phase.
Stimulus Set Two
In Phase Four, learning the name-colour relations for the second set of stimuli, GJ attained criterion performance in the production phase in four trial blocks.

Family Category Testing
Stimulus Set One
When four stimuli were presented simultaneously GJ attained criterion performance in two trial blocks. Subsequently, when all six stimuli were presented GJ attained criterion performance in three trial blocks.
Stimulus Set Two
With the second set of six stimuli, when four stimuli were presented simultaneously, GJ attained criterion performance in one trial block. When all six stimuli were simultaneously presented GJ again attained criterion performance after one trial block.

Total
In phase two GJ required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

K B

Comprehension

Stimulus Set One

KB required a total of six trial blocks to attain criterion performance in comprehension.

Stimulus Set Two

KB required three trial blocks to complete comprehension training with the second set of stimuli.

Production

Stimulus Set One

KB required seven blocks of trials to attain criterion performance in the production training phase.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, KB attained criterion performance in the production phase in four trial blocks.

Family Category Testing

Stimulus Set One

When four stimuli were presented simultaneously KB attained criterion performance immediately i.e. in one trial block. Subsequently, when all six stimuli were presented KB attained criterion performance in three trial blocks.

Stimulus Set Two

With the second set of six stimuli, when four stimuli were presented simultaneously, KB attained criterion performance in one trial block. When all six stimuli were simultaneously presented KB again attained criterion performance immediately i.e. after one trial block.

Total

In phase two KB required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

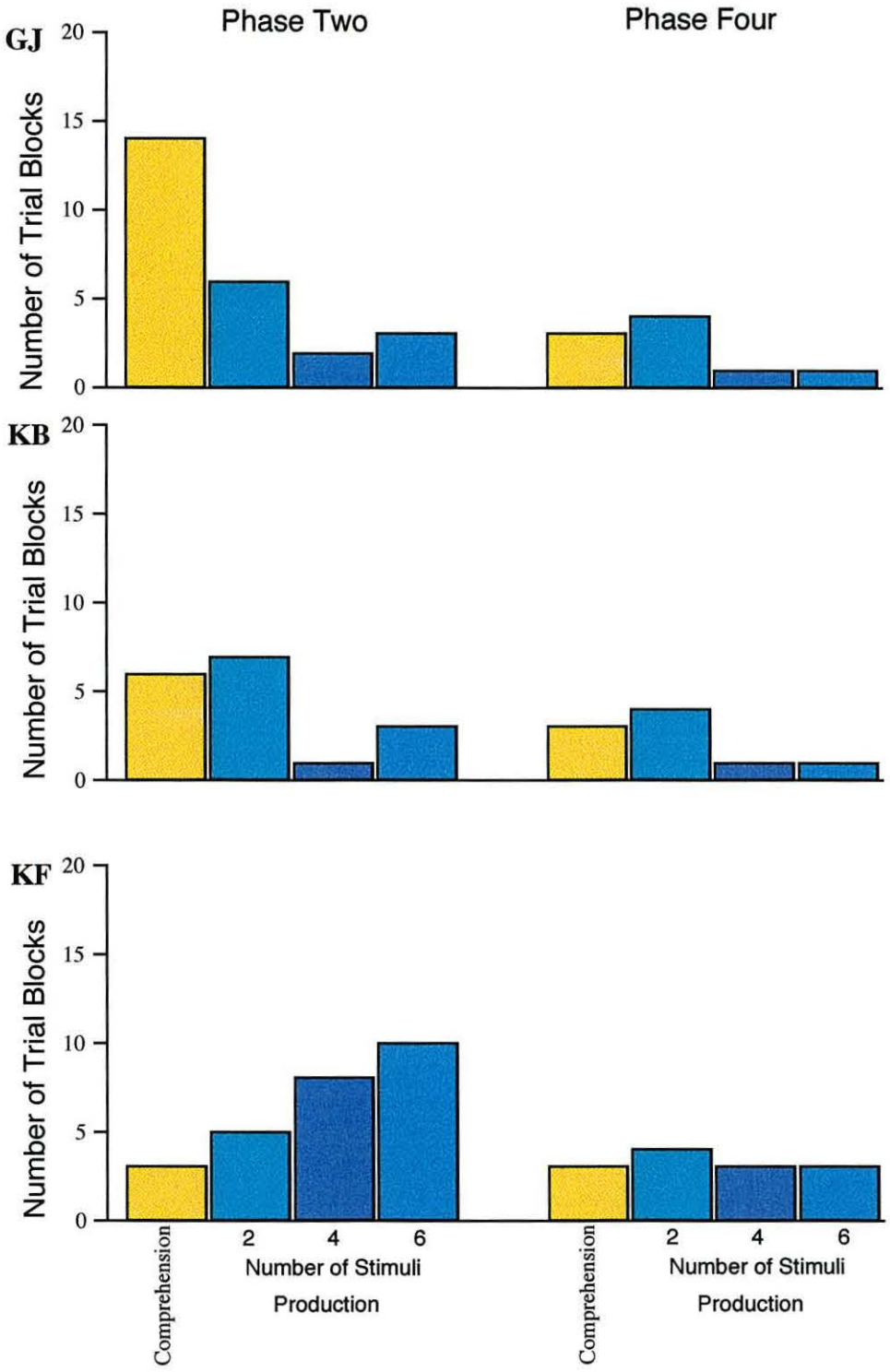
Figure 7.2

Training and Testing Colour Name Relations

Data are shown for all three subjects - GJ, KB, and KF.

Total number of trial blocks completed during the comprehension (minimum trial blocks = 3) and production phases (minimum trial blocks = 3); (production phase including performance when two, four, or all six stimuli - three from each stimulus set - were simultaneously presented) in Phase Two (Stimulus Set One) and Phase Four (Stimulus Set Two). The data was calculated by totalling block numbers performed until criterion performance was observed (see text for detail).

Figure 7.2: Training and Testing Colour-Name Relations



K F

Comprehension

Stimulus Set One

KF required a total of three trial blocks to attain criterion performance in comprehension.

Stimulus Set Two

KF again required three trial blocks to complete comprehension training with the second set of stimuli.

Production

Stimulus Set One

KF required five blocks of trials to attain criterion performance in the production training phase.

Stimulus Set Two

In Phase Four, learning the name-colour relations for the second set of stimuli, KF attained criterion performance in the production phase in four trial blocks.

Family Category Testing

Stimulus Set One

When four stimuli were presented simultaneously KF attained criterion performance after eight trial blocks. Subsequently, when all six stimuli were presented KF attained criterion performance after ten trial blocks.

Stimulus Set Two

With the second set of six stimuli, when four stimuli were presented simultaneously, KF attained criterion performance after three trial blocks. When all six stimuli were simultaneously presented KF attained criterion performance after three trial blocks.

Total

In phase two KF required a total of 33 trial blocks; in phase four he required a total of 24 trial blocks yielding a grand total of 57.

Phase Three: Training and Testing Name-Taste Relations

These data are presented graphically in Figures 7.3, 7.4, and 7.5.

G J

GJ required a total of 14 trials before attaining criterion performance in the name-taste relation training phase.

She stated a preference for the Yaz stimulus (Y1) on the first trial but refused to taste either food. She selected one Lud (L2) and one Yaz (Y3) as other stimuli she would like to try. She maintained that her preference was for L1 at the end of the trial. On trial two she said she preferred the presented Lud (L2) but again refused to taste either stimulus. She selected Y3 as the sole other stimulus she would like to try and maintained a preference for L2 at the completion of the trial. On trial three she chose the Yaz (Y3) but once again refused to taste either stimulus on offer. L2 was selected as the only other stimulus she would like to try. At the end of the trial she again restated her preference for Y3. Trial four marked a change - on this trial she stated a preference for the Lud (L2), chose L2 to consume and selected the remaining Luds to also try. When it came to tasting she was successfully prompted to taste both the Lud and the Yaz. After tasting she maintained her preference for the Lud (L2). On trial five she stated a preference for the Yaz (Y2), chose not to consume either stimulus, selected L2 and L3 as the other stimuli she would like to try, refused to taste either stimulus and finally stated a preference for L1. In the remaining nine trials she invariably stated a preference for the Luds, always chose the Luds to consume, and always tasted only the Lud on offer. Invariably she also restated her preference for the Lud at the end of each trial. Her performance in choosing from the remaining Yazs and Luds to try was somewhat more variable. As can be seen in Figure 7.3 on trials 6-10 she always selected the remaining Luds to try but on these trials she also invariably included a Yaz in her selection. From trial 11 onwards she selected only Luds. During the final few trials GJ spontaneously said "I don't want the Yazs...they're nasty. I only want the Luds as they are nice" clearly verbalising a rule formulated about the stimuli and her preferences for their respective tastes.

