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ASPECTS OF THE LANGUAGE AND THOUGHT OF FOUR-YEAR-OLD MAORI CHILDREN: A STUDY BASED ON BIERWISCH'S COMPONENTIAL ANALYSIS OF A SET OF ADJECTIVES

Submitted for the degree of Doctor of Philosophy in Education at the Victoria University of Wellington

1976

ABSTRACT

Using an analysis developed by the linguist Manfred Bierwisch of the semantic components of the set of spatial adjectives, *big, little, long, short, high, low, wide, narrow, deep, shallow, far, near, thick, thin, fat, thin, tall* and *short,* four series of tests were constructed in order to determine whether differences existed in the meaning systems of Maori and of Pakeha four-year-old children with respect to these words, and whether Maori and Pakeha performances were similar across all four series.

The series were:

(a) A word recognition series testing for components of meaning in which pairs of components were placed in binary opposition.

(b) An implication series testing for understanding of the concepts referred to by the words of the set.

(c) An anomaly series, designed to elicit words of the set and to explore the children's understanding of the use of the words.

(d) A feature series which explored the children's implicit understanding of normativity and proportion.

In addition the children were asked to do a drawing of something *big* and something *little*. Their mothers were also interviewed in order to collect information about a number of

background variables such as mother's education, father's occupation and the language background of the child. Maori and Pakeha samples were established by asking the mothers to give the ethnic identity of the child.

The main findings were that the Pakeha performed better than the Maori sample on recognition of the set of target words but this difference did not reach a level of statistical significance. Two words of the set, *low* and *wide* were recognised significantly more often by Pakeha than by Maori. With regard to the range of the words of the set elicited the Pakeha children produced a greater variety of words but, again, this difference was not statistically significant. The two samples performed about equally with regard to comprehension of the concepts signified by the words of the set. Nor was any important difference detected in the feature series or the drawings. An analysis of choice patterns showed no significant difference between the two samples.

These results were interpreted to mean that the four-year-old Maori children in the sample did not exhibit cognitive deficit relative to the Pakehas even though they showed differences in word recognition and word use. Nor were they hampered in their access to the meaning of the words in the study by acquaintance with the Maori language.

In order to assess the possible effects of various background factors, measures of word recognition, concepts, and strategies (choice patterns) were correlated with the background variables. The age of the child was significantly associated with the concept scores and with number of words elicited. Father's occupation was associated significantly with words

recognised in the Pakeha sample but not in the Maori sample.

In addition to exploring possible Maori-Pakeha differences in interpretation of words and concepts, the semantic feature acquisition hypothesis was examined and found to be inadequate as an explanation of the acquisition of words and meanings. An alternative multi-level model based on a hierarchy of preferred interpretations was developed to suggest the way in which the words of the set and their meanings are acquired by the young child.

ACKNOWLEDGEMENTS

This study was begun while the author was the holder of the Queen Elizabeth II Fellowship 1972-73 administered by the Maori Education Foundation. The Foundation was interested in promoting research into pre-school children and their education since it has always had a special interest in this field and the spread of pre-school groups in predominantly Maori areas was greatly assisted by the Foundation and its pre-school officers. In choosing a topic several points were kept in mind. First, that the project should be enjoyed by those involved in it, that it should have some kind of practical result, that it should imply respect for the feelings and wishes of the participants and that it should be concerned with a matter of general interest to parents as well as to teachers.

I would like to thank my supervisors Professor A.E. Fieldhouse and Professor R.W. Marsh for their help and guidance. Professor Marsh gave me substantial assistance with the preparation of the project, the statistical treatment of the findings, the ordering of the material, and the presentation of the results. Various friends and colleagues have read portions of the manuscript or have listened to an outline of it. I am grateful to Dr Richard Benton and Mr Tamati Reedy for advice on the analysis of the Maori words. Mr Ian Livingstone helped with the computer analysis of the data. Mrs Kiri Boyce and Mrs Kahu Carter guided me while I was in Gisborne and on the East Coast and I received special help in organising the project from the late Mr Doug Boyce, from Mrs Hine Weka, Mrs Margaret Duke and Mrs Marie Collier. My family helped me to design objects and situations suitable for testing four-year-olds and Mrs Lesley Powell brought two of her children, Clare and David, to my house to be the first to try the equipment. Fortunately the children enjoyed the activities and the project proceeded. Miss Mary Wood made her kindergarten freely available for trying out the materials.

The expenses of travel and accommodation were alleviated by a grant in 1973 from the Victoria University of Wellington Internal Research Committee.

Finally, I would like to thank Mrs Julie Mackenzie who typed the manuscript with scrupulous care and attention to detail.

Geraldine McDonald
June 1976

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A NOTE ON TERMINOLOGY

In New Zealand there are two main ethnic categories, *Maori* and *Pakeha.* The Maori are those who are primarily affiliated to the culture of the Maori people, the original inhabitants. The Pakeha are those who are primarily affiliated to the culture of the European settlers. There has been considerable intermarriage between Maori and Pakeha during the course of New Zealand's history and the two groups cannot be defined on purely racial grounds.

CHAPTER I

THE PROBLEM

The research problem can be put very simply by asking the question: "What meanings do Maori children assign to English words?" But whereas the question may be put very simply, its answer appears to be complex and the task of providing it is complicated by controversy over the interpretation of meaning, and by the relatively undeveloped state of the study of linguistic semantics and semantic acquisition. Nevertheless, the nature of meaning and how it is acquired is of basic importance to our understanding of language and thought, as well as being of special concern to educators.

Writing about sub-cultural differences in children's language in the United States, Cazden (1966, 198) says that a great deal of attention has been paid to the grammatical structure of children's speech from the standpoint of developmental sequence, structural complexity and conformity to standard English. The same emphasis can be found in the few studies of the language of young Maori children carried out in New Zealand. (Clay, 1970, 1971, 1972). In the past most interest has been in the possible deficiencies of Maori children's use of English in comparison with that of Pakeha children. (Barham, 1965; Benton, 1966; Brooks, 1973; MacArthur, 1956; Presland, 1973; R. St George, 1970).

A further feature of research into child language in New Zealand has been a reliance on tests standardised on overseas samples of children, although Clay has developed a sentence repetition test suitable for New Zealand conditions and the relationship between this test and other measures of language is now being explored. (Tarbutt, 1975).

The study of meaning

There has been a variety of approaches to the definition and determination of meaning and a plethora of terms, each used, according to Lyons (1968, 403), without any high degree of consistency and uniformity between different authors. There are two major sources of meaning of concern to linguistic semanticists, words and sentences; and there are two major theoretical orientations towards the analysis of meaning. One endeavours to grasp what meaning is and thus produces theories of reference, and the other, how meaning works, and thus produces operational theories. (Ullman 1962, 55). Saussure's theory of the linguistic sign is an example of a theory of reference and it attempts to give precision to what meaning is. The linguistic sign, according to this view, is a fusion of symbol and thought, form and content, name and sense, word and reference, or in Saussure's own terms "signifiant" and "signifié", these latter terms being generally translated into English as "signifier" and "signified". The well-known semiotic triangle of Ogden and Richards (1948) is an attempt to relate the symbol or signifier, to the reference or signified, and to the thing which is referred to, the referent. Raphael (1968, 38) expresses this relationship as follows:

> Meaning here relates word with thought about object, not necessarily with the object itself.

While an analysis of this general kind can be applied to sentences it is obviously easier to apply it to words. Sentences, for example, do not always have meaning but words, on this definition, do. As Leech (1969, 35) comments, "the relation between lexical meanings and the meanings of whole sentences and discourses has only been tentatively explored".

There is no denying that such entities as "signifiés", "senses", "references", and "contents" are elusive "and so, when squeamishness about 'mental' data prevailed, particularly in America", (Weinreich, 1966, 395) other interpretations of meaning were offered. The most famous of these was presented by Bloomfield who defined the meaning of a linguistic form as, "the situation in which the speaker utters it and the response which it calls forth in the hearer". (Bloomfield, 1950, 139). Bloomfield wished to bypass the reference and equate meaning with its referent.

Mentalism has proved difficult to eradicate from the study of meaning carried out either from a linguistic or from a psychological point of view and psychological models of meaning based on stimulus response theory (such as that of Osgood, 1964) are generally inadequate to explain all the facts that a semantic theory is called upon to explain (for criticisms see for example, Greene, 1972; Macnamara, 1970; for discussion of some of the issues see Chomsky, 1959; Fodor, 1965; Osgood, 1966).

Operational definitions of meaning, that is, attempts to define the meaning of words by how they work, depend on determining how words are used. For Wittgenstein, whose name is most closely associated with this interpretation, the meaning of a word *is* its use. There are two ways of determining how a word is used. Bloomfield, for example, interpreted "use" as use with reference to external situations. Wittgenstein interpreted "use" as use in relation to other words, that is, in situations of verbal context. A well-known study by Werner and Kaplan (1962) explores the growth of word meaning from such an operational orientation.

Ullman (1959, 1962) says that there is no need to prefer one type of theory to another since both have their uses and "the operational theory is concerned with meaning in speech, the referential with meaning in language". (Ullman, 1962, 67). It should be noted that Ullman's use of "speech" here seems to correspond with Saussure's "parole" and thus refers to the use of language within a speech community rather than "speech" as the act or behaviour of an individual.

Semantic fields

In the 1930s Trier "elaborated his conception of fields as closely knit sectors of the vocabulary, in which a particular sphere is divided up, classified and organised in such a way that each element helps to delimit its neighbours and is delimited by them". (Ullman, 1962, 245). Along with the purely analytical process of demonstrating how "the raw material of experience is analysed and elaborated in a unique way, differing from one language to another and often from one period to another in the history of the same idiom" (ibid., 245) there arose the associated belief that this analysis revealed the special character and way of thought of those who spoke the language. Does a formal analysis of any aspect of language reflect underlying thought processes? There seems to be a tendency for scholars to believe that it does and this was certainly the case so far as the field theorists were concerned. Field theorists have also inclined to the belief that the logic of the semantic system determined the thought of a language group. In this respect, of course, the theory is similar to the Sapir-Whorf hypothesis. As Whorf (Carroll, 1956, 212) said, "We dissect nature along lines laid down by our native languages".

Componential analysis

The early exploration of semantic fields generally used words as the basic units but more recently the conception of a semantic field has been defined in terms of semantic components (or features, markers or sememes). Componential analysis has been employed to analyse domains of the analyst's own language. Examples can be found in Bierwisch (1967), Bever and Rosenbaum (1971), Lamb (1964), Lehrer (1969) and Teller (1969). It has also been applied to domains of a language other than the analyst's own, for example by Bendix (1960) and Benton (1968, 136-9). The techniques of analysis have been explained and commented on by Bierwisch (1970a, 1970b), Chafe (1965) and Wallace (1962), and, finally, such an analysis has been presented by Katz and Fodor (1963) as the "interpretive" or semantic component of a transformational generative grammar.

Componential analysis has also been used as a tool by cognitive anthropologists in "an attempt to understand the organising principles underlying behaviour". (Tyler, 1969, 3). It has been used mainly in well-structured areas of terminology such as those of kinship terms (Goodenough, 1956; Lounsbury, 1956), colour terms (Conklin, 1964) and diseases (Frake, 1964). Such studies have revealed marked differences in the distribution of components in different cultural settings.

The particular organisational system revealed by the linguist or anthropologist may take the form of a taxonomy (elements ordered by contrast and inclusion), a paradigm (cross-classification of elements by types of components), or a tree (ordered by sequential contrast of only one feature at a time). (Tyler, 1969, 7-11).

In the view of componential analysts, meanings of words are not unanalysable wholes. They suggest that there are primitive elements of meaning which are "attached" singly or, more usually, in groups, to words or phrases. A few words like the logical operators *or, and,* and *not* are considered to signify single primitive elements (and are hence difficult to define by means of other words) but most of the words in any language express combinations of primitive elements. As Bierwisch (1970a, 170) says, "The meaning of a word is a complex of semantic components (or features, or markers) connected by logical constants". Bierwisch goes on to say (op.cit., 171-2), "In general, one might define a complex of semantic components connected by logical constants as a concept", and "sets of lexical entries whose meanings have certain features in common form a 'semantic field'," (ibid.).

Bierwisch (op.cit., 181) arrives at

> ... the extremely far-reaching, though plausible hypothesis that all semantic structures might finally be reduced to components representing the basic dispositions of the cognitive and perceptual structures of the human organism.

One can see that on the basis of his analysis of the meanings of natural language Bierwisch suggests that there are innate and universal cognitive discriminators. In other words, there are underlying cognitive and perceptual structures (or features) which provide the basic components and these, acting as a kind of reservoir of meaning, are brought together in different sets in different languages.

Some further comments should be made. A componential analysis can be converted into an operational analysis by means of meaning postulates. The difference between these two types of analysis is that "the theory of meaning postulates does not introduce theoretical elements that are not part of the language to be described", (Bierwisch, 1970a, 182-3), whereas componential analysis does just this. Thus meaning postulates define words by means of other words whereas a componential analysis defines words by means of markers, sememes and so on. Componential analysis deals with the *sense,* and meaning postulates with the *use* of words. When selection restrictions are ignored word combinations are anomalous. It has been suggested that semantic components function as selection restrictions controlling the use of words in sentences by providing a measure of conceptual congruity between words. (Bierwisch, 1967; Katz and Fodor, 1963). Finally, componential analysis deals with denotative but not with connotative meaning.