Figure 7.3

Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject GJ.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 7.3: Phase Three: Training Name - Taste Relations

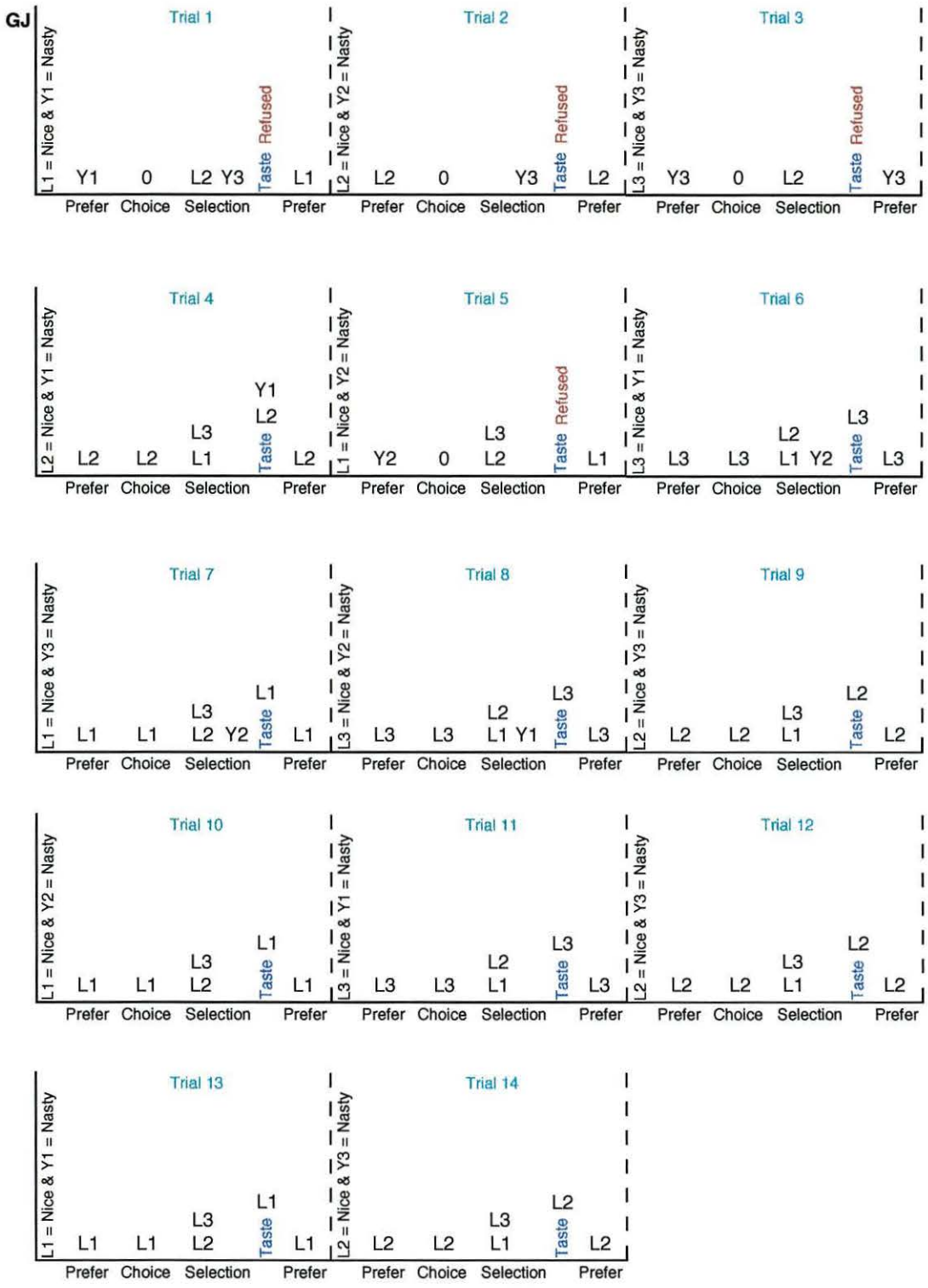


Figure 7.4

Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject KB.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 7.4: Phase Three: Training Name - Taste Relations

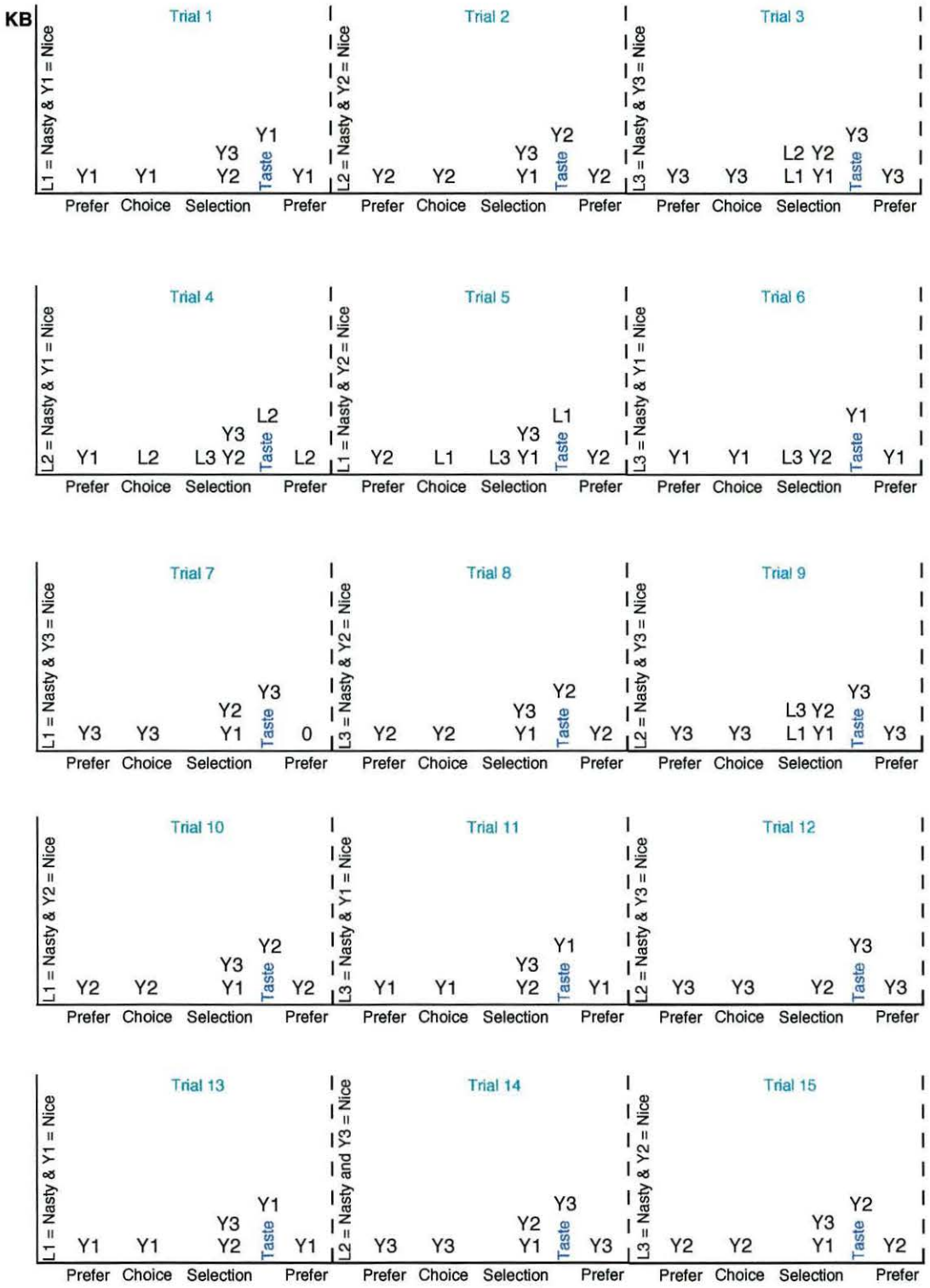


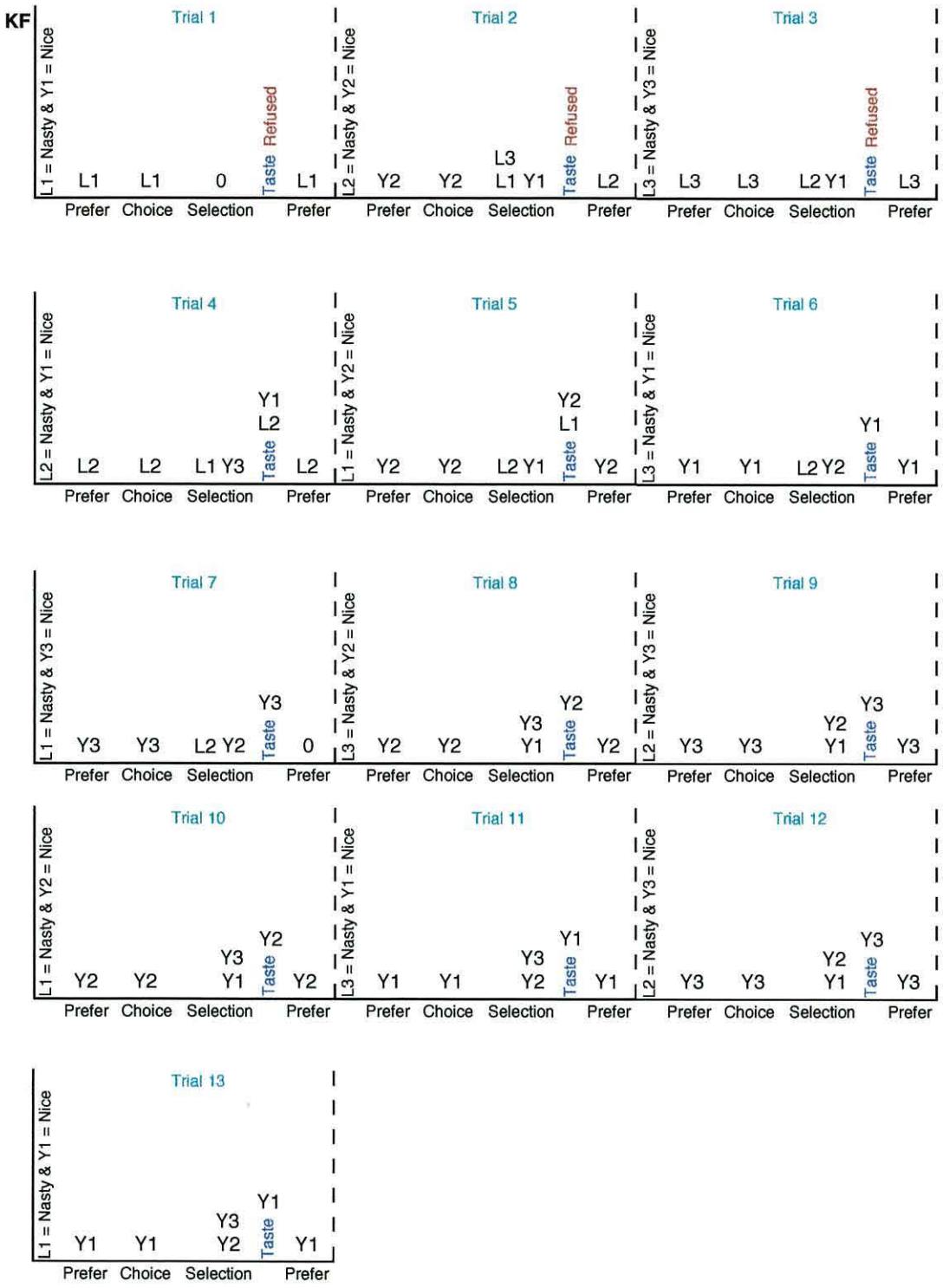
Figure 7.5

Training Name-Taste Relations

Total number of trials completed until criterion performance was attained (see text for details), trial by trial, for Subject KF.

Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 7.5: Phase Three: Training Name - Taste Relations



K B

KB required a total of 15 trials to attain criterion performance in the name-taste relation training phase. On trial one KB stated a preference for the Yaz (Y1), chose Y1 to taste, selected the remaining Yazs as others he would like to try, tasted only Y1 (despite prompting) and subsequently said he preferred it. On trial two he again stated a preference for the Yaz (Y2), chose the Yaz to taste, selected the remaining Yazs (Y1 and Y3) and a Lud (L3) as others he would like to try, and proceeded to taste the Yaz and restate his preference for it. On the third trial he again stated a preference for the Yaz (Y3) and chose the Yaz to taste. He selected all of the remaining stimuli (Y1, Y2, L1, and L2) as stimuli he would also like to try. He proceeded to taste Y3 and then restated his preference for it. On trial four he stated a preference for the Yaz (Y2) but chose to taste the Lud (L1). He selected the remaining Yazs (Y1 and Y3) and a Lud (L3). He tasted L1 and then stated his preference as being for Y2. In the remaining nine trials he always stated a preference for the Yaz and always chose the Yaz to taste. With the exception of trial seven - when he stated after tasting that he had a preference for neither the Yaz nor the Lud - he invariably stated a preference for the Yaz at the end of each trial. His performance in selecting other stimuli that he would also like to try was a little more variable; in trial five he selected another Yaz (Y2) and another Lud (L3), in trial nine he selected all of the remaining stimuli to try (Y1, Y2, L1, and L3). In all other trials he selected the remaining Yazs with the single exception of trial twelve when he selected one of the remaining Yazs rather than both of them. As with GJ above, KB spontaneously reported "I only want to taste the Yazs...they taste nice" again indicting a clear relationship had been formulated between the food names and their tastes (at least with respect to the 'positive' flavoured foods).

K F

KF required a total of 13 trials to attain criterion performance in the name-taste relation training phase. On the first trial S3 stated a preference for the Lud (L1), chose L1 to taste but did not select any others as stimuli she would also like to try. However, when the opportunity to taste arose she refused to do so. She completed the trial by restating a preference for L1. On the second trial she stated a preference for the Yaz (Y2) and chose Y2 to taste. She selected L1, L3 and Y1 as others she would like to try. Once again she refused to taste either stimulus and ended the trial by stating a preference for the Lud (L2). On trial three she stated a preference for the

Lud (L3), and chose L3 to taste. She selected L2 and Y1 as others she would like to try. Again, when the time came to taste she refused to do so despite considerable prompting. On trial four she stated a preference for L2, chose L2 to taste, and selected L1 and Y3 as others she would like to try. On this trial she tasted both the Lud (L2) and the Yaz (Y1) and after doing so stated a preference for the Lud. On trial five she stated a preference for the Yaz (Y2), chose it to taste and selected Y1 and L2 as others she would like to try. She proceeded to taste both stimuli and ended the trial by stating a preference for the Yaz. In the remaining eight trials she invariably stated a preference for the Yazs, chose only the Yazs to taste and always ended the trial by restating her preference for the Yazs. Her performance in selecting other stimuli that she would like to try was a little more varied; on trials five and six she selected only one of the remaining two Yazs (Y2 on both occasions), on the remaining six trials she always selected both remaining Yazs. KF remained relatively quiet throughout this entire series of trials and did not produce any spontaneous verbal comments which may have provided additional material to aid interpretation of the results.

Phase Five: Testing Extension of Naming

These data are presented graphically in Figures 7.6, 7.7, and 7.8.

GJ

Stimulus Set One

In all three trials GJ stated a preference for the Lud, chose only the Lud to taste, and always ended the trial stating a preference for the Lud. On trial one and two she selected the remaining two Luds when requested to indicate which other stimuli she would like to try, on the third trial she selected one of the remaining Luds and one Yaz.