Componential analysis has not been without its critics. One well-known attack on its use in anthropology has been made by Burling (1969), and linguists (for example, Bolinger, 1965; Nyíri, 1971; Weinreich, 1966) have criticised the Katz-Fodor (1963) semantic theory which, after modification, became incorporated in Chomsky's (1965) revision of his transformational generative grammar. (See also, Allen and Van Buren, 1971, 120-122). The psychological adequacy of the Katz-Fodor formulation has been examined by Macnamara (1971) and by Macnamara, O Cleirigh and Kellaghan (1972) and, in the opinion of these authors, is found to be unsatisfactory.

The semantic feature acquisition hypothesis

Just as Chomsky's syntactic theory became a model for studies of language acquisition (see, for example, Brannon, 1968; Cambon and Sinclair, 1974; Carol Chomsky, 1969; Kessel, 1970; Menyuk, 1963a, 1963b, 1964, 1972) and students of child language began to write transformational grammars for the language of young children (Bloom, 1970; Bowerman, 1973) the establishment of interpretive semantics sparked off a search for the manner in which meaning (defined as semantic components) is acquired.

Impetus for the use of componential analysis as a model for the acquisition process came from Jakobson's description in 1941 (see Jakobson, 1971) of the evolution of speech sounds and more recently from the association of componential analysis with Chomsky's work. Jakobson suggested that phonological features are both universal and acquired according to the principle of maximal contrast. The transfer of this model to semantic acquisition is suggested in the following quotation.

> The addition of a semantic feature to a dictionary is an event with ramifying consequences ... Each new semantic feature is a distinction that separates one class of words from another. (McNeill, 1970, 116).

The basic idea that language development proceeds from an undifferentiated original condition to a greater differentiation and separation (Gardner, 1973, 200; Leopold, 1971, 101; Wales and Campbell, 1970, 394) is one that can be specified by means of a componential analysis. What a componential analysis does, whatever its particular form or arrangement, is specify the basis for distinction between one term and another. These specifications or features, therefore, mark some words off from others and provide a shared basis of relationship (similarity in one or more features) for certain sets of words.

Does thought determine language or language determine thought? Although it is not clear what those who use componential analysis believe to be the determining factor (a basic cognitive organisation which is expressed in language, or a basic linguistic organisation which gathers together cognitive elements for expression), it can be suggested that the latter is probably the preferred explanation of the linguists although probably not that of the anthropologists. To use componential analysis as a research tool, however, does not necessarily imply that one has an opinion on the precise relationship between language and thought.

Perfetti (1972, 255) has observed that the idea of semantic features has taken on some force within psychology. Both psychologists and psycholinguists have suggested that semantic acquisition is, in some manner, determined by semantic components of meaning and this notion has come to be called the "semantic feature hypothesis". (Andersen, 1975; Carpenter, 1974; E. Clark, 1970, 1971, 1972, 1973b; H. Clark, 1970a; McNeill, 1966, 1970). Bruner (Bruner et al, 1966, 32) comments favourably on the notion of semantic components as psychological entities and there has been some attempt by Hamilton and Deese (1971) to test the psychological validity of semantic components or features by getting adult subjects to sort adjectives into groups. It was found that marked and unmarked adjectives are reliably differentiated and seem to be evaluated positively and negatively. Wallace (1965), on the other hand, employed the technique of asking a Japanese informant to sort kin terms in an attempt to develop a technique that would ensure the psychological validity of componential analysis. Definition of words by means of features has been used in computer programmes designed to simulate semantic retrieval (Quillian, 1968) and natural language processing (Winograd, 1972). Finally, at least one writer (Baron, 1973) has suggested that all cognitive development takes place through the acquisition of semantic components.

It should be pointed out that very few componential analyses have ever been carried out either by linguists or by anthropologists and what has been done has been restricted to small and highly structured sets of words. Claims for a semantic feature hypothesis rest on even more slender evidence than exists for the presence of semantic fields since practically the only semantic feature that has received much research attention is polarity (or antonymy) and no complete psychological exploration of any one defined field appears to have ever been carried out. Much of the so-called evidence has been amassed by using the idea of features as an explanation for data collected for reasons other than to test the theory of feature acquisition, or from studies of single pairs of words.

Discussion of the feature acquisition hypothesis and its different interpretations will now be deferred and will be presented later at appropriate places in the discussion.

Psychological methods used in the study of meaning

Miller's (1971) review of experimental methods in the psychological study of semantics records that four general methods have been used, scaling, substitution, classification and association. It can be noted in passing that each method yields a different interpretation of meaning and that each in turn relates to the divisions referred to earlier as "sense" and "use". Except for classification employing objects and pictures, the methods discussed by Miller are unsuitable for use with young children. Entwisle, for example, who has studied word association data extensively (Entwisle, 1970; Entwisle and Muus, 1968) has found this technique unsatisfactory with children below the age of five (see also Downing and Oliver, 1973). One of the problems is the young child's difficulty with the concept of "word". (Papadropolou and Sinclair, 1974). A componential analysis, however, offers a research worker the chance to develop materials with which to explore systematically, and in a manner following the meaning system of natural language, the understanding of a young child. Classification based on sorting, on the other hand, usually results in the discrete classes typical of logic rather than of natural language concepts. This point will also be raised again later.

The selection of the words to be studied

There is a set of adjectives referring to objects considered in relation to space. These adjectives are *big* and *little*, *long* and *short*, *high* and *low*, *wide* and *narrow*, *deep* and *shallow*, *far* and *near*, *thick* and *thin*, *tall* and *short*, *fat* and *thin*. The reasons for choosing such a set of words are as follows:

(a) Manfred Bierwisch (1967, 1969) has already written a componential analysis of the German equivalents of these words.

(b) Both the inherent structure of the spatial adjectives and their analysis by Bierwisch mean that it is possible to develop a logical and integrated set of tasks with which to explore a child's understanding of a particular semantic field.

(c) In their basic meanings the adjectives modify nouns referring to common physical objects and aspects of the world with which young children should be familiar.

(d) There are, in different cultures, well-attested differences in the interpretation of aspects of space. (For a discussion see Hall, 1959; and Yarmolenko, 1964, 97-8.) An analysis of the East Coat Maori terms and their comparison with the English terms, which will be presented later, shows that there are differences between the two languages with regard to the arrangement of semantic components.

(e) Some or all of the words have been studied by other research workers by a variety of methods and for a variety of purposes. (See for example, Ames and Learned, 1948; Anan'yev and Lomov, 1964; E. Clark, 1972, Poteat and Hulsebus, 1968). There has, in particular, been some influential work carried out by Margaret Donaldson and her associates in the Edinburgh Cognition Project especially that part of the study reported by Campbell and Wales (1970) concerned with young children's understanding of the words of the Bierwisch set.

(f) These adjectives begin to be acquired at about the age of two years (ascertained by records of what children say rather than by what they comprehend) and four-year-olds are in the process of acquiring the full set.

There do not appear to be any other studies of the semantic systems of young children from different cultural or ethnic groups apart from the work of Entwisle on verbal associations.

One of the spurs to studying the spatial adjectives and related words has been an interest in the methodology of Genevan studies of conservation and in the relationship between language and performance on conservation tasks.[1] Although the exact relationship between knowledge of these words and operational thinking is unclear (the primacy of operational thought is upheld by the Genevan school, Sinclair-de-Zwart 1969, 1973; Inhelder et al., 1966; Inhelder and Sinclair, 1969) the words are in some way related to the kind of concepts which are the concern of Piaget.

SUMMARY

The meaning that a Maori child assigns to the words he hears and to those he uses may well differ from the meanings assigned by a Pakeha child and this may particularly be the case if the language of his community is Maori rather than English (or both Maori and English). Componential analysis offers a way of tapping such cultural differences if they exist. But in view of the differences of opinion with regard to the legitimacy of features as elements of cognitive structures the opportunity will also be taken to examine critically the claims for the feature acquisition hypothesis, using the findings from this project.

This chapter has dealt, rather summarily, with meaning, but perhaps sufficiently to explain the general position of componential analysis in the fabric of semantics and anthropology, its current attachment to Chomsky's theory of transformational generative grammar, and its extension as an explanation for the acquisition of lexical meaning and for order in the learning of lexical items. The reasons for selecting a set of spatial adjectives as the target words of this study have also been explained.

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1. See for example, Braine and Shanks, 1965; Farnham-Diggory and Bermon, 1968; Gallagher, 1971, 1972; Griffiths, Shantz and Sigel, 1967; Harasym, Boersma and Maguire, 1971; Nummedal and Murray, 1966; Palermo, 1973, 1974; Pratoomraj and Johnson, 1966; Rothenberg and Courtney 1969; Smedslund 1966; Walta 1971, 1972; Weiner 1974.

CHAPTER 2

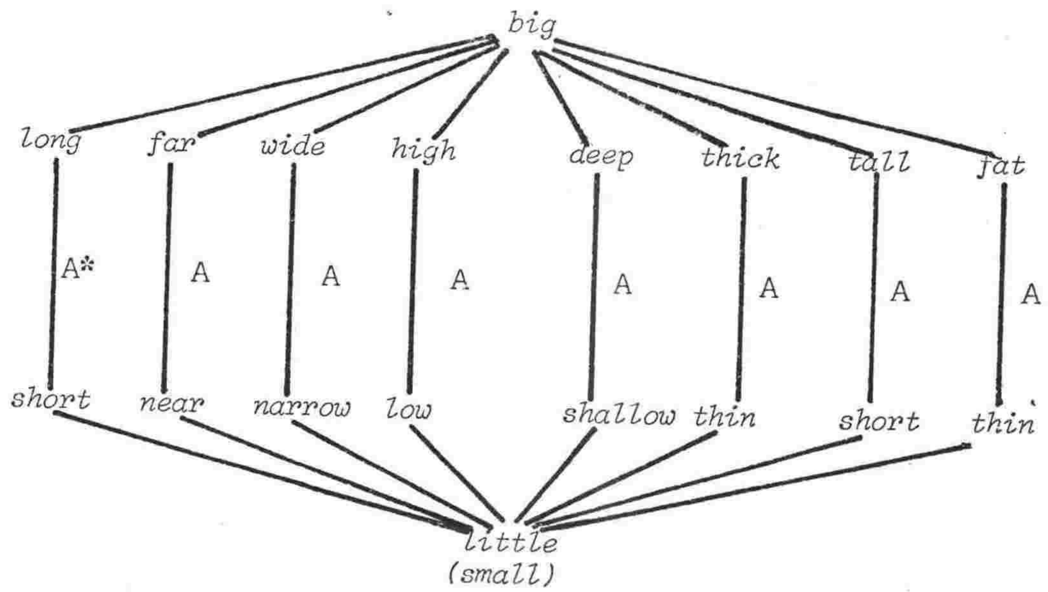
ANALYSIS OF THE ENGLISH AND THE MAORI SPATIAL ADJECTIVES

The semantic model to be used in this study will now be discussed.

The English terms

The set of spatial adjectives which are being used in this enquiry is taken from Bierwisch (1967) with slight modification. The original German words have been replaced by English ones with the assistance of Langenscheidt's Pocket Dictionary, (Klatt and Klatt, 1959). For part of the enquiry the word pairs *tall* and *short* and *fat* and *thin* were used, in addition to those taken directly from Bierwisch to make a set of 18 words. The whole set will, however, be referred to as the Bierwisch set of spatial adjectives because all words share the components of meaning specified by Bierwisch.

Teller (1969, fn 185) says that Bierwisch's examples have close counterparts in English and, it is clear that even though there may be differences in the extension of the German and English terms, there is an English word to match each set of components, that is, each "sense characterisation". The diagrammatic arrangement of the English terms in figure 1 is taken from that of Wales and Campbell (1970) but includes *far* and *near* which are given by Bierwisch but not by Wales and Campbell. *Broad* in Wales and Campbell's list is here replaced by *wide* and the Scottish dialect form *wee* is replaced by *little* and *small*.



Source: Adapted from Wales and Campbell (1970)

* A = antonymous relationship

Figure 1 *A structured set of spatial adjectives*

Ljung (1974) says that terms like "antonymy" and "antonymous adjective" are used in various ways by different writers. He distinguishes three different characteristics of the antonymic relationship.

(a) Markedness. One of the members of an adjective pair functions as the unmarked or generic cover term and the positive term generally denotes unusually great possession of the common quality.

(b) Contrary opposition. The adjectives are related in such a fashion that the assertion of one implies the denial of the other, but not vice versa. Contrary opposites denote the extreme poles of a dimension leaving an undefined "middle area".

(c) Relativity to a norm. Each adjective functions as a relational term in that it expresses a particular relationship between two entities and each is related to a shared norm. A *big* object, for example, is big in relation to some norm.