Stimulus Set Two

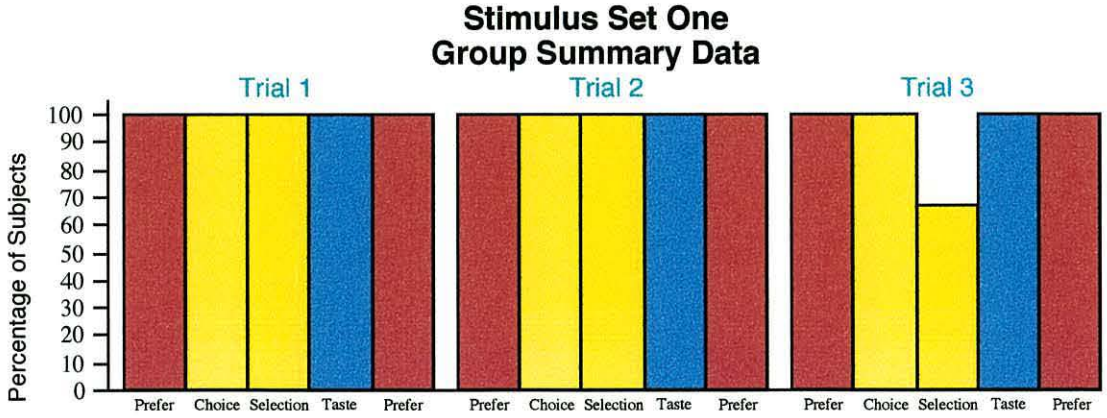
In trial one GJ stated a preference for the Lud (L4), chose it to taste, selected the remaining two Luds as others she would like to try, and ended the trial restating her preference for the Lud. In trial two she stated a preference for the Lud and chose to taste it but selected only one of the remaining two Luds (L4) as a stimulus she would also like to try. She ended the trial by restating her preference for the Lud. In the final trial she stated a preference for the Lud and chose the Lud to taste. She did not select any other stimulus as one that she would also like to try. She ended the trial by restating her preference for the Lud.

Figure 7.6

Testing Extension of Naming - Summary Data

The bottom panel of the graph shows the total percentage correct data for all three subjects - GJ, KB and KF in each of the three trials completed to test extension of naming. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, five separate response components are summarised and displayed as follows: (i) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (ii) the histogram presented above 'choice' represents the percentage total of subjects who chose to taste *only* the positive stimulus offered, (iii) the histogram presented above 'selection' represents the percentage total of subjects who selected *all* of the remaining 'positive' stimuli (and none of the remaining 'negative' stimuli) as those others that he/she would also like to try, (iv) the histogram presented above the vertical 'taste' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (v) the histogram presented above the final 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Each test trial is numbered in sequence. Within each trial, presented sequentially on the horizontal axis, five separate response components are summarised and displayed as follows: (i) the histogram presented above 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question before tasting, (ii) the histogram presented above 'choice' represents the percentage total of subjects who chose to taste *only* the positive stimulus offered, (iii) the histogram presented above 'selection' represents the percentage total of subjects who selected *all* of the remaining 'positive' stimuli (and none of the remaining 'negative' stimuli) as those others that he/she would also like to try, (iv) the histogram presented above the vertical 'taste' represents the percentage total of subjects who elected to taste *only* the 'positive' stimulus offered, and (v) the histogram presented above the final 'prefer' represents the percentage total of subjects who indicated preferring the 'positive' stimulus in question after tasting.

Figure 7.6 Testing Extension Of Naming Group Summary Data



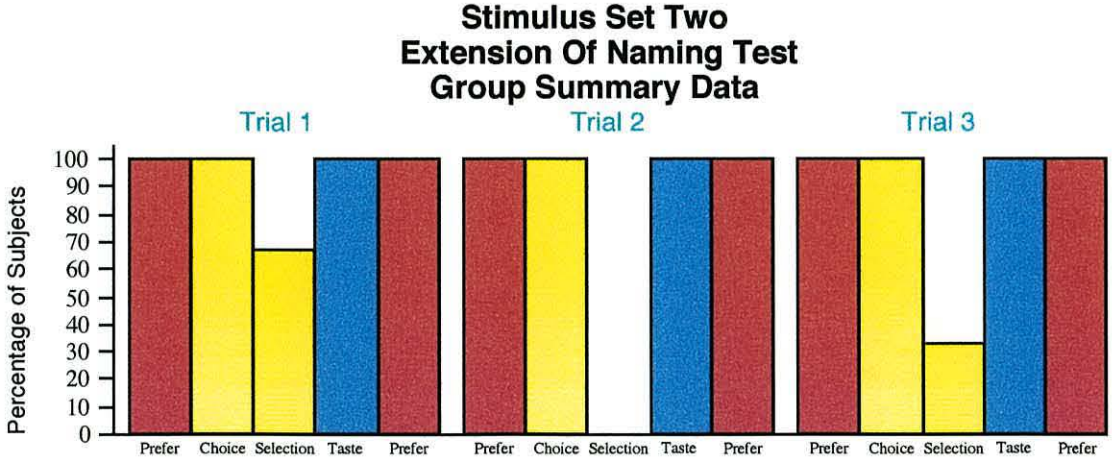


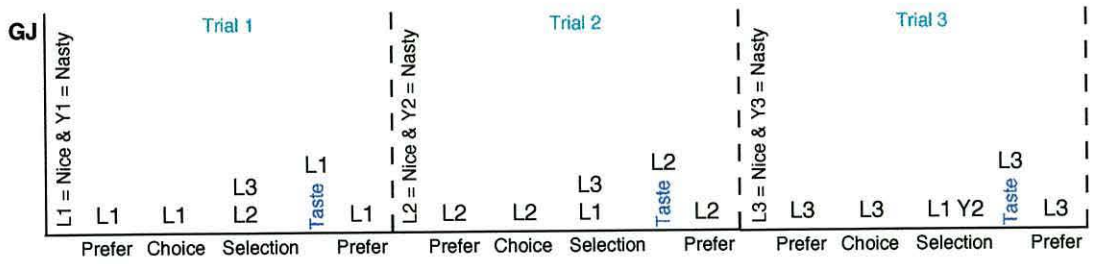
Figure 7.7

Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject GJ, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 7.7: Phase Five : Testing Extension of Naming

Stimulus Set One



Stimulus Set Two

Extension of NamingTest

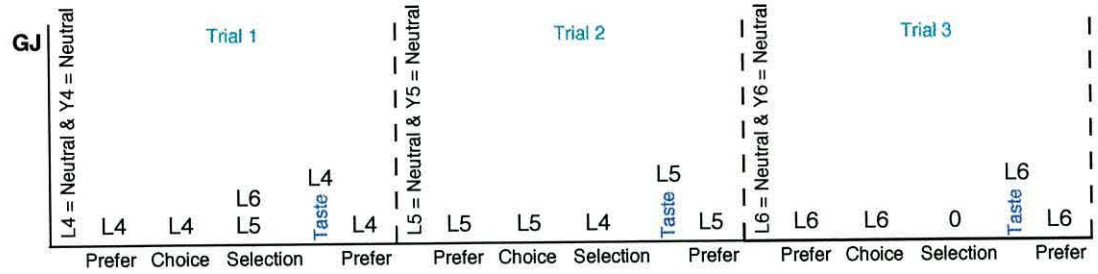
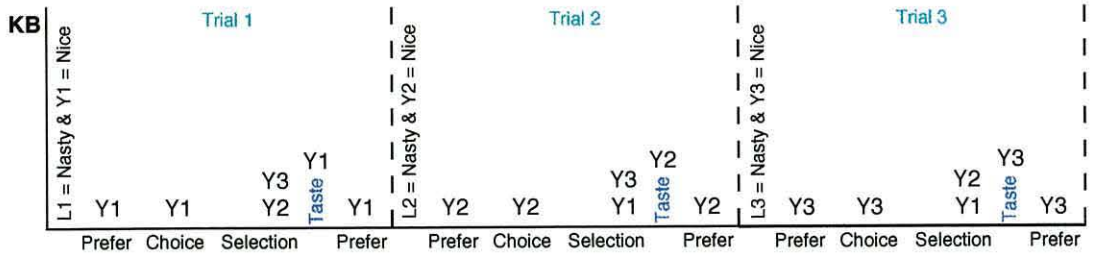


Figure 7.8

Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject KB, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