The Bierwisch analysis

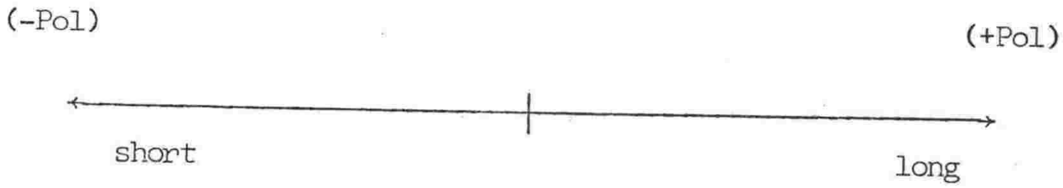
According to Bierwisch (1967) the adjectives are marked by a number of semantic features which, in part, determine the particular use that is made of each term, that is, the objects to which it can be applied, and, in linguistic terms, the words with which it can co-occur. The terms for objects which can be described by these spatial adjectives are also marked by features some of which determine the selection of particular adjectives; that is, they restrict the selection of an adjective to those which are marked in a way similar to the word being qualified.

Bierwisch arranges the semantic features in dependency trees but Teller (1969) has pointed out a number of weaknesses in such a formulation. In the simplified version of the Bierwisch analysis which follows the tree structure is not fully explained but the features are discussed in the processing order embodied in the structure.

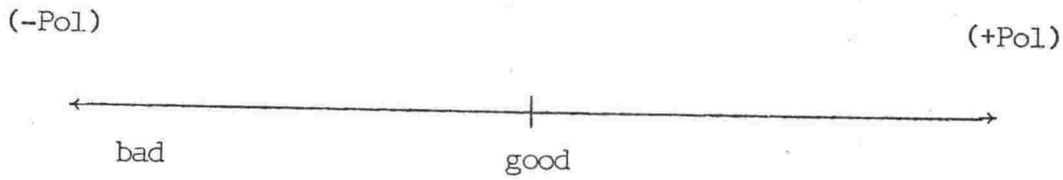
Semantic features

Polarity: The idea of polarity or contrary opposition (±Pol) is common to all the terms of the set (with the possible exception of *shallow*, see below p.21) and is, in fact, a feature with application very much wider than to the set of terms used here. It is not, however, a universal attribute of adjectives since colour adjectives, for example, are not arranged in polar pairs. (Possible exceptions are *black* and *white* if these are classified as colours).

Because of the feature of polarity, sets of terms such as *big* - *small* form a primitive scale in which the idea of normativity is expressed. Thus, for example, the terms *long* and *short* form a scale of the following kind:



In this scale the terms are placed near the ends of the scale and there is a norm somewhere between them. This is the pattern typical of the spatial adjectives. The diagram given earlier (fig. 1) shows the (+Pol) terms at the top of the diagram with the matching (-Pol) terms below them. Other terms may, however, form a different kind of scale as the following diagram suggests.



In the scale *good* - *bad, good* coincides with the norm. *Black* and *white* in at least one of their uses exhaust the domain, that is, things are either *black* or *white* and do not allow for a "grey area".

Another characteristic of the spatial adjectives is that the (+Pol) term is neutralised by a "Measure Phrase". Thus a stick may be described as being *three feet* long but is not necessarily long (Lees, 1961, 176). This use of the (+Pol) term in a nominal sense (i.e., as equivalent to length) and its selection in sentences starting with *how* has been noted many times (see for example, Lyons, 1968;

H. Clark, 1970a).

Space: Bierwisch handles the analysis of what is generally thought of as dimensionality by two layers of components. First there is an abstract feature (Space) in which it is the number of spaces (1 Space), (2 Space), (3 Space) that is important for processing. Thus, a term which is capable of being qualified may be marked for (1 Space) such as *time* or *line*, or for (2 Space) as in *surface* or *road*, or for (3 Space) as in *box* or *can*. The adjectives in the set under consideration are all marked for (Space). *Big* and *small*, for example, are marked (*n* Space) since they can modify words marked for (1 Space), (2 Space) or (3 Space). The (Space) feature, according to Bierwisch, corresponds to a similar usage in mathematics.

Volume: Bierwisch introduces a set of markers (±Main) to distinguish main dimensions (length, breadth and height) from subsidiary dimensions constituting only the volume of an object. Objects like ropes, cigarettes and poles have a main dimension (generally referred to as length) but their other two dimensions are not considered separately and are therefore described as *thick* or *thin*. *Big*, which describes main dimensions only, can be used of a cigarette and it then refers to its length (which is a main dimension) but not to its other dimensions for which *thick* or possibly *fat* would be selected.

Bierwisch discards a special marker for dimension and the three familiar orthogonal dimensions of space are distinguished by a set of components which will be referred to as the dimension set. These components consist of (Vert) or verticality, (Max) or main axis, (Second) or horizontal dimension other than the main axis, (Inherent) or a measure inherent in the object, and (Observ) which refers to measures taken from an observer as point of origin. The components of the dimension set may mark words other than the adjectives. They are shared by prepositions such as *up*, *across*, and by verbs such as *climb*, *drop*, *traverse*, *sink* and *lower*. Components are related to underlying features. Bierwisch suggests, among others, a feature of orientation and another of proportionality.

Orientation: The feature of orientation is related to the objects capable of being modified by the spatial adjectives and indicates the relationship of these objects to the environment. Thus, orientation may be inherent in the object (+Inherent) as it is for *cigarette*, *stick*, and *man*. A man is *tall*, for example, whether he is standing up or lying down, and cigarettes and sticks are *long* whether they are horizontal or upright. It can be noted that *long* is appropriate to an object whose dimensions are seen as inherent to itself and not with reference to an observer or to the surface of the earth. A stick, on the other hand, if placed upright would probably be referred to as a *tall* stick although it might also continue to be referred to as *long*. A *tower*, however, has a vertical dimension, that is, it has an orientation relative to the surface of the earth. It carries the marker (+Vert) and is described by the words *high* or *tall* for the vertical dimension. For some terms there is the assumption that the orientation is from the point of view of the observer (+Observ). Thus the first dimension of a cupboard or a cave is not described as *long* but as *deep* and in these contexts *deep* implies a direction or orientation with respect to the observer who may be the self or another.

Deep and *shallow* are possibly the only two terms of the adjectival set which are genuinely ambiguous, a deep cave, for example, can mean a cave deep down in the earth or a cave running a long way into the earth, but these terms *deep* and *shallow* are ambiguous only with a limited set of words referring to objects such as holes, caves and tunnels. Possible ambiguities caused by polysemy, for example, *deep* referring to pitch of sound and *deep* referring to water, are less likely to cause ambiguity since it is difficult to think of instances in which the meaning would not be clarified by context.

Thus, the orientation of one or more of the axes of an object may be inherent in the object, with reference to an observer, or with reference to the surface of the earth, and in the two latter instances the observer and the earth respectively are the zero points if the dimension is measured. Anything high, for example, is thought of as being measured from the earth, and the depth of a cupboard is the degree to which it recedes from a hypothetical observer.

Proportion: According to Bierwisch "expected proportionality determines our conceptions of objects rather deeply, [and] it is not easy to decide whether it is one of the basic features that govern our interaction with the surrounding world or not". (Bierwisch, 1967, 18). It appears to Bierwisch however, that something like proportionality, which he describes by means of the marker (Max), which is used to signify the presence or absence of a maximal axis, is needed for the semantic description of spatial structure. If an object has a maximal axis and this axis is normally vertical then it is appropriate to select *high* (or *tall*) to describe this dimension.

The feature lists for the spatial adjectives

Bierwisch's arrangement of features on the spatial adjectives is given below. "These are the primary spatial meanings" (Bierwisch, 1967, 32) for ten of the words.

Big (+Pol) [(*n* Space)[(+Main)]]
Little (-Pol) [(*n* Space)[(+Main)]]

Long (+Pol) [(1 Space)[(+Inherent)[(+Max)]]]
Short (-Pol) [(1 Space)[(+Inherent)[(+Max)]]]

High (+Pol) [(1 Space)[(+Vert)]]
Low (-Pol) [(1 Space)[(+Vert)]]

Wide (+Pol) [(1 Space)[(+Second)]]
Narrow (-Pol) [(1 Space)[(+Second)]]

Far (+Pol) [(1 Space)[(-Inherent)]]
Near (-Pol) [(1 Space)[(-Inherent)]]

Bierwisch's analysis of *deep* and *shallow* suggests that their opposition is with reference to a marker (±Plain) rather than with (±Pol):

Deep [(+Pol)[(-Plain)]][(1 Space)[(+Observ)]]
Shallow (+Plain) [(1 Space)[(+Inherent)]]

However, for the purposes of the present research *deep* and *shallow* have been treated as though they have these simpler readings:

Deep (+Pol) [(1 Space)[(+Observ)]]
Shallow (-Pol) [(1 Space)[(+Observ)]]

The justification for this is that, in the tests, both the words *deep* and *shallow* were used with reference to *water* and in this context the above reading is acceptable. *Deep* was not contrasted with *shallow* on the marker (Plain).

Thick and *thin* are dealt with in their reference to dimensions and not to consistency and *far* as an antonym of *near* but not as an antonym of *wide*. The readings for *thick* and *thin* are:

Thick (+Pol) [(*n* Space)[(-Main)]]
Thin (-Pol) [(*n* Space)[(-Main)]]

The square bracketing indicates what Bierwisch believes to be the processing order in the selection of these words for combination with others in sentences. Bierwisch also shows place holders in each of the "feature lists" to show at what stage in the processing account must be taken of the markers of the noun to be modified. These place holders have been omitted in the present account. In brief, the place holders divide the lists of markers into two and indicate which units of meaning are derived from the adjective and which are selections brought about by the noun with which it is associated in a sentence.

Four additional related words have been added to those for which the feature lists have been given in order to make up what will be referred to as the Bierwisch set. These words are *fat* and *thin*, and *tall* and *short*. Because these words were used only in a limited way in the tests and for the specific purposes of including human beings as reference objects no attempt has been made to give their full sets of markers. They are used in the tests for the feature of polarity, and *tall* is used in tests for the feature of orientation.

A note on terminology

Bierwisch's discussion of features, components and markers is not entirely clear and these words sometimes seem to be used interchangeably. However, the features are, in his view, underlying cognitive and perceptual organisations, and they supply components which may differ in value (+) or (-) and thus produce a relationship of simple binary opposition, or they may differ in a more complex manner as, for example, when (+Vert) is in binary opposition to (-Vert) but may also block (+Inherent). Once these components have been given a value they may mark lexical items. Therefore *feature* in this thesis will be interpreted as a category of meaning which can enter into and contribute to the meaning of more than one lexical term. Words, therefore may be "marked" by features and when a feature marks a word in this way it is a marker with respect to this word. Markers may also differ in value and hence words may carry meanings which are positive or negative with respect to a particular feature.

A "component" may be considered as a part of word meaning or as a feature in its aspect of "marker".

It can be noted that the features of polarity, proportion and so on, are not concepts directly signalled by the spatial terms, and their use is unconscious. A person could go through life using *high* and *low* correctly without ever being aware that they express polarity.

If the features were acquired in the course of development in the order specified by Bierwisch for the cognitive processing of the adjectives (as expressed in a dependency tree), polarity (±Pol) would be the first feature to mark each word; then the numerical values for (Space); then the volume markers, (±Main); and finally proportion (+Max), and (+Second); and orientation (+Vert), and (+Inherent), and (+Observ); which are all in opposition to each other and are hence on the same level.

It should be noted, that Bierwisch has not suggested that his analysis provides an order of acquisition merely that it rests on innate and universal features of meaning. His arrangement of the features in dependency trees implies, however, a certain order of cognitive processing.

Analysis of the Maori spatial adjectives

Having looked at the Bierwisch analysis of the adjectives in English a matching set of words in the East Coast Maori dialect will be examined.

In the East Coast area, in which the greatest part of the field work was conducted, and where were found most of the children who had much contact with the Maori language, the author asked native speakers of Maori to look at the same displays as were used to test the children, and to give the Maori word which would express the relationships illustrated in these displays. The Maori words in general make similar discriminations in meaning as do the English words but there are, nevertheless, some differences between the sets. The parallel words are as follows.

Display Objects	English terms	East Coast Maori terms
Corks	*big* *little*	*kaitā* *paku*
Sticks	*long* *short*	*roa* *poto*
Blocks	*high* *low*	*roa* *poto*
Strips	*wide* *narrow*	*mōmona* *tūpuhi*
Water	*deep* *shallow*	*hōhonu* *pāpaku*
Dolls	*near* *far*	*tata* *mamao*
Rods	*thick* *thin*	*rahi* *whāiti*
Men	*fat* *thin*	*nui* *tūpuhi*
Men	*tall* *short*	*roa* *poto*

East Coast Maori uses *roa* for *long*, *tall*, and for *high* where *high* is synonymous with *tall* (the situation with respect to the blocks used in the test item). In other words, the East Coast Maori does not use the feature of orientation which in English discriminates *long* from *tall.* English speakers, on the other hand, may use the one word *high* for both *roa (tall)* and *tiketike (lofty)* and thus not discriminate between measure inherent in the object, and distance between the surface of the earth and the object. Teller (1969, 203) discusses the ambiguity of *high* in English, pointing out that it can refer to elevation or to tallness and that in the *high* = *tall* reading it is analogous to *long.*

East Coast Maori distinguishes between the thinness of inanimate rods and the thinness of persons by means of two words *whāiti,* for inanimate objects, and *tūpuhi* for animate objects. English does not discriminate these two sense of *thin.* East Coast Maori uses *pāpaku* where English uses *shallow* and *low.*

Thus, both languages have a word for every meaning but there are differences, admittedly slight, in the arrangement of particular components of meaning. The most important difference, and the one that may have particular relevance for this study, is the lack of a marker of orientation for the Maori equivalents of *tall* and *long.* The Maori word refers to overall distance, continuous, with an observable starting and finishing point, and not to the position in space in which the object measured is lying. Again, this does not mean that Maori lacks the concepts of orientation. *Tiketike (up high),* for example, is marked (+Vert) and Maori also has the words *atu* and *mai* which refer to orientation in the horizontal plane. Thus in Maori as in English, similar spatial concepts can be expressed. What differs is the way in which the meaning components are arranged according to the terms of the lexicon. A further point of interest is that Maori has a word, *waenganui*, for the middle item of a discrete series. Literally it means "divided off from the big" (Williams, 1971), whereas English can only speak of "the middle one" or "the one in the middle".

If the semantics of the Maori language were to have an effect on acquisition of meaning one would expect, perhaps, that young Maori children would tend to confuse *high* and *long* to a greater extent than do Pakeha children.

CHAPTER 3

REVIEW OF STUDIES OF WORDS

For at least ten years after the publication in 1957 of Chomsky's *Syntactic Structures,* the main research interest expressed in studies of child language lay in the acquisition of syntax. In the period preceding Chomsky's publication, research into words was concerned chiefly with growth of vocabulary as McCarthy's (1954, 526-536) review shows. Yet there has also always been interest in children's use of, and their interpretation of, words. The Russians, for example, following Vygotsky, have maintained an interest in the study of words and concepts. The Russian studies share with those of the early diarists a concern for word meaning particularly in the sense of extension,that is, in the objects, actions,and relationships to which a child's words refer. There has been a recent resurgence of interest in young children's use of words and in the interpretation that children give to the words they hear and those they utter (for example, Nelson, 1973. 1974a). Developmental changes in word meaning have also been studied (for example, Anglin, 1970). What is new in these and similar studies is the search for general principles which might explain in fairly precise terms the order of the acquisition of words. Differing views on principles of acquisition have been put forward (see for example, Nelson, 1974b and E. Clark, 1973a). With respect to syntax there has been a move away from the innateness hypothesis of language acquisition and Chomsky's postulation of an acquisition device in favour of seeking a cognitive base. Another suggestion for the derivation of syntax is to the effect that early syntax is derived in part from words (Macnamara, 1972; Starr, 1975). The main strands in current studies of the lexicon include a shift from the examination of spontaneous speech to speech in controlled settings, to experimentation where the latter is possible, and to a search for principles of semantic acquisition. One can note also the use of both linguistic and cognitive theories to explain the order of word and meaning acquisition.

Research findings

Summarised below are the main findings from studies of children's use of and understanding of the spatial adjectives of the Bierwisch set; studies of other words referring to aspects of space; comments on some of these words in studies not centrally concerned with that part of the lexicon that refers to space; and studies inspired by conservation experiments and dealing with such things as amount and proportion.

(a) *Children's interpretations of many words differ from those of adults.*
There are many examples in diary studies (extracts from several of these appear in Bar-Adon and Leopold, 1971) of word use by very young children and particularly of their misuses and over-extensions of words. Russian psychologists and educators (Anan'yev and Lomov, 1964; Sokhin, 1971) have, in particular, studied children's interpretations of words referring to space.

(b) *The meanings that children attach to words and the acquisition of the words themselves seem to follow a developmental order.*
By and large, the studies that support this finding examine

only a small number of words. *More* and *less* have been studied by Smedslund (1966) and by Griffiths, Shantz and Sigel (1967). Both words have been studied more intensively by Donaldson and her research associates (Donaldson and Balfour, 1968) and this work has been replicated and extended by Palermo (1973, 1974) and Holland and Palermo (1975). The general finding from the studies by Donaldson and by Palermo was that between the ages of about three and a half and four children interpret *less* as being the same as *more*. A recent study by Weiner (1974) of the same words but with younger children comes to different conclusions and Weiner reports that the children she studied did not think that *less* meant more. Townsend (1974) makes the point that the studies by Donaldson and Balfour (1968) and Palermo (1973) did not distinguish between incorrect responses and "opposite" responses and that the studies therefore may indicate only that the child does not know what *less* means in the situation presented to it. This comment raises the theoretical issue of what "knowing" a word means and whether or not there may be stages in "knowing". However, these *more* and *less* studies showed, irrespective of the interpretations given to the findings, that there is an order of development both in the acquisition of the words and in the acquisition of word meaning.

Order of acquisition of both words and meanings has been studied for other sets. E. Clark (1970, 1971, 1973a) has studied *before* and *after* and *in* and *on*. Johnson (1975) has also studied *before* and *after*. *Under, behind, opposite, above, below, side* *by side, between* and *on* have been studied by Museyibova (1964), *under* and *on* by Sokhin (1971), *large* and *small, long* and *short, high* and *low,* and *broad* and *narrow* by Kotyrlo (1964), *up, down, in front* and *behind* by Vovchik-Blakitnaya (1964), *full* and *empty* by Bruner (Bruner et al., 1966), *same* and *different* by Fein and Eshleman (1974), and *different* by Webb, Oliveri and O'Keeffe (1974). Nixon (1971) has studied Australian children's use of *big* and *small.* Johansson and Sjölin (1975) have studied the operators *and* and *or.* All studies reveal stages in the development of word meaning and many show that children are frequently confused by words related in meaning.

(c) *Recognition of the positive pole of antonymous word pairs is achieved before recognition of the negative pole.*

Donaldson and Wales (1970) and Wales and Campbell (1970) provide evidence from their study of the spatial adjectives that the positive pole words are acquired first. In spontaneous descriptions of the materials of conservation tasks children mention the positive pole before the negative pole (Farnham-Diggory and Bermon, 1968; Sinclair-de-Zwart, 1969). Words associated together on Osgood's semantic differential potency factor are confused by children up to the age of eight years (Ervin-Tripp and Foster, 1960; Nummedal and Murray, 1966); and these words are, of course, positive pole words.

(d) *General terms are acquired before more specialised terms.*

The Donaldson team (Wales and Campbell, 1970) has demonstrated that superlatives are acquired before comparatives. Many studies have shown that *big* and *little* are acquired before the other terms of the space set.

(e) *Perceptual processes affect the young child's interpretation of words referring to objects in the visual field.*

Phenomenal versus "real" size has been studied by Braine and Shanks (1965). Freyberg (1964, 237-8) also notes a phenomenal interpretation of *more* in his longitudinal study of conservation. Maratsos (1973, 1974) has studied the effect of verticality on the meanings that children give to *big* and Poteat and Hulsebus (1968) and Lumsden and Poteat (1968), have shown that at certain stages of development the vertical dimension is particularly salient.

(f) *Development of the correct use of words is a function of both age and situation.*

"Conservation" terms are used correctly first in content areas in which conservation is first achieved. (Griffiths, Shantz and Sigel, 1967).

(g) *Children of low socio-economic status may be slower to acquire correct use of "conservation" and spatial words than are children of high socio-economic status.*

Rothenberg and Courtney (1969) came to the conclusion that children of low socio-economic background may lag behind other children in their vocabulary development although, since their subjects were black children, the results may also have been due to the effects of other factors such as dialect difference.

Greenberg and Formanek (1973) found higher scores for middle class children on Boehm's Test of relational concepts.

Whether or not language in the form of the words expressing the essential relationships of a Piagetian experiment are a prerequisite for operational understanding is still an open question. The Genevan school believes that operational structures are independent of language and children only acquire the words and the appropriate syntactic complexity after the advent of reversibility and concrete operational structures (for an early statement see Inhelder et al., 1966). Others such as Peisach (1973) believe that the acquisition of the dimensional terms is important to the acquisition of operational structures and Rattan (1974) maintains that conservation is sensitive to language training. Both Gallagher (1971, 1972) and Walta (1971, 1972) produce evidence to support the Piagetian position and Keats and Keats (1973) reported a similar result in experiments with the conservation of weight in bilingual children.

Explanations according to the semantic feature acquisition hypothesis

The feature acquisition hypothesis suggests that semantic acquisition is related to the features marking words, and specifically by their number, their values, and their order on particular words. It has been used in attempts to account for the kind of data revealed by the studies that have just been reviewed. Although there is no generally agreed upon set of postulates associated with the hypothesis the following is a summary of the main suggestions.

(a) *Adult-child differences in interpretations:* Young children do not possess the full set of features for the words they use. Over-extension of word meanings is typical of very young children and meaning approaches conventional usage as the word acquires greater specification, that is, is marked by more features. (E. Clark, 1973b).

(b) *Order of word acquisition:* There has been a variety of suggestions of which the following are typical. Unmarked words are acquired before marked ones (H. Clark, 1969, 1970a, 1970b). The greater the number of features marking a word the slower the acquisition of its conventional meaning (E. Clark, 1972, H. Clark, 1970, McNeill, 1970). H. Clark and McNeill believe that the marked adjective in an antonym pair "derives" its meaning from its unmarked counterpart. A componential analysis indicates the way in which meaning develops (E. Clark, 1972).

(c) *Strategy of acquisition:* The features, and particularly polarity, may act as a heuristic in helping children to learn word meanings. This is suggested in passing by Wales and Campbell (1970) but rejected by them on the basis of their evidence. The idea is in agreement, however, with McNeill's (1970) idea of semantic acquisition by horizontal development. But it can also be thought to follow from analyses such as that of Bierwisch (1967) in which innate and deep structure features are presumed to provide meaning components for sets of words. (See also, Baron, 1975; Baron and Kaiser, 1975).

(d) *A perceptual base:* The features may be derived from perceptual input (cf., Maratsos', 1974, "top point") and encode perceptual features (E. Clark, 1973a, 1974). This interpretation differs, for example, from those which see the source of meaning in sensori-motor schemata (for example, Carter, 1975).

(e) *Evidence for a semantic field:* A possible explanation for the confusion by children of words associated on Osgood's semantic differential potency factor is that these words share features and form a semantic field. The structure of verbal associations also suggests semantic fields because associated words often share features of meaning.

Other explanations

Other suggestions unrelated to the feature acquisition hypothesis have been offered to explain certain facts about what is known of the order of acquisition of the words of the Bierwisch set. Why is *big* learned before *high, long,* etc.? Wales and Campbell (1970) suggest greater substitutability, greater utility, and greater frequency as possible reasons.

CHAPTER 4

HYPOTHESES

The following two hypotheses were developed to guide the research.

1. That there will be no difference between four-year-old Maori and Pakeha children with respect to

   (a) level of achievement in the referential use of the Bierwisch set of spatial adjectives,

   (b) the order of the acquisition of the referential use of the Bierwisch set of spatial adjectives,

   (c) the level of achievement on the semantic features marking the Bierwisch set of spatial adjectives,

   (d) the order of acquisition of the semantic features marking the Bierwisch set of spatial adjectives.

2. The achievement levels and order of acquisition of the semantic components of the set of spatial adjectives will be the same for four-year-old Maori and Pakeha children irrespective of the nature of the task used to test for these components.

These two hypotheses should be sufficient to allow an examination of the substantive issue of what Maori children think the words of the set mean and to determine whether there is any association between patterns observed and a variety of background variables, and sufficient also to assess the worth or otherwise of the feature hypothesis as a model of semantic acquisition. The way in which the data have been analysed is shown by means of a flow diagram (fig. 2).