Figure 7.8: Phase Five : Testing Extension of Naming
Stimulus Set One



Stimulus Set Two
Extension of Naming Test

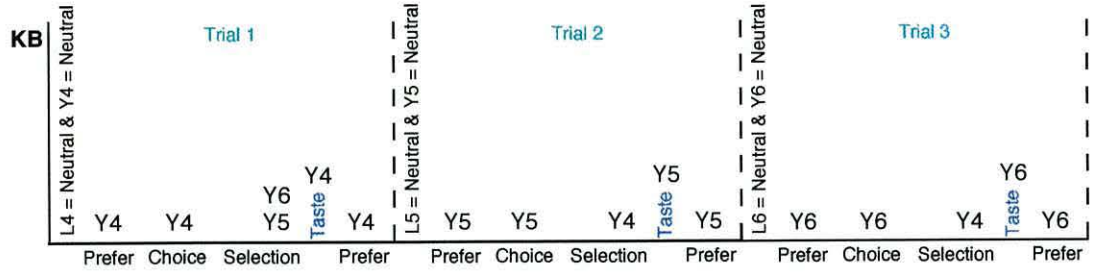


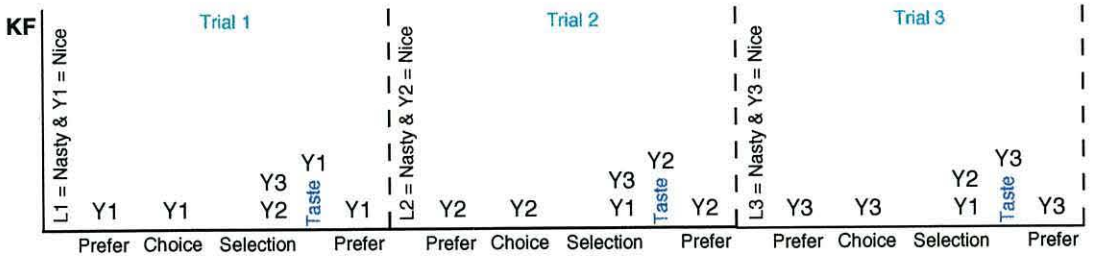
Figure 7.9

Testing Extension of Naming - Individual Data

The bottom panel of the graph depicts performance, by Subject KF, in each of the three trials in the extension of naming test. Each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste property, all neutral (as defined by the individual subjects responding) as this is the extension test , are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting. The top panel shows performance with Stimulus Set One prior to the Extension of Naming Test. Again, each frame represents a single trial, as numbered in sequence. The stimuli presented, and their taste properties, nice or nasty (as defined by the individual subjects responding), are identified vertically within the beginning of each frame. Within each trial, presented sequentially on the horizontal axis, five separate response components are displayed as follows: (i) the stimulus presented above 'prefer' represents that indicated as being preferred by the subject before tasting, (ii) the stimulus presented above 'choice' represents that that the subject elected to taste, (iii) the stimulus/stimuli presented above 'selection' represent those others that the subject said he/she would also like to try, (iv) the stimulus presented above the vertical 'taste' label represents that actually tasted by the subject (or refused, as indicated), and (v) the stimulus presented above the final 'prefer' represents that which the subject indicated a preference for after tasting.

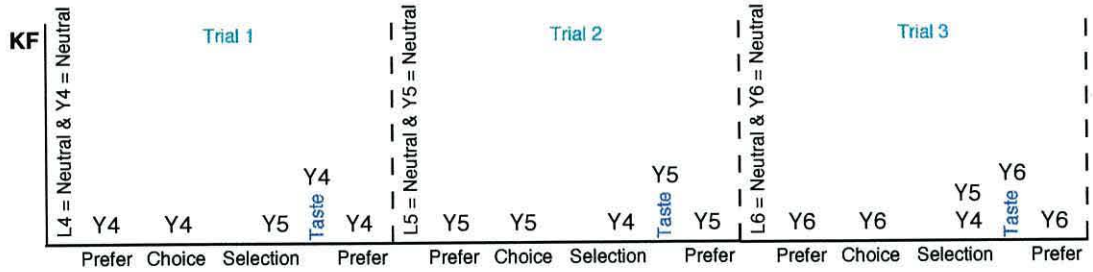
Figure 7.9: Phase Five : Testing Extension of Naming

Stimulus Set One



Stimulus Set Two

Extension of Naming Test



K B

Stimulus Set One

In all three trials KB stated a preference for the Yaz, chose only the Yaz to taste, selected the two remaining Yazs as stimuli he would also like to try and always ended the trial stating a preference for the Yaz.

Stimulus set Two

In all three trials KB stated a preference for the Yaz, chose only the Yaz to taste and always ended the trial by restating a preference for the Yaz. In the first trial he selected the remaining two Yazs as stimuli he would also like to try but in the remaining two trials he selected only Y4 - the Yaz he had consumed on the first trial.

K F

Stimulus Set One

In all three trials KF stated a preference for the Yaz, chose only Yazs to taste, selected the two remaining Yazs as stimuli she would also like to try and always ended the trial stating a preference for the Yaz.

Stimulus Set Two

In all three trials KF stated a preference for the Yaz, chose only the Yaz to taste and always ended the trial stating a preference for the Yaz. In trial one she selected only one of the remaining Yazs (Y5) as a stimulus she would also like to try, on trial two she again selected only one of the remaining Yazs (Y4 - the Yaz she had tasted in the preceding trial) and on the final trial she selected the two remaining Yazs (she had tasted both of these by now).

DISCUSSION

There are a number of striking observations in this experiment.

Perhaps the key finding is the general evidence of the effective extension of naming - all participants showed responding in the extension of naming test indicating that the earlier name-taste relation training had indeed had an extensive impact. On each trial, each subject stated a preference only for the stimulus whose name was consonant with the earlier palatable name-taste link. Prehaps more importantly, each subject chose only those stimuli whose name was linked with the palatable taste to taste in this test - it should be remembered that each of these stimuli were never tasted before; thus, this is clear evidence that verbal categorisation can, through extension, increase the likelihood of the consumption of an entirely novel food (or increase the avoidance of consumption of one). Thus, the subjects in this experiment did indeed show behaviour characteristic of responding to "categorizations as much as to the world itself" (Horne and Lowe, in press, p.3) during the Extension of Naming Test. Not only did the participants proceed to state a preference for the neutrally-flavoured stimuli whose name was consonant with that of the the positively-flavoured stimuli in the earlier name-taste training, they subsequently tasted *only* those stimuli with such 'positive' names. It is difficult to envisage a clearer example of how responding to categorizations may not only occur but direct subsequent responding such that entire classes of stimuli are avoided (i.e. consumption responses to the stimuli with the 'negative' names in the current example) as well as approached.

The observation that these subjects, comparatively younger than those in Experiment Six, performed with a greater degree of extension of naming is perhaps a little surprising and demands explanation. What might account for this observed difference?

The obvious difference between these two experiments that might account for such divergence is the addition of the post-taste stimulus naming in each trial during the name-taste relation training phase. It was noted in Experiment Six that when this procedural modification was introduced the data from each subject evidenced rapid stabilisation - one subject's data met the response stabilisation criterion after twelve trials, one after seven, and one after six. Thus these older subjects were exposed to a greater number of trials without the modification than trials where it was in place. Looking at the data from Experiment Six we can see that the first subject had

undergone twenty-eight trials before the the post-taste naming was introduced, the second subject underwent eight trials prior to the modification, and the final subject completed twenty-one trials before the modification was in place. In contrast each subject in Experiment Seven experienced this feature on every trial since the outset - it is therefore not unreasonable to assume that their training, involving a more extensive use of subjective verbal production, and a consistent training history with it might well have led to greater extension.

It is also worth noting that this sequencing in the trial, name-taste-name, is precisely the sort of condition which may best promote the name-taste link and lead to emergent behaviour in that this sequence itself induces a symmetrical verbal response encapsulating the taste. This may well be a very powerful way in which to condition such relations in that bi-directionality of responding is trained - this matter will be discussed in more detail later.

Also of interest is the finding that these subjects stated a verbal preference for these tasted foods after consumption - it should be remembered that these stimuli now had a neutral taste but they still led to the emission of a positive verbal preference statement.

A further observation of interest is the somewhat low rate of selecting other members of the same named stimulus class as others that these subjects 'would like to try' in each trial. The appropriate verbal production of a particular stimulus name is one thing, it's extension to other stimuli within that named class is quite another. These young subjects did not show too much difficulty in acquiring the verbal production in response to the different coloured foods, indeed this may have been more rapidly acquired than in previous experiments - although the altered procedure may account for this - but they did tend to restrict responding to individual stimuli, even in a context - such as that present in the extension of naming test - when they could quite easily have extended their behaviour somewhat further. In other words, they appearred to treat ecah stimulus as a seperate entity despite the common name of the stimulus class. Again, this may simply reflect their level of exposure to these stimuli. Perhaps, if followed up sometime later, they would evidence more class-inclusive responding - this would be entirely consistent with the Horne and Lowe account.