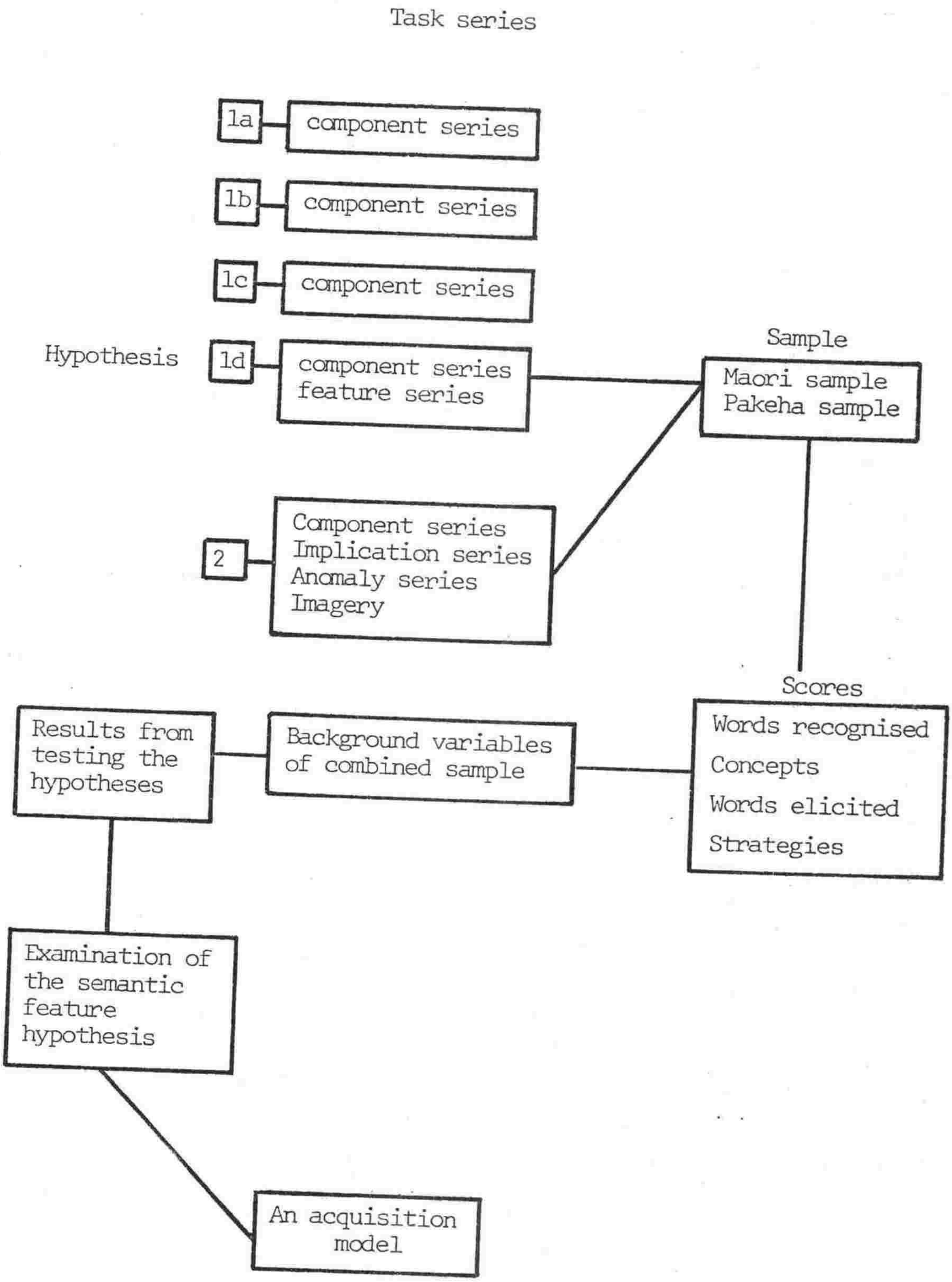


Figure 2 The analysis of the material

CHAPTER 5

DEVELOPMENT OF THE TASKS AND TESTING PROCEDURES

A more detailed description of the tasks and their presentation will be given before each set of results. Here the rationale of the tests will be given. The score sheets which show the order of presentation and the positions of the objects are in appendix B, and the specifications of the objects used and illustrations of each object are in appendix C. The componential analysis by Bierwisch of a set of adjectives provided a pattern for the construction of the tests. Tasks were arranged in four series, *component, implication, anomaly* and *feature* and there were, in addition, some tasks related to *imagery*.

(1) COMPONENT

This series required a child to choose a particular referent in the presence of other items, a process which necessitated a discriminatory choice based on a binary opposition of specific semantic components. The displays were arranged, and the questions asked, so that whatever the child's selection it would be possible to observe the particular component of meaning that he was employing. Thus the child's speech was not required for elucidation of his cognitive processes with respect to the tasks. The different categories of tasks will now be briefly described.

(a) *Polar*

The components (+Pol) and (-Pol) were tested for all 18 words of the Bierwisch set. The results from this testing have been used to give a measure of words recognised, polar pairs known, and cognitive strategies used. Each task employed three objects.

(b) *Space, Volume, Dimension, Orientation and Proportion*
The component (*n* Space) was contrasted with (1 Space) using the (+Pol) set as target words. (*Fat* was omitted). The component (+Main) was tested with those terms of the (+Pol) set marked by this feature.

The components (+Vert), (+Max), (+Inherent), (+Second) and (+Observ) were tested with those terms of the (+Pol) set marked by these components in the presence of objects which could be described by words marked with other components with which they are in opposition. Most of the tasks employed four objects.

(2) IMPLICATION

The implication series required a child to make a choice of an object for a reason which, if expressed by adults, would probably include one of the words of the Bierwisch set. This series was constructed in order to test for the sense of the words without requiring the child to recognise the word itself. Such tasks are of a kind generally known as cognitive. They usually require the child to draw on a wider spectrum of knowledge and experience than is required to recognise the referent of a word but they also supply more in the way of information, and they are more interesting to a child. As in the component series the objects used were selected to express contrasts between components set in binary opposition to each other and repeated the three- or four-object pattern of the corresponding test in the component series. The implication series comprised the following categories.

(a) *Polar*

All (+Pol) and (-Pol) terms were included except for the pairs *fat - thin* and *tall - short.*

(b) *Volume*

Only one contrast was tested and this used a (+Pol) term as the target.

(c) *Dimension Set*

(+Pol) terms were contrasted according to the features marking the dimensional terms *high, long* and *wide.*

(d) *Orientation*

Three tasks tested for the feature of orientation. The first was based on *far* and *near* and the second on a transformation from diagonal to horizontal. The third paralleled an earlier task and asked the child to identify a deep cupboard.

(e) *Normativity*

Two tasks were concerned with the implications that could be drawn from things that were "too big" and "too small".

(f) *Proportion*

Two tasks were concerned with the implications to be drawn from changes in the proportions of familiar objects.

(3) ANOMALY

Katz and Fodor (1963) set bounds for a semantic theory and within these bounds they placed,

(a) the detection of semantic anomaly,

(b) the detection of ambiguity,

(c) the ability to assign more than one reading to a sentence,

(d) the ability to paraphrase.

Most semanticists would find this list unnecessarily restrictive but would probably agree that such processes are related to meaning. Therefore the idea of semantic anomaly was adopted for the construction of one task series. The essential characteristic of the anomaly tasks is that the words are presented without any appropriate reference objects and thus the child was forced to supply meaning from his own meaning system. One way of viewing semantic anomaly is to see it as an inappropriate match between the semantic features of one or more of the words of a sentence with the semantic features of those other words with which it is associated in the sentence. The anomaly tasks do not offer the child any correct reading. The anomaly tasks were in two series.

(a) *Polar*

Half the words of the total set were included: *big*, 4 (+Pol) terms and 4 (-Pol) terms.

(b) *Space, Volume, Dimension, Orientation and Proportion*

A total of 13 tasks covered these features.

(4) FEATURE TASKS

The feature tasks are restricted to two sets (a) Normativity and (b) Proportion. Neither normativity nor proportion are represented directly in the child's lexicon. "Adjectives do not express norms but normativity". (Bierwisch, 1967). Such features, or organising principles, are presumed by Bierwisch to form a substratum, that is, to be part of what linguists refer to as deep structure.

Wales and Campbell (1970, 375) stress "the importance of studying systemic development rather than simply looking at the development of individual items". It can be seen that this advice has been taken in the preparation of the tasks described so far. In the next set of tasks a different approach was taken.

(5) IMAGERY

Piagetian theory states that both imagery and language arise on the basis of an underlying semiotic function. Imagery should therefore be related to language development and in this research the semiotic function was assessed through drawings and through actions as well as through language. (See Furth, 1971, for a commentary on the Piagetian position).

In the following account it will be necessary to distinguish word, concept, and referent and therefore the following conventions have been adopted.

Big = word.

"Big" = concept.

Big = objective referent condition.

MATERIALS

Most of the items were made at home or were assembled from bought objects. It was hoped that one end result of the work would be ways of assessing, informally, children's understanding, and that it would provide suggestions for "conversation pieces" for adults and children. Home-made items would, it was felt, be more readily reproducible and seem to teachers and parents more possible to obtain, than professionally made materials. (The materials are shown in appendix C.)

Testing considerations

It is common to read in reports of experimental studies of young children that a number of the selected sample do not respond. This raises the question of why such children do not respond - whether, for example, it is inability to perform the task, unfamiliarity with the task, lack of comprehension of the instructions or fear of the testing situation, differing cognitive style, or lack of information. This is obviously a matter of extreme importance especially since there is every reason to suspect that a structured testing situation favours some groups of children more than others.

Brown and Semple (1970) varied the familiarity of the setting (a familiar classroom as against an unfamiliar room) when nursery school children from a poor socio-economic environment were tested on a motor-perceptual task and a word-naming task. The findings showed that children subjected to unfamiliar social and physical conditions performed more poorly on both the motor-perceptual and language task than did those in familiar settings. Global gazing and freezing behaviour increased in unfamiliar settings and in this respect, say the authors, the children's behaviour was similar to that of animals placed in strange and fear-provoking situations.

When black pupils are given formal tests their performance may be affected by the race of the examiner (a white examiner leading to lower scores), the examiner's manner, the purpose for which the test is supposedly being carried out, and whether the children expect comparison with other black children or with white children (Katz, 1968). As Watson says in commenting on the Katz studies (Watson, 1970) "these experiments demonstrate, as do no others, the way in which even the *flavour* of race relations can sap the intellectual strength of minority groups". However, Pryzwansky, Nicholson and Uhl (1974) in a review of examining effects came to the conclusion that the evidence is conflicting and Jensen (1974) reports that race of examiner did not produce large or consistent effects in performance on ability tests when these were given to a large sample of black and white children.

A most telling account of what occurs when a white interviewer tries to elicit narrative speech from a black child in a typical testing situation is given by Labov (1970a). The child's speech becomes what Labov calls "defensive monosyllabic behaviour". Labov also presents the transcript of a tape illustrating the changes in the verbal behaviour which occur when the testing is carried out in the child's home, by a skilled black interviewer, when the child is supported by his friend, when the interviewer sits on the floor with the child, when the interviewer brings along a bag of potato chips to change the situation into something in the nature of a party, and when the interviewer introduces taboo words and topics. Labov (1970b) makes further criticisms of the typical testing situation describing it as "an adult face-to-face with a child, questions with no obvious purpose, a permanent record to be used for some purposes outside the child's control, and isolation from the peers who provoke and control normal speech".

Donaldson says (1970, 398) of testing that "the child is placed in a deliberately contrived situation and is given some kind of instruction or question which is intended to reveal what he is able to do". Therefore such situations "demand not only competence in respect of the behaviour which the instruction is meant to elicit but competence in the way of responding 'to order'". She says further that, ".... we are obliged to try to come to grips with the question of the nature of the demands that a formal task situation makes simply by virtue of the fact that it is formal".

These were the general considerations which were taken into account in planning the testing of the children and in assessing the results. The procedures adopted will now be outlined.

TESTING PROCEDURES

Three Maori women acted as research assistants during the work in Gisborne and on the East Coast. They came with the author to the homes of both Maori and of Pakeha children. Like most of the guidelines for the testing situation it was not possible to keep strictly to the requirement that a Maori research assistant should be present, at least during the first session, but all persons involved in the study, mothers, pre-school teachers, research assistants and the author did their best to create conditions comfortable for the child.

As it turned out, most of the children tested in the present study seemed to be unaffected by the appearance of the examiner or the assistant but there were a few instances in which Pakeha children drew back and looked away upon seeing the Maori research assistant and a few Maori children exhibited similar behaviour with respect to the Pakeha research worker. Some children, therefore, seemed to react to the appearance of the research workers, but most apparently did not.

In practically every instance the mother or another person close to the child was present during the testing. Each child was tested in a familiar setting. This was generally the child's own home but a few children were tested for one or more sessions at the pre-school the child attended. One child was tested on the verandah of a Maori meeting house and others were tested outside in the shade of a tree. There was never any attempt to take the child away from brothers and sisters or friends and there was often a small audience for the testing. This is a normal situation for a small Maori child and much less intimidating than being taken away to a quiet room.

In assessing the effect of different stimuli and different experimenters on mean length of response of children at different age levels, Cowan, Weber, Hoddinott, and Klein (1967) demonstrated the effect of the experimenter. Two different experimenters were employed and the authors suggest that their experiment showed the predominant influence of "person variables rather than recording, scoring and questioning habits" (op. cit., 201).

In the present study one experimenter (the author) took all the sessions with the children and conducted all the interviews with mothers. The research assistant helped with the equipment and took the child away to do a drawing while the mother was interviewed in private.

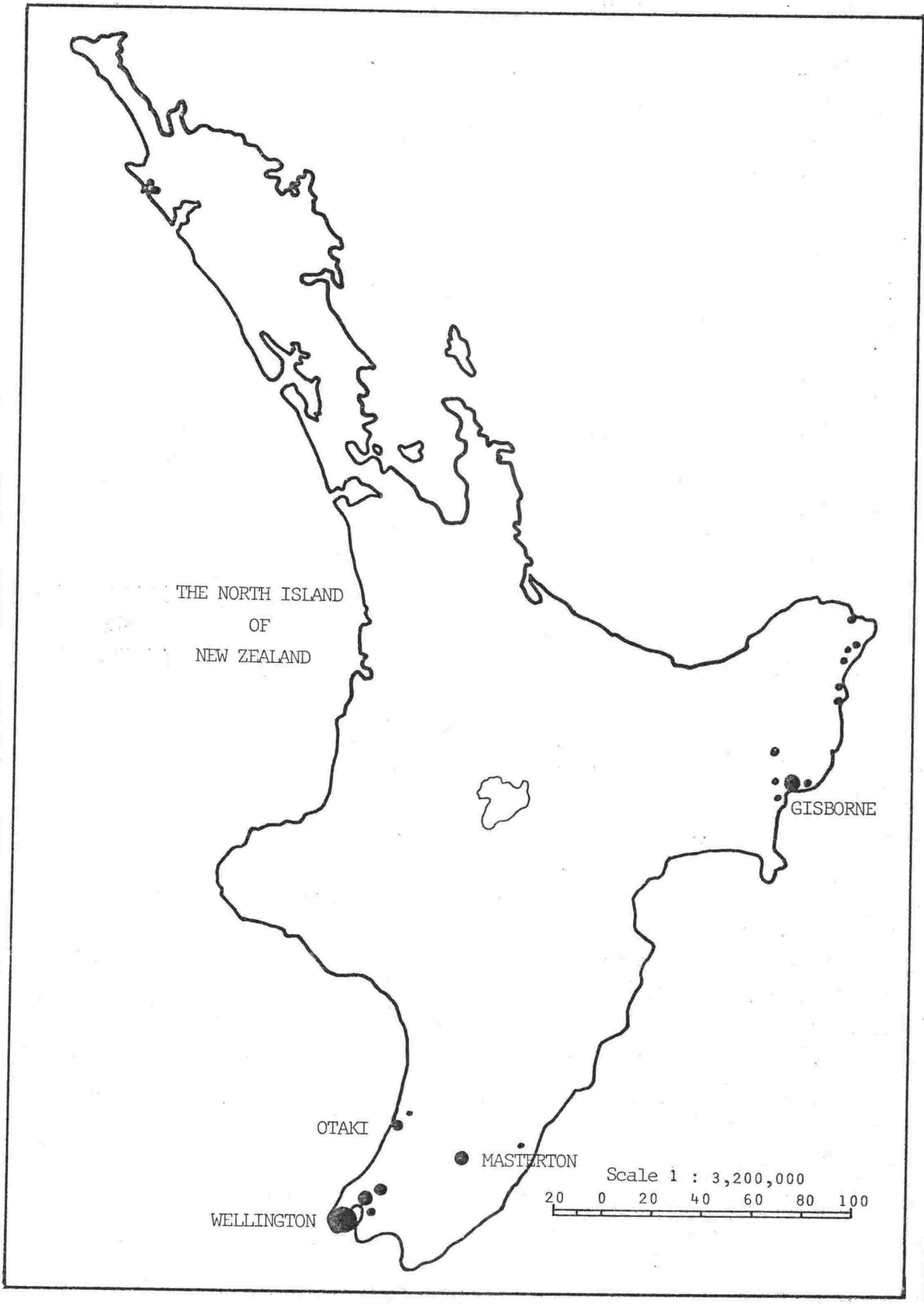
The author of the study reported in this thesis did try to introduce potato chips on two occasions when children were very tense and the gambit would probably have worked had the mothers not been there. The mothers, however, interpreted the giving of potato chips as bribery and considered it morally wrong.

All the test materials were made to be touched or handled (Goodnow, 1969) and the children were encouraged to do this. The testing materials were not fastened to bases and could be readily moved. Huttenlocher (1967) has demonstrated the importance of plane and relative position of sample and copy for the performance of four-year-olds, and hence the need to ensure similarity of visual presentation for each child.

Care was taken to see that the displays were in the same order and position for each child but sometimes the child and experimenter sat on the floor and sometimes on a couch with a stiff board to place the items on, sometimes by a coffee table and sometimes at a dining table. The surfaces presented were rarely flat and some of the more delicately balanced blocks were inclined to tumble over. The research worker managed, however, to set up each display or to help the child to do so and the mother or the research assistant also helped. Many mothers took a great deal of trouble to provide space and tables for the testing.

The objects for the test items were chosen so that they would be familiar to children from town and from country and some were chosen for their appeal to girls and some for their appeal to boys.

A pilot study was carried out in Wellington with children from a kindergarten. The main study was carried out with children from 24 pre-school centres (playcentres and kindergartens) in and around Gisborne and on the East Coast, in Masterton and the Wairarapa, in and around Wellington and on the coastal area north of Wellington. The map of the North Island, New Zealand (p.47) shows the areas visited. Seven visits were made to Gisborne and the East Coast and the testing was carried out over a period of six months. In Gisborne the author stayed in a motel. While working with children in the playcentres from Te Araroa to Tokomaru Bay she stayed with a friend, Mrs Kiri Boyce, in Ruatoria. Mrs Boyce and Mrs Hine Weka assisted while the author worked from Ruatoria and Mrs Kahu Carter



Map showing the areas from which the sample was drawn and approximate size of settlement assisted with the work in Gisborne.

The author interviewed 91 mothers or grandmothers and tested 80 children over the course of three sessions. Some 12 children additional to the 80 did not complete three sessions. Most of these children were gathered in the course of establishing the sample. Each session lasted, on average, 45 minutes although the first session sometimes took longer and the final one much less. The session stopped whenever a child appeared tired. On the whole the children enjoyed the "school work", the classification of the activities supplied by many of the mothers. Some parts of the testing were more interesting to the children than others and variations of this kind will be reported in the results.

The first session was arranged so that the child first performed a set of word recognition tasks, then did a drawing while his mother was interviewed, and then heard a story in which he was asked questions at appropriate places. The second session started with recognition tasks and finished with "story" items. The third session required the child to do things such as using his arms to suggest an axis, answer questions about the size of various objects and comment on pictures.

CHAPTER 6

THE SAMPLE

The selection of the sample was on the basis of ethnic categorisation, type of community in which child resided, and age. Sex was not used as a selection variable. The type of community was determined on the basis of whether the Maori residents were the traditional residents (kin-based community) or whether they were recent migrants with no traditional rights to the land (migrant community). These residence categories are based on Maori patterns of settlement and the case for using them rather than the European categories "rural" and "urban" has been argued in an earlier study by the author (McDonald, 1973, 17-20). Using data collected during the present study the argument has been taken further (McDonald, 1975) to show how attempts to establish matched samples of Maori and Pakeha children based on residence produces samples unequal for socio-economic background, and an attempt to equalise for socio-economic status of necessity excludes children almost all of whom live in country areas.

The selection variables, ethnic categorisation and age of child were determined by interview with the mother (see appendix A) as were the uncontrolled variables: child's length of time at pre-school, language background of the home, education of the mother, education of the father, father's occupation, mother's former occupation, mother's age, number of children in the child's family, the child's place in the family, the ethnic identity of the mother, the ethnic identity of the father, and the child's ancestry.

Ethnic categorisation

Each mother or grandmother was asked, "Do you consider yourself Maori, Pakeha, or what?" When this question had been answered it was followed by, "What about your husband?" and then, "What about [name of child]?" The first question was intended to leave the way open for an answer expressing any categories other than *Maori* and *Pakeha* without suggesting that there necessarily were other categories.[1]

The sample comprises 80 children identified by their mothers in the following manner:

Maori	28
Maori and Pakeha	11
Cook Islander	1
Pakeha	37
"Just a child"	3

The children listed above as "Maori and Pakeha" were identified by their mothers by a variety of terms: "half and half", "half-caste", "a bit of both" in addition to "Maori and Pakeha". The child identified as a Cook Islander had a mother from Rarotonga and a father from Niue. The language spoken to and by the grandmother who lived with the family was Cook Islands Maori. Cook Islands Maori is closely related to New Zealand Maori. Because the aim of the research was to explore the possibility of differences in children's meaning systems, on the supposition that these may arise where children have experience of differing languages, all the foregoing children were

1. For a fuller report of the results of this question and a discussion of the methodological issues see McDonald (1976). For discussion of self-report of Maori identity see Pool (1973) and for problems related to ethnic boundaries see Barth (1969) and Vincent (1974).

placed in the "Maori" sample. The other 40 children comprised 37 whose mothers identified them as Pakeha and 3 whose mothers said, "He's just a child". The reasons for this last categorisation are fully explained in McDonald (1976). These were the children whose mothers did not identify them as either *Maori* or *Maori and Pakeha*. They will be referred to as the "Pakeha" sample. Nine of the mothers of Pakeha children said that their child had some Maori ancestry.

One Maori child and one Pakeha child had Dutch fathers and the mothers in both instances gave the husband's identity as Pakeha. One Pakeha child had a father of Italian descent. In both samples some of the children were adopted (either formally or by custom) and one was fostered.

Table 6.1 shows the ethnic identity of the mothers and fathers in relation to the Maori and the Pakeha samples of children. "Mother" and "father" refer to those who care for the children and they may be grandparents or other persons.

Table 6.1

Ethnic identity of the mothers and fathers of the children in the Maori and the Pakeha samples

Children	Maori or Rarotongan		Maori - Pakeha		Pakeha		Pakeha (some Maori ancestry)		Niuean		N
	Mother	Father	Mother	Father	Mother	Father	Mother	Father	Mother	Father	
Maori sample	32	27	4	3	3	9	1	0	0	1	80
Pakeha sample	1	1	1	0	34	37	4	2	0	0	80
	33	28	5	3	37	46	5	2	0	1	160

It must be stressed that the two samples "Maori" and "Pakeha" are not defined racially but in terms of ethnic affiliation and that both samples are diversified within themselves. In the sample as a whole there are 22 children with both a mother and a father defined by the mother as "Maori". There are 31 children with both a mother and a father defined as "Pakeha". There are 26 children who have at least one parent who is either "Maori and Pakeha" or "Pakeha with some Maori" and there is 1 child whose parents are "Rarotongan" and "Niuean". The use, in the subsequent report, of "Maori" and "Pakeha" to define the two samples refers to those samples whose establishment has just been described.

Community difference

The children were all attending pre-schools serving their own residential area. The pre-schools were situated in kin-based communities and in migrant communities with equal numbers of children drawn from pre-schools in each type of community. In order to avoid selecting the sample only from areas where Maoris are concentrated, all the playcentres in Gisborne were surveyed and children were drawn from centres, both in Gisborne and the Wairarapa, where there were only one or two Maori children. The Pakeha children were drawn from the same settlements as the Maori children. From the Pakeha point of view the kin-based communities are rural communities and small towns. The areas visited are shown on the map of the North Island of New Zealand on p.47.

The resulting sample is representative of the New Zealand Maori population so far as rural and urban residence is concerned, but the Pakeha sample is more heavily weighted with rural children than is the Pakeha population as a whole.

Table 6.2 shows the ethnic categorisation x sex x community classification of the sample.

Table 6.2

Distribution of the children in the sample according to ethnic category, community category and sex

	Maori sample (N = 40)		Pakeha sample (N = 40)		
Sex	Kin-based	Migrant	Kin-based	Migrant	N
Male	7	11	9	11	38
Female	13	9	11	9	42
	20	20	20	20	80

There are 38 boys and 42 girls. The sex difference between the Maori and Pakeha samples is statistically non-significant (χ^2 = 0.18, 1 df). The sex difference between the two community categories, kin-based and migrant, is also non-significant (χ^2 = 1.79, 1 df). The average age in days past 4 years for each ethnic x residential x age category is set out in table 6.3. Each cell represents 5 children.

Table 6.3

Average age in days past 4 years of the children in the sample according to ethnic category and community category

Age Category*	Maori sample Kin-based (N = 20)	Maori sample Migrant (N = 20)	Pakeha sample Kin-based (N = 20)	Pakeha sample Migrant (N = 20)
1	40.6	29.8	28	43
2	144.4	147.2	134.4	135
3	193.0	245.2	208.8	229.6
4	327.2	332.2	334.2	326.2

* Category 1: 4 years and 0 days to 4 years and 91 days.
Category 2: 4 years and 92 days to 4 years and 182 days.
Category 3: 4 years and 183 days to 4 years and 273 days.
Category 4: 4 years and 274 days to 4 years and 364 days.

Length of time at pre-school

There was no statistically significant difference in the two samples with regard to the length of time at pre-school ($\chi^2 = 3.76$, 3 df, $p.>0.05$). The relevant data are set out in table 6.4.

Table 6.4

The length of time that children have attended pre-school

Time at pre-school	Maori sample (N = 40)	Pakeha sample (N = 40)
Over 18 months	12	20
12 months and up to 18 months	7	4
6 months and up to 12 months	10	9
Under 6 months	11	7

Language background

Table 6.5 shows the difference in language background of the Maori and the Pakeha samples. Combining the bottom three categories produced a 2x2 contingency table and calculations made on this table showed that $\chi^2 = 34.58$. With 1 df a value of this order has a probability of occurrence beyond the 0.001 level. It must be emphasised however, that no child in either sample had a fully productive use of any language other than English.

Table 6.5

The nature of the language or languages heard in the home

Language heard in the home	Maori sample (N = 40)	Pakeha sample (N = 40)
English only	10	36
Some Maori	16	2
Quite a lot of Maori	14	0
Another language heard occasionally	0	2

Education of the parents

The education of the parents is shown in table 6.6. Calculations were made for each parent separately with the top two categories combined and the bottom two categories combined. The decision to combine the bottom category of "primary only" level of education and "not known" level of education can be justified by assuming that non-report of educational level meant that there was little to report. Informants said, for example, "I don't know", of a father's education when it seemed fairly certain that if the person concerned had had even a high school education and left without qualifications, the informant would have known about it. Most of the "not known" responses referred to elderly men living in country district and therefore the chances are that they had had very little opportunity for education.

Table 6.6

The educational level reached by the parents of the children in the sample

Level of Education	Fathers of children in Maori sample (N = 40)	Fathers of children in Pakeha sample (N = 40)	Mothers of children in Maori sample (N = 40)	Mothers of children in Pakeha sample (N = 40)
Tertiary	1	3	0	2
High school with qualifications	2	9	3	16
High school without qualifications	23	23	31	20
Primary only	4	0	5	2
Not known	10	5	1	0

There is a highly significant difference between the education of the mothers of children in the Maori sample and the mothers of children in the Pakeha sample. ($\chi^2 = 12.82$, 2 df, $p.<0.001$). The difference between the education of the fathers of children in the Maori sample and the fathers of children in the Pakeha sample is also statistically significant ($\chi^2 = 9.66$, 2 df, $p.<0.01$).