Other observations in this experiment are also important. The number of trials required in Phase Three to achieve stable responding is considerably less than observed in the preceding experiment - perhaps for three reasons. One possibility is, of course, the procedural refinement of introducing the necessity to produce the stimulus name before and after tasting at the outset of this phase. It will be recalled that its introduction in Phase Three in Experiment Six quickly resulted in stable response patterns across all subjects. A second interesting possibility is that this effect is perhaps more to do with verbal behaviour in general. These subjects exhibited considerably less spontaneous behaviour throughout this phase than did the comparatively older subjects in Experiment Six - two of the subjects (GJ and KB) spontaneously verbalised rules about the name-taste relations but only made these statements *once.* An interesting possibility then is that these subjects learnt more effectively using the name as this was a 'minimal' verbal intervention and perhaps one they could learn quite easily. A third possibility is simply that this younger group were more reluctant to taste the unpleasant tasting stimuli or, indeed, to taste in general - this may be broadly consistent with the food preferences literature (see literature review). These issues will be dealt with in more detail later.

Overview of Results
From Experiments Four, Five, Six, and Seven

An initial experiment was conducted largely with the objective of testing all major aspects of the procedure to be employed in the investigation of the effects of common naming on the acceptability of, and preferences for, novel foods in three- to five-year-old children.

This initial pilot study was conducted in five phases. Firstly, each child participated in a test of their preference for 'positive' ingredients (i.e. icing sugar, maple syrup, and vanilla essence), and 'negative' ingredients (i.e. salt, vinegar, and lime juice) added to the base food, Fromage Frais. The subjects then completed a second phase during which they learned to reliably name the first stimulus set which comprised six individual stimuli - three named "Yaz" and three named "Lud". During the phase dedicated to training name-taste relations subjects tasted each of the stimuli, and thus had an opportunity to learn which category of stimuli had been flavoured positively, and which negatively (recall that this was, of course, defined by the subjects own responding and not arbitrarily classified by the experimenter). Subjects then proceeded to learn to reliably name the second set of six stimuli - three named "Yaz" and three "Lud". Finally, a fifth phase featured a test of extension of naming - thus, each subject was now required to express preference for each of these new second set of stimuli and, perhaps more critically, were offered each to taste allowing a careful analysis of consumption patterns.

Five subjects, averaging four years and seven months in age, participated in this experiment.

Four of the subjects were reliable in responding positively to sugar, but were somewhat more variable in response to the other sweet flavours. Three of the subjects responded reliably in classifying the salt-flavoured food as negative but were, again, less reliable with other flavours. One of the subjects was very unreliable and responded both positively and negatively unpredictably to the flavours but he was retained in the study to furnish a comparison with his more reliably responding peers.

All five subjects required a considerable amount of training to attain criterion performance in naming each of the specifically coloured foods, although in general subjects attained criterion performance with

somewhat fewer trials in Phase Four (when learning to name the second stimulus set).

The most salient observation in the extension of naming test was that the subject with the most reliable preference data - also, coincidentally, the subject who was most spontaneously verbal throughout the experiment - was the subject showing the greatest degree of extension of naming.

This pilot study served it's purpose in providing a rigorous test of the design and procedures to be employed in the naming experiments. Assessing the results of the study allowed a number of significant procedural refinements to be implemented.

A second experiment again had the major objective of assessing the influence of common naming on the acceptability and preferences for novel foods. This study featured several procedural changes.

There were four major changes in the preference testing procedure - only sugar and salt were used to flavour the base food, test trials were increased - they were now repeated until subjects showed reliable positive and negative response divergence between the flavoured foods, reliable responding to the 'neutral' foods (one unflavoured, the other containing a little vanilla essence), and, lastly, subjects whose responding in the preference test was unreliable were discarded from the study.

In the phase dedicated to training subjects to correctly name each coloured stimulus, the comprehension of the stimuli names was now initially tested with subjects proceeding to production training.

There were also extensive revisions to the phases featuring the training of name-taste relations and testing extension of naming.

Subjects were required to name each stimulus at the beginning of each trial, subjects were asked which stimulus they *liked the best* which may have been easier for them than the use of the word 'preferred', subjects were asked if they would like to *try* a food rather than eat it - the latter perhaps implying that all of a particular food would have to be consumed, and they were asked which other stimuli they would like to try - allowing a rapid test of within-class generalisation.

Three subjects participated in the second naming experiment, averaging five years and two months in age.

All three subjects' responding was reliable in the initial preference test. Again, subjects required considerable training trials to attain criterion performance in learning to name each coloured stimulus food reliably.

Despite the reliability observed in the preference tests, subsequent main effects of the intervention were not very clear. All three subjects chose to taste both Yaz and Lud stimuli in the first trial of the extension test, rather than responding consonant with their previous name-taste training. Indeed, one of the subjects consumed both Yaz and Lud stimuli on all three trials in the extension test.

Two final experiments were conducted. In Experiment Six some procedural refinements were again introduced.

In the phases dedicated to training colour-name relations, when subjects were undergoing production training they were initially presented with two stimuli and progressed to training with four, and then six stimuli and subjects had to indicate which were Yazs and which Luds without touching or moving the stimuli in any way.

The phases dedicated to training name-taste relations were also revised; subjects experienced many more trials in this phase which was now deemed complete when subjects had attained a criterion of six consecutive identical responses i.e. exhibit stable name-taste relation responding. Finally, subjects were prompted to name the stimulus at the end of each trial if they had not done so - up until this experiment subjects could have responded to the question "which one tastes best?" by pointing - a *verbal* response was now required.

Testing for extension of naming was also changed. Due to the often lengthy delay between colour-name relation training and testing for extension of naming, the first stimulus set were re-presented before extension testing began - although it should be noted that this was *always* on a different day to that on which the extension testing occurred.

Three children, whose ages averaged five years and one month, participated in this experiment. Although one subject was a little variable, all three responded with adequate reliability in the initial preference test and remained as participants throughout the entire study.

All three subjects attained criterion performance in colour-name relation training more quickly than in the previous experiment, thus highlighting the utility of the procedural changes introduced in this phase.

Interestingly, all three subjects required a considerable number of trials, ranging from fourteen to forty, in the name-taste relation training phase before stable responding was seen.

In the extension of naming test one subject began by tasting the stimulus which had been linked with the 'negative' flavour (although in this test it was of course neutral in flavour) and proceeded to select the same named stimulus in the second trial, reverting in the final trial to tasting the stimulus whose name had previously been linked to the 'positive' flavour. The second subject chose the novel 'positively named' stimulus (the offered stimulus the name of which had been linked with 'positive' responding to trhe flavour in the previous training) in the first extension trial, and proceeded to taste this. In the second trial he said he preferred the 'positive' stimulus but refused to taste anything, and in the final trial he refused to answer most of the questions but did finally express a preference for the 'positive' stimulus. The third subject initially chose the stimulus the name of which had been linked with the negative flavour in the name-taste training and persisted to chose, and express a preference for these stimuli throughout the remaining trials. He selected every other stimulus on each trial as those others he would like to try and proceeded to taste every stimulus, although always expressed a preference for the stimuli whose name had previously been associated with the negative flavour.

The final experimental study was conducted largely to replicate Experiment Six. Two minor procedural changes were introduced. The precise requirement for responding in the verbal production component of the colour-name training was altered with the aim of potentially reducing the number of trials required and also allowing a more sensitive measure of the required amount of training at this point. Secondly, the procedural refinement introduced in phase three in Experiment Six above - the

requirement to re-name the stimulus after tasting had occured in each trial - was implemented from the outset in the present experiment. In this investigation the participants were younger than above - with an average age of three years and two months.

The responses recorded in the preference test were somewhat different in this younger age group. Although all three subjects showed a reliable divergence between stimuli groups, two subjects showed neutral responses to the salt flavoured stimuli - all three subjects were reliable in responding to sugar positively.

Learning the colour-name relations appeared to require a little less training than that described above in Experiment Six, although this may reflect the procedural change.

All three subjects required a similar number of trials to attain criterion performance in the name-taste training phase. The number of trials required ranged from thirteen to fifteen.

In the extension of naming test the first subject consistently stated a preference for and chose to taste only those stimuli which shared a common name with those that were linked with a positive flavour in the name-taste training trials. There was, however, little evidence of complete within class generalisation (i.e. both other members of that stimulus class being chosen) in stimulus selection on only one trial.

In the extension of naming test the second subject chose and tasted only stimuli labelled consistently with the name used in his initial name-taste training trials. Interestingly, however, this subject selected the two other members of this stimulus group as those he would like to try on only one trial - the first trial.