Occupations of the parents

Table 6.7 sets out the distribution of the occupations of fathers as measured by the Elley-Irving scale (Elley and Irving, 1972). The difference between the two samples is statistically significant beyond the 0.001 level. (χ^2 = 26.4, 2 df, calculated by combining the data in the top 3 ranks and the data from the bottom 3 ranks.) A difference at the same level of significance was found when a comparison was made of the occupations arranged according to the ranks of the Congalton-Havighurst scale. (Vellekoop, 1969).

Table 6.7

Distribution of occupations of fathers on the ranks of the Elley-Irving Scale

Rank on Elley-Irving Scale	Fathers of children in Maori sample (N = 40)	Fathers of children in Pakeha sample (N = 40)
1	1 (1P)*	3
2	0	13
3	4 (2P)	2
4	5 (2P)	15 (1M)*
5	15 (2P)	4
6	10 (2P)	1
n.a.	5	2

* M = Maori parents; P = Pakeha parents

A consistent attempt was made by the investigator to find out whether there were any Pakeha children with fathers in unskilled occupations attending the pre-schools visited. None were found.

A comparison of the former occupations or present occupations of the mothers of children in the Maori sample and the mothers of children in the Pakeha sample is shown in table 6.8. A prestige ranking scale for women's occupations developed by Vellekoop (1967) was used to classify the occupations.

Table 6.8

Distribution of occupations of mothers on the ranks of the Vellekoop Scale

Rank on Vellekoop Scale	Mothers of children in Maori sample (N = 40)	Mothers of children in Pakeha sample (N = 40)
1	0	0
2	0	0
3	5	8 (1M)**
4	1	2
5	15 (2P)**	19
6	4 (1P)	8 (1M)
7	9	2
n.a.*	6	1

* No occupation outside the home

** M = Maori or Maori and Pakeha parent; P = Pakeha parent

Calculations were made after combining together categories 3 and 4, and categories 6 and 7 and n.a. The difference in frequency distribution between these two samples is statistically non-significant (χ^2 = 3.62, 2 df, p.>0.10).

Age of mother

There was no statistically significant difference with regard to the ages of the mothers (χ^2 = 3.00, 2 df, p.>0.05). See table 6.9.

Table 6.9

Age of mother

Age in years	Maori sample (N = 40)	Pakeha sample (N = 40)
40+	8	3
30-39	15	20
20-29	17	17

Number of children in the family

The numbers of children in the families of the Maori and the Pakeha samples are shown in table 6.10.

Table 6.10

Number of children in family

Number	Maori sample (N = 40)	Pakeha sample (N = 40)
3+	19	14
3	12	8
2	6	17
1	3	1

Calculations made on these data with the bottom two categories combined show that the difference in family size is not statistically significant (χ^2 = 4.56, 2 df, p.>0.05).

Place in family

There was no significant difference in the two samples with regard to the child's place in family ($\chi^2 = 0.96$, 2 df, >0.05). The calculations were made on the data shown in table 6.11.

Table 6.11

Child's place in family

Place in family	Maori sample (N = 40)	Pakeha sample (N = 40)
Oldest and only	13	16
Middle	9	8
Youngest	18	16

SUMMARY

Two samples, one Maori and one Pakeha, were established on the basis of the mother's report of the child's ethnic identity. Each sample was balanced for age and according to type of community in which the child resided.

The occupations of the fathers of the children in the two samples differ significantly (p.<0.001) with the parents of Pakeha children having more highly ranked jobs. The education of the mothers differs significantly (p.<0.001) as does that of the fathers (p.<0.01). In both instances the parents of Pakeha children are more highly educated.

The language backgrounds of the two groups differ significantly (p.<0.001). The children in the Maori sample are more likely to have had some experience of and knowledge of the Maori language. The differences in the time that a child has spent at pre-school, the ages of the mothers, the number of children in the pre-school child's family, the child's place in the family, the mother's former occupation, and the sex of the child do not differ significantly between the two samples. The difference in sex between the kin-based and migrant samples does not reach statistical significance at the 0.05 level.

The differences between the two samples will be examined again when the results from the series of tasks have been presented.

CHAPTER 7

THE POLAR COMPONENT TASKS

There are 18 words in the Bierwisch set. The aim in this series was to see whether children could recognise the words of the set and indicate this recognition by selecting the correct referent from a set of three possibilities. The set includes words such as *fat* and *tall* which are commonly used of people, as well as others which are more usually used to refer to rigid objects. The set also includes the words *short* and *thin* which are antonyms for *tall* and *fat* as well as for *long* and *thick*. Including these words may enable one to look at the way in which context affects a child's recognition of *short* and *thin*.

METHOD

Materials

The items were adapted from ones used in the Edinburgh Cognition Project (Donaldson and Wales, 1970; Wales and Campbell, 1970) in a study of the use of comparatives. The objects used in the present investigation were:

- 3 corks of varying size
- 3 sticks of varying length
- 3 yellow cardboard strips of varying width
- 3 blocks of varying height
- 3 translucent containers with water at varying levels
- 3 dolls of equal size placed at varying distances from the child
- 3 sticks varying in thickness
- 3 cardboard men varying in height
- 3 cardboard men varying in girth

The positions of the objects used in the visual display were randomised and for half the items the (+Pol) term was presented first and for the others the (-Pol) term was presented first. The objects and details of their sizes and colours are provided in appendix C. Order of presentation is shown in the score sheets in appendix B and in chapter 10. Children were encouraged to handle the objects and to help the experimenter to set them out in the predetermined order.

<u>The "Relational" test</u>

The first test in the polar component series was used to screen out any children who appeared to be suffering from any abnormality. Each child was shown the set of three corks and asked to,"Give me the big one". The cork chosen was replaced. The child was then asked to,"Give me the little one", and the cork chosen was replaced. The biggest cork was then removed and the child was asked to, "Give me the big one". The biggest cork was then replaced and the smallest one removed. The child was asked to, "Give me the little one". Two children were unable to perform this task. One was a Pakeha child who exhibited echolalia and had other behavioural abnormalities and the other was a Maori child suspected by the public health nurse and by his kindergarten teacher of being deaf. Children enjoyed this task and many of them laughed with surprise as they indicated that the middle sized cork in the first display could be either big or little in a subsequent display. All children in the research sample correctly identified *big* and *little* in this way and thus showed that they grasped that their meanings are relative to a norm and not fused with the objects to which they can refer. Bryant (1974) calls this the difference between a relative and an absolute code. It seems reasonable to state that normal four-year-olds can identify big and little objects in a set of three and understand the "shifting" or relational nature of the term *big*. If a child could not cope with this first task it is unlikely that he would have been able to cope with any subsequent items.

Presentation

The polar component tasks were the first with which the child was presented and this meant that the experimenter generally had to gain the child's confidence during this series. The child was encouraged to give the named object to the experimenter or to give it to his mother if that made him more confident. If, in the stress of the testing situation, he did not feel able to touch the objects, he was encouraged to point and, if all else failed, the experimenter pointed to one object after another and encouraged the child to nod for the one he believed to be the named object. The experimenter was careful to continue pointing after the first choice had been made in order to make sure of the child's certainty regarding it. One little boy pointed out the objects to his dog. The mothers, all of whom cooperated well, were asked to sit a little behind the child or to hold the child on their knee if he felt happiest like that. The experimenter watched the child to see whether he was seeking clues from his mother's behaviour and if this seemed likely, the seating of child and mother was rearranged to make it difficult for him to see her face. In fact there was not very much behaviour of this kind and often a child seemed to be trying to get reassurance rather than information from his mother.[1]

It is worth recording that many of the mothers had attended courses in child observation conducted by the playcentre movement and that they had, therefore, some knowledge of child behaviour and

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1. Results in this series may suffer from contamination by non-verbal signals, such as movements by the mother but they are less likely to suffer from bias caused by non-response.

some interest in the testing programme apart from the success of their own child's performance. Some time was spent in preparing mothers for the session. They were told that the experimenter was trying to find out how much four-year-olds understood of a set of words. The experimenter said that the child would not be able, according to adult standards, to do all items correctly but that the experimenter was just as interested in the kind of "mistakes" made by four-year-olds as in determining what they knew. The experimenter also said that if four-year-olds could answer all the questions there would be no point in asking them all the questions. She told the mother that although it might look as though she were testing the child to see how "good" he was, in fact, this was not so. The experimenter said that nobody knew how well New Zealand children understood the words and this was an attempt to find out.

When a child had made a first choice by picking up the object chosen it was replaced by the experimenter and the child was encouraged to look at the full array before answering the second question. All responses were rewarded by a comment such as "Good". When children chose a (+Pol) item for a (-Pol) term on the first question, the experimenter created a short diversion by talking to the mother and by picking up the objects and putting them down again. This was to overcome the possible problem of the child avoiding the correct item because he had already chosen it. In fact, these slight diversions may not have been necessary because when young children feel that they really know a word they are quite untroubled by a previous choice of the correct object and will readily make double choices; for example, a *high* object may be called both *low* and *high* if the word *low* is presented first. Nevertheless it seemed then a sound practice, and on reflection still does, to create a pause before the second question if the child's first choice has been the answer to the second question. In testing situations of the kind described one has the choice of standardising the presentation, following a "testsand measurements" model, or standardising the meaning, following a clinical model. With young children and with persons of a different culture it is difficult to do both at once and a decision had to be made as to what approach to use. An attempt was made to standardise meaning.

RESULTS

Achievement on word recognition

Table 7.1 shows the number of children who recognised each word. The most noticeable feature of the table is the similarity between the samples with regard to scores. The Pakeha sample, however, scores higher on 11 items and the Maori sample on 2. One can note no difficulty for the Maori children in discriminating *high* and *long* in this test series.

Table 7.1

Number of correct responses to each word

Words	Maori (N = 40) Number of correct responses	Maori (N = 40) Rank of word	Pakeha (N = 40) Number of correct responses	Pakeha (N = 40) Rank of word
big	40	1.5	40	1.5
little	40	1.5	40	1.5
long	34	4	34	5
short	21	9.5	22	10.5
wide	19	11.5	20	14
narrow	19	11.5	21	12.5
high	33	5	38	4
low	10	17	26	9
deep	32	6	30	8
shallow	12	15	16	15
far	31	7	33	6
near	27	8	31	7
thick	17	14	9	17.5
thin	11	16	14	16
tall	18	13	22	10.5
short	9	18	9	17.5
fat	39	3	40	1.5
thin	21	9.5	21	12.5
	433		466	

Zubin's *t* (Marsh, 1967) was determined for the difference between Maori and Pakeha performances on each word. Only one word, *low*, produced a difference of statistical significance (Zubin's $t = 0.81$, $p.<0.01$) and in 18 applications of this procedure at least one significant difference could be expected by chance alone.

The difference in overall achievement between Maori and Pakeha samples is caused substantially by the difference in recognition of the word *low*. Sixteen more Pakeha than Maori children recognised a low object. Maori children did rather better than Pakeha children on the word *thick* but the difference fell just short of statistical significance.

Table 7.2 indicates the distribution according to the number of words recognised by each sample and shows a slight skewing towards the top end of the scale for the Pakeha sample and a slight skewing towards the bottom end for the Maori sample.

Table 7.2

Number of words recognised by Maori and by Pakeha samples

Number of words	Maori sample (N = 40)	Pakeha sample (N = 40)
18	1	1
17	0	0
16	0	0
15	2	5
14	1	2
13	4	3
12	6	10
11	6	6
10	9	6
9	6	4
8	3	2
7	1	1
6	1	0

The mean for the combined sample = 11.24 words and the median = 11. The mean for the Maori sample = 10.83 words and the median = 10. The mean for the Pakeha sample = 11.65 words and the median = 12. For the Maori sample s = 2.33 and for the Pakeha sample s = 2.31.

The t test was used to determine the significance of the difference between the means of Maori and Pakeha performance on the recognition of the 18 words of the polar component series. The value of t = 1.54 which fails to reach the 0.05 level of probability.

Age trends

The average number of words recognised by Maori and by Pakeha samples in the four age subdivisions are shown in table 7.3.

Table 7.3

Age trends in number of words recognised

Age Group	Maori (N = 40)	Pakeha (N = 40)	Total Sample (N = 80)
4;0 up to 4;3	9.5	11.1	10.30
4;3 up to 4;6	11.8	11.1	11.45
4;6 up to 4;9	11.3	11.0	11.15
4;9 up to 5;0	10.7	13.3	12.00

While there is a difference between the scores of the youngest and the oldest groups of children in both samples there is no simple linear progression and no doubt the scores are affected by factors such as intelligence and the opportunity to learn the words. A proper assessment of rate of acquisition would require data from a longitudinal study.