The third subject again showed responding consistent with her training in the name-taste training phase, in that all stimuli preferred and chosen to taste were those who shared a name with the earlier stimulus name linked with the 'positive' taste. Again, complete within class generalisation was seen on only one trial, but it should be remembered that the subject had already tasted the two selected stimuli in the preceding trials.

General Discussion

Naming and Food Preferences and Consumption Patterns in Young Children

A number of important observations are evident from the second set of experiments.

Considerable variability was seen in taste preference responding in each of the initial preference tests. It is not entirely clear why this was the case. One possibility is that such preferences are simply due to natural variation in the innate perception of different taste properties (see, for example, Logue, 1991). Given that the two principle flavours used in these experiments were salt and sugar, and we know that these elicit differential responding even from neonates then we should perhaps not be surprised to find it in these older children. Nonetheless, such responses were somewhat variable within-subject.

With such variability evident in infancy the question arises as to when this variation is greatest, and what factors might be involved in maintaining or altering that variation throughout the lifespan.

A second explanation arises from the observation of these subjects ages. Perhaps the differential taste responding seen was the result of preferences already acquired earlier in childhood. At the ages of the children featured in these experiments we may well be already seeing the results of considerable learning.

A third, and perhaps more intriguing hypothesis, is that the children were covertly naming and / or describing their taste experiences and using these descriptions to regulate their responding to the stimuli thus classified. It will be recalled that, at this age, children are capable of this form of responding and, indeed, it may be the most powerful way that they do respond (see Catania, 1992; also Horne and Lowe, 1996).

Thus the variation seen in responding in initial preference testing is deserving of study in far greater detail and, further, it is unlikely to yield the mystery of these subtle genetic - perceptual - verbal - behavioural interactions without concerted and focused effort. That said, it does not appear to be imperative to achieve perfect reliability and divergence in taste to ultimately 'drive' two separate stimulus classes. Evidently, the results reported later in this series support the view that whenever such valence and divergence is predominantly, but not neccessarily totally present (i.e. in the experiments reported each category featured tastes that

led to largely negative or positive responding - but neither the negative nor the positive responding appeared to be present on every trial nonetheless this did appear to lead to the emergence of two distinct classes with differential palatability) this will suffice to elicit differential responding. Another question remaining then is just how much of a stimulus difference must there be to achieve the minimum requirements to form two different response patterns? It seems, again, that the answer to such a question is not likely to emerge unless considerable investment is made in researching single subject responding where these subtleties are perhaps best captured, and of course such divergences may well vary considerably between individuals. The methodologies already exist within which to frame such investigations.

This second set of experiments was designed primarily to develop a procedure to test the hypothesis that naming, established through training with an initial set of stimuli would facilitate a transfer of responding to a set of novel stimuli which, despite having different physical appearances to the initial set (in that they were coloured differently) did, nonetheless, share a common name with the first set. This tranfer of responding was framed within the naming account proposed by Horne and Lowe (1996) whereby behaviours emitted in response to one exemplar of a named stimulus class are extended to other, even novel, members with the same name via this evoked verbal common denominator. What comments can be made after completing the current set of investigations?

Naming appeared not only an important feature of subjective responding but perhaps an imperative one, especially where the differentiation of these stimuli could best be served with recourse to such verbal categorisation. Significantly, there were occasions where subjects, having named stimuli, proceeded to not taste them. This is an important observation showing that taste is not a universal determinant of whether a food will be ingested - rather learning experience conferring a verbal categorical referent for any particular food may ultimately be *more* important , for if a food is named and because of it's name the subject proceeds to *not* taste it, how will a subject ever learn that this particular exemplar of apple is far sweeter than the bitter exemplar his initial learning encounter afforded him?

This is, of course, entirely in keeping with the account proposed by Horne and Lowe, who claim that

"...a common name for physically different objects can provide a powerful means of establishing entirely new behavior towards both the stimuli that are already encompassed within that name relation, and any future exemplars that come to be brought within the same relation."
Horne and Lowe, in press, p.21

Not only do the experiments above go at least some distance toward a specification of at least one training method which might result in stimuli being 'brought within' such a name relation, to the extent that they achieve this they also demonstrate the power exerted by that relation.

This brings us to the distinction between verbal comprehension and verbal production. It was noted, as the experiments progressed and the burden of behaviour shifted from comprehension to production, the effects on subjective responding appeared to increase. This, again, is an important issue. If we had noted effects of greater magnitude when subjects were in the position of comprehension-based responding this would imply that environmentally origined instruction driven responding was the most effective with such subjects. An even casual perusal of this position shows it's weaknesses in accounting for human behaviour. Perhaps the single most unique feature of humans is their ability to carry their behavioural repertoire with them into even novel situations - rather than simply being necessarily responsive to the events that surround them. We do not need to seek out another to tell us how to respond in any given situation and, indeed, even considering that possibility makes it's absurdity shine. We can tell ourselves. This does not mean that our eventual self-generated repertoire does not have an origin in an initial verbal environment outside of us - it does - the major implication here is that *we respond to our own learning in any given context and not just to the context.* Small wonder then that verbal production might be to the fore when it can be. This is, again, entirely in keeping with the Horne and Lowe account which posits that once a verbal organism has learned such naming, they proceed

"ever afterwards responding to those categorizations as much as to the world itself"
(Horne and Lowe, in press, p.3)

Clear evidence for just such a proposition can be seen in the data from Experiment Seven where participants tasted *only* those stimuli with 'positive' names (consonant with earlier name-taste training).

There were also clear differences between the behaviour of the younger and the older subjects in the above experiments.

The observation that the subjects in Experiment Seven, comparatively younger than those in Experiment Six, performed with a greater degree of extension of naming is perhaps a little surprising and demands explanation. What might account for this observed difference?

Perhaps the most critical factor in promoting a clear and significant degree of extension of naming is to be found in the manner in which the name-taste trials are conducted. Why? The most obvious answer to this question is that it is only in these trials that the subjects are also brought into direct contact with the contingencies of tasting 'positive' and 'negative' stimuli - in all other phases of these experiments the subjects are selecting and interacting with the stimuli but not directly tasting them and thus the prevailing contingencies in these other phases of the experiments are perhaps predominantly social (the experimenter's responding) and obviously not potentially so aversive. This, however, applied to the older, as much as to the younger, subjects.

Younger children appear to rely more upon the particular food name whilst the older children appear to more often use intraverbal strategies, at least in their observed encounters here with novel food items. Again, this is hardly surprising (see, for example, Dugdale and Lowe, 1990; Wearden, 1992). Given that the name may be a more fundamental unit in the verbal rule one would expect it to be more a feature of the younger child's behaviour. This does not mean, of course, that the name is less important as children grow and develop, rather that the name can find itself embedded in increasingly sophisticated verbal behaviour which may, in some cases, modify it's impact. To extend the example given above, a young child may learn to avoid things called apples after an encounter with a particularly bitter Granny Smith, but his older sister might happily sample a type of apple not before encountered in the context of the parental instruction "but these are *sweet* apples - Cox's Pippins" - this allows the older child to self-regulate a response with verbal behaviour extended *beyond* the name

of the stimulus object. One interesting implication of this is that whilst naming may be a useful intervention in early childhood, it may be increasingly necessary to resort to intraverbal strategies, and indeed ultimately instructions, as children get older - this alteration in potential intervention being consonant with the child's own verbal development.

This finding is consistent with one recently reported by Lowe and Horne:

"There were interesting differences in the findings of Experiments 1 and 2. In the latter, conducted with 5-6 year-olds, the effects for the group as a whole did not appear to be as great as for the 3-4 year-olds in Experiment 1, though there was a sub-group of 5-6 year-olds for whom there were effects comparable to those seen in Experiment 1. These older children sometimes used a colour name in combination in combination with the trained common name (e.g., "the red is Yaz") when referring to individual foods. Colour names were most often not available to the younger children; it appeared to be the case that tio them a given food *was* a YAZ (or a LUD). Such directness of relation between the common name and the foods to which it is applied might yield particularly strong effects, especially where conditioning processes...are involved"

(Lowe and Horne, in press, p.12).

This leads to a consideration of the optimal conditions for rule formation. It will be recalled that naming has a categorising function and can thus form a critical component of a rule dedicated to regulating the response to such categorised stimuli - as noted earlier, a stimulus must be categorised reliably in order to facilitate the emission of an appropriate response.

It was noted in the experiments reported that, generally speaking, as subjects underwent more name-taste trials their differential responding to the featured stimuli became more apparent. There may be two explanations for this. One obvious explanation may lie in the fact that as the name and it's subsequent taste became repeatedly experienced this facilitated learning the relation. The question is, how? What here appears a rather simple process may be quite sophisticated. Supposing, for example, that the process unfolding here was one of rule formation. Then, adding what was reported above about natural variation in response to taste properties, we might well see that some subjects learned the rule more quickly than others; it may be the case, for example, that those subjects who were particularly sensitive to the negative flavours learned more quickly as they were under the influence of a more powerful proximal negative reinforcement contingency. What seems most important here, however, is that when a child *can* have a rule, they will, and we know that the children

in these studies were capable of this type of responding and, with procedural refinement, the circumstances of the experimental context favoured formation of just such rules.

It is also worth noting that this sequencing in the trial, name-taste-name, is precisely the sort of condition which may best promote the name-taste link and lead to emergent behaviour in that this sequence itself induces a symmetrical verbal response encapsulating the taste. This may well be a very powerful way in which to condition such relations in that bi-directionality of responding is trained.

It should be remembered that direct contact with a stimulus is not neccessarily required for any sort of rule formation. Subject JH, in Experiment Six, for example, while participating in the extension of naming test chose a stimulus from one named class, tasted it, and then professed a verbal preference for the stimulus from the other named class that also featured in the same trial. This again, is not difficult to account for. Either the subject simply tried one stimulus and, not liking it, claimed a preference for the other; or, having learned that there was a difference between the two named classes, and having sampled a negative member from one named class, proceeded to respond away from that class of stimuli and toward the other named stimulus class *with no further taste exposure.* This again illustrates that verbal regulation may overide direct contingency exposure.

This deserves further comment. If, for example, an organism elects, on the basis of a learning history, to taste only foods that fall into a particular verbal category because these "are nice" then even neutral flavoured foods may well be accepted into the category. But if, even on only one ocassion, the taste evokes a negative or aversive reaction then the rule formed may be subject to breakdown. It may, of course, be 'rescued' and maintained by other verbal behaviour - one might conclude, for example, that a particular sample of milk must have been sour rather than concluding that despite one's history of liking milk it has now changed and is no longer palatable - presumabely the key factor here is the extent of one's conditioning history. Bear in mind though that these experimental histories are all comparatively brief and thus care ought perhaps be exercised from these results when attempting to extrapolate to the very many learning trials

any organism would experience in it's natural environment, particularly in relation to food and feeding behaviour - given its necessary frequency.

Finally, reviewing the above experiments allows some comment as to methodological issues. One observation noted repeatedly above was that subjects only infrequently showed clear evidence of extending their behaviour to other members of the same named stimulus class.

One possibility here may be to use a procedure which promoted more verbal production immeadiately prior to interacting with the featured class of stimuli. Just such a procedure has been employed by by Horne and Lowe in a study conducted in collaboration with Harris (see Horne and Lowe, in press, p.19). In that study only a third of all participating subjects responded by sorting an array of stimuli according to a commom name in response to a request to do so; however, when the subjects were asked "what's this?" and then "where are the others?" they proceeded to sort the group according to the common name.

Perhaps one quite simple way to test the formation of rules more fully would be to probe subjects as to their verbal behaviour about the process throughout the experiment. Such a procedure has been successfully employed by Wearden (1988). Naturally, care would have to be taken to ensure that this didn't induce a greater amount of experiment-relevant verbal behaviour or, indeed, that inadvertent reinforcement was not made contingent upon differential aspects of this verbal behaviour. That said, employed correctly, it seems a potentially powerful and informative source of information.

Thus the precise conditions under which these stimuli are sorted according to such verbal productions or, indeed, the conditions under which such sorting is best produced remain a matter of procedural subtelty and requires considerably more empirical investigation before conclusive evidence has been amassed. This is largely due to the comparative recency of the theoretical account upon which such procedures are based.

Finally, it should be recalled that the experimental context is one that generates learner driven responses just as any other situation might. As Horne and Lowe (1997) put it:

"the verbal repertoire that verbally-able subjects bring with them to an experiment inevitably transforms the experimental environment into one that is also substantially verbal"
(Horne and Lowe, 1997, p.2).

It is important to note that the verbal behaviour deployed whilst an experiment is in progress may be a more important determinant of outcome than linguistic developmental level per se. The ability to form rules is not the whole issue - rather the rules formed and applied in any given situation may well be the source of much experimental variation. Prehaps, then , more empirical investigation could be conducted emoploying verbal probing (see, for example, Wearden, 1988).

In summary it should however be remembered that the subjects in Experiment Seven appeared to respond in a more systematic manner than the subjects in the preceeding experiments (Experiments Four, Five, and Six) and studies such as these that show such clear dependence on procedural subtleties require replication before clear conclusions can be confidently drawn. It is clear from this set of experiments that childrens' reactions to a food are not driven exclusively by its physical characteristics by also by the way in which it is named, or categorised in relation to other foods. The extent to which naming exerted an effect was variable across these experiments (perhaps largely attributable to procedural parameters) and, where experiments did show greater effects in general (e.g. the results obtained in Experiment Seven) these were variable across subjects.

Nonetheless, the most striking observation in this final experiment was the extent to which all of the subjects effectively used the stimulus names to regulate their responding to the second set of stimuli. This procedure, with this age group and these food stimuli, does seem a very effective and economical manner in which to modify food preference and consumption patterns and an extended version of the procedure has already been used by Lowe and colleagues (see Lowe and Horne, 1999) with impressive results.

Conclusion

The acquisition and alteration of food preferences, and perhaps more importantly, food consumption patterns has been investigated in two series of experiments.

The first series explored the impact of mere exposure and modelling on the food consumption patterns of human infants. Perhaps the key finding here was the high acceptability of novel foods - even when being presented for the very first time in these young infants lives. The inter-exposure interval appeared to make little systematic difference to the consumption levels of these foods. Further, when the exposure trials were conducted within the context of adult modelling there was, again, little clear systematic effect.

It was noted that, with particular food items, these young infants sometimes oscillated between patterns of relative stable consumption and patterns of considerably less stability, data somewhat reminiscent of that described earlier by Lowe, Bentall and colleagues (See, for example, Bentall, Lowe and Beasty, 1985).

Importantly also, the validity of the widespread use of neophobia as a conceptual explanation in the food preferences literature was questioned - this has not been directly tested, data such as those presented in the current thesis contradict it's universal adoption, and it appears odd to invoke a pathological concept as a fundamental part of normal development. If neophobia does indeed exist as a stage of normal food preference development, then the question arises as to when it is most prominent, and why?

In light of the findings reported here, it is perhaps time to revise the conceptual analysis of food preference acquisition in infancy and to context the data gathered within a greater framework - such as that of behavioural development.

The second series of experiments were conducted with the primary aim of designing a procedure to test the effects of common naming on the acceptability of, preferences for, and consumption of novel foods. This series of experiments was conducted with three- to five-year-old children and, once the design was refined, clear effects of naming were observed

although extension of naming within classes was less evident in the comparatively younger subjects.

The specification of the precise conditions under which naming may best be learned and extended to affect other stiumli was considered.

Clearly, the full specification of the origin of naming and it's effects is a comparatively recent addition to the behaviour analytic literature and, as Horne and Lowe state...

"...a great deal remains to be done if we are to provide a comprehensive account of verbal behaviour, and much of it, of necessity, is attendant upon further experimental investigations of the key phenomena"
(Horne and Lowe, in press, p.23).

It is hoped that the design development presented here, and the observations gained will contribute to the comprehensive account sought.

Between 1990 and 1996 the Journal of the Experimental Analysis of Behavior has published seven special issues, among them one focusing upon the origins of naming and other symbolic behaviour, a special issue with twenty-six peer commentaries. This shows that the naming account is not just the province of particular investigators but rather has been embraced by the entire behaviour analytic community and thus we can look forward to more empirical and conceptual analyses featuring this issue.

The food consumption patterns of children have been shown to be related to the later incidence of health and wellbeing, and the above series of experiments have shown that these patterns are not fixed but can be altered and thus brought toward greater nutritional value, and ultimately thus yield greater liklihood of good health. Achieving such change, and specifying the best parameters for doing so is imperative.

The issue of food consumption, and the theoretical issues described above clearly merit further empirical and conceptual analyses - not only because of their considerable practical applications but also because of their theoretical importance.

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