Estimate of rate of acquisition

The average number of words known by the youngest Maori group is 9.5 and by the oldest Maori group is 10.7. The difference, 1.2, represents the average number of words learnt during the year. The average number of words known by the youngest Pakeha group was 11.1 and by the oldest Pakeha group, 13.3 and the difference is 2.2 words. The Maori sample therefore gained on average 0.1 word per month and the Pakeha children about 0.18 words per month. The Maori children are therefore 10 months behind the Pakeha sample with respect to recognition of the words of the set if test results are a true indication of the children's knowledge. Much of this difference would have been eliminated had the Maori sample been more familiar with *low*.

Order of acquisition of words

How similar are the orders of achievement of Maori and Pakeha samples?

Spearman's rho was calculated on the data in table 7.1 above and this produced a correlation coefficient of 0.89 ($p.<0.01$). Therefore the rank orders of Maori and Pakeha achievement on recognition of antonyms are both substantially and significantly associated.

Order of acquisition of markers

The rank order of all words is shown in table 7.1 above and the ranking for the best known words is shown in table 7.4 together with the polar value of each word. The words known by under 40% of each sample have been omitted. It can be seen that there is little variation in the ranking of the better-known words and that the ranking of the features (+Pol) and (-Pol) is identical for each sample. Both Maori and Pakeha samples "know" 6 (+Pol) terms and 2 (-Pol) terms.

Table 7.4

Ranking of words and values on better known words

Maori sample (N = 40) | Pakeha sample (N = 40)

Word	Polar Value	Rank	Word	Polar Value	Rank
big	+	1	*big*	+	1
little	–	2	*little*	–	2
fat	+	3	*fat*	+	3
long	+	4	*high*	+	4
high	+	5	*long*	+	5.5
deep	+	6	*far*	+	5.5
far	+	7	*deep*	+	7
near	–	8	*near*	–	8

It would not be sound to compare the ranking of the remaining words in order to judge the acquisition of markers but they may be examined for interest. Table 7.5 shows the same pattern in each sample for (-Pol) and (+Pol) for the top four items and only after that, with quite unfamiliar words, does the order of markers vary.

Table 7.5

Ranking of words and values on lesser known words

Maori sample (N = 40)			Pakeha sample (N = 40)		
Word	Polar Value	Rank	Word	Polar Value	Rank
short (-long)	-	9	*low*	-	9
thin (-fat)	-	10	*short (-long)*	-	10.5
wide	+	11.5	*tall*	+	10.5
narrow	-	11.5	*narrow*	-	12.5
tall	+	13	*thin (-fat)*	-	12.5
thick	+	14	*wide*	+	14
shallow	-	15	*thin (-thick)*	-	15
thin (-thick)	-	16	*shallow*	-	16
low	-	17	*thick*	+	17
short (-tall)	-	18	*short (-tall)*	-	17

Word recognition

1. The words fall into two main groups. In the first group are *big, little, fat, long, high, deep, far* and *near*. Each of these words was recognised by over two-thirds of each sample.

2. Of these 8 words *big, fat, long, high, deep,* and *far* are marked (+Pol) and only 2, *little* and *near* are marked (-Pol). This is the (+Pol)-first effect which has been found in many other studies.

3. Not all (+Pol) terms are readily recognised. *Wide, tall* and *thick* were not familiar to most of the children tested and *thick* appears to be particularly baffling.

4. Of the second group of words a tentative division can be made into those recognised by between 40% and 66% of each sample. *Short*, (*-long*), *thin* (*-fat*), *wide*, *narrow*, and *tall* fall into this category for both samples. In the Pakeha sample, *low* and *shallow* also fall into this category, and in the Maori sample *thick* does too. These words are ones which a four-year-old may or may not know.

5. The remaining words *thin* (*-thick*), *short* (*-tall*) were recognised by few children in either Maori or Pakeha samples. In the Maori sample *low* and *shallow* were recognised by under 40% of the children and in the Pakeha sample *thick* was recognised by under 40% of the children.

6. The order of acquisition for both samples combined, arranged in groups, appears to be as follows, starting with the best recognised group of words.

   (i) *big, little, fat.*

   (ii) *long, high, deep, far, near.*

   (iii) *short* (*-long*), *thin* (*-fat*), *wide, narrow, tall.*

   (iv) *thin, low, thick, short* (*-tall*) and *shallow.*

DISCUSSION

(a) The relational nature of *big* and *little*.

Nelson and Benedict (1974, 335) say that,

> A frequent assumption has been that children begin by using even the relative adjectives categorically and subsequently use them relatively. However, it has been shown .... that very young children do use these adjectives in a relative manner, and it is only the class standards that must be learned.

The results from the first item, the "relational" test support the above statement. (See also, Bryant, 1974).

(b) A comment on *low* and *long*.

It has been reported that the Maori sample performed more poorly than the Pakeha sample, in large part because of unfamiliarity with the word *low*. The most likely explanation for this discrepancy is that Maori children tended to hear the word *little* rather than *low* used of objects (such as the blocks which were the test items) in the speech communities to which they belong. This finding cannot be interpreted to mean that because Maori children do not use *low* in the context tested they cannot perceive "lowness" but only "littleness". As Bierwisch's analysis shows, *little* and *big* can be applied to one or more dimensions but they are applied to main rather than to secondary dimensions. Therefore, to use *little* in the presence of a high object probably implies correct perception of a vertical dimension.

The fact that the Maori children's and the Pakeha children's performance was equal for *long* and varied only slightly for *high* (Maori 33, Pakeha 38) lends no support to the idea that differences in the Maori language may bring about differences in the use of the English language.

(c) A comparison with the findings from two other studies.

How similar are the results regarding word recognition to those found by other research workers? Table 7.6 compares results from the present study with those from the Edinburgh Cognition Project (Donaldson and Wales, 1970; Wales and Campbell, 1970) and those from a study of antonyms by Eve Clark (1972).

Table 7.6

Comparison of word order results from three studies

New Zealand (N = 80)	Scotland (N = 15)	US (N = 30)
big	*biggest*	*big - small*
little	*wee-est*	*long - short*
fat	*longest*	*tall - short*
high	*highest*	*high - low*
long	*fattest*	*thick - thin*
far	*thickest*	*wide - narrow*
deep	*tallest*	*deep - shallow*
near	*shortest*	
short (-long)	*thinnest (-thick)*	
thin (-fat)	*lowest*	
tall	*shortest (-tall)*	
narrow	*thinnest (-fat)*	
wide		
low		
shallow		
thick (-thin)		
thin (-thick)		
short (-tall)		

There were 15 children of mean age 3.5 years at the start of the Edinburgh Cognition Project. The words with which they were tested were the comparative and superlative forms of *big - wee, long - short, thick - thin, high - low, tall - short,* and *fat - thin.* The display for each item was four objects, sticks, blocks etc, arranged in order of size. The child was asked, "Which is the (biggest block, longest stick, shortest man, etc)?" and subsequently, "Which is the (wee-est block, shortest stick, shortest man etc)?" The experimenter also tested for comprehension of comparatives by saying, "Now give me one that's bigger than this one," and so on.

The results for the superlatives only are given in table 7.6 since superlatives are acquired before comparatives and seem to be interpreted by young children as equivalent to the stem word. (For a discussion of simple versus superlative forms, see Wales and Campbell 1970, 378; and Maratsos, 1974, 368.)

The children tested by Eve Clark (1972) were aged 4;0 - 5;5 and were asked to supply "opposites" (antonyms) for the words of the set. Clark found no overall difference between performance on the positive and negative members of the pairs and suggested that the words were, in fact, learnt as pairs. As table 7.6 shows, *big* and *small* are the best known pair followed by the pairs *long - short, tall - short* and *high - low*. The New Zealand children showed little familiarity with any of the (-Pol) terms except for *little* and *small*. The American children also appear to be more familiar with *tall* and less familiar with *high* but the methods of the present study and that of Clark's differed substantially and this makes comparisons somewhat risky. It is possible, however, to compare the Edinburgh and New Zealand results. (See table 7.7).

Table 7.7

A comparison of the percentage of Edinburgh and New Zealand sample achieving success on word recognition

Word	Polar Value	Number of Edinburgh children recognising the word	Edinburgh (N = 15) %	Rank	NZ (N = 80) %	Rank
biggest	+	15	100.00	1.5	100.00	1.5
wee-est (littlest)	-	15	100.00	1.5	100.00	1.5
longest	+	14	93.33	3	86.09	5
highest	+	13	86.66	4	88.75	4
fattest	+	12	80.00	5	98.75	3
thickest	+	10	66.66	6	32.50	9
tallest	+	9	60.00	7.5	50.00	7
shortest	-	9	60.00	7.5	22.50	11.5
thinnest	-	8	53.33	9	28.75	10
lowest	-	6	40.00	10.5	45.00	8
shortest (-tall)	-	6	40.00	10.5	22.50	11.5
thinnest (-fat)	-	3	20.00	12	52.50	6

Spearman's rho was calculated on the rank orders of performance of the New Zealand and Edinburgh samples as shown in table 7.7 producing a correlation coefficient = 0.74, $p.<0.01$.

The Edinburgh children, like the New Zealand children, showed most familiarity with *big, wee (little), long* and *high*. *Fat,* which the New Zealand children knew so well is in fifth rank in the Edinburgh study. There is an interesting difference in that *thin* (-*fat*) is better understood by New Zealand children while *thin* (-*thick*) was better known by the Scottish children. There are some major differences in method and aim in the two studies but nevertheless the ranking of the first five words in the Scottish list is very like our results. And so is the ranking of the polar markers. There are reasons for thinking, however, that the performance of the Scottish children may have been enhanced by the nature of the presentation. H. Clark (1970a, 276) comments on the "unbalanced" procedure of asking for the (+Pol) term first on every item and comments as follows on the behaviour of the children that "when choosing the wee-est object they often pointed to the object immediately adjacent to the biggest extreme. Did they choose this object because they wanted to pick the biggest object but were hesitant to point to the same object for both questions?"

In the present study, as has already been explained, the (+Pol) term was presented first on half the items and the (-Pol) on the other half. The placing of the objects in relation to each other was randomised and did not follow a serial order of size, and in the order of presentation well-recognised and less well-recognised words were intermingled. These devices may possibly have made the present test more difficult than the Edinburgh one, particularly because, as will be explained and illustrated throughout this report, young children are attracted by what they perceive as *big* and (+Pol) first presentations are, therefore, likely to inflate the number of correct responses. This point will be dealt with more fully later. There is a further point which deserves mention. In both the Edinburgh Cognition Project and in E. Clark's study, the children were drawn from a single pre-school group and the experimenters were familiar to the children. These conditions did not prevail in the present study in which the children were drawn from a variety of pre-school groups situated in different geographical areas. It is, therefore, not suprising that the New Zealand results showed a lower rate of achievement than the Edinburgh and American ones.

Kotyrlo (1964, 117) reporting a study of the word knowledge of Russian children says that "most of the children (aged 3 and 4) stubbornly insist that a 'block' 2 cm tall, 4 cm wide, and 16 cm long 'has no height'. To them it has height only when stood on end." Unfortunately, the results given by Kotyrlo are largely of this kind, anecdotal rather than systematic, but like the Western children, the Russian ones learnt *large* and *small* before *high, low, long, short, broad* and *narrow*. In the Russian sample, only 80% of the four-year-olds chose the tallest of 4 blocks but 100% of five- and six-year-olds were able to do so. The Russian four-year-olds' performance on *tall* is close to ours for *high*.

(d) Size of vocabulary

A major difference between the two samples was found with only one word; *low*. Since the entire set of words in this research project totals 18 and by the time a child enters school he may have a vocabulary of two to three thousand words (Menyuk, 1972) a one-word difference may be important.

There is reason to think that, as a whole, the vocabularies of

Maori children are less extensive than those of Pakeha children. Certainly when measured by tests standardised on American and English children Maori children, as a group, seem to perform more poorly than Pakeha children (see for example, Barham, 1965; Clay 1972). Vocabulary differences of this kind may be characteristic of children from minority groups. Mickelson and Galloway (1973), for example, report results of a similar kind for American Indian children in relation to non-Indian children. On the other hand, there is reason to suspect that tests widely used for judging differences in vocabulary size such as the Peabody Picture Vocabulary Test (Dunn, 1965) in both its American and English versions are unsuited to testing groups whose experiences may differ from those of the majority group (Lyman, 1965). Jamieson (personal communication) has found in a study of children resident in New Zealand but whose families came from the Tokelau Islands that the Peabody Picture Vocabulary Test contains a group of words, associated with the home, which it may be considerably more difficult for Tokelau children to recognise.

As reported earlier in this thesis Maori children tend to be drawn from families situated in the lower socio-economic ranks of New Zealand society and one could predict vocabulary restriction on this ground. Widlake (1971) found that, measured by the English version of the Peabody Picture Vocabulary Test, children from homes of lower socio-economic status did less well than children from families higher up the scale, Bruck and Tucker (1974) found more vocabulary errors amongst lower class children than amongst middle class ones, and Quigley (1973) found that the vocabulary score of nursery school children measured on the words used in beginning readers was lowest for children whose fathers were in manual occupations. All aspects of language, vocabulary, the ways in which language is used (Tough, 1973, 1974) and complexity of grammar (Jones and McMillan, 1973) appear to vary according to socio-economic status even in very young children. Amongst older children such variations have been noted many times (Cazden, 1966; and Lawton, 1968 provide an overview) although it would seem that at least some differences which appear in the language use of five-year-olds from such disparate groups as Guatemalan village children and urban American children, may disappear by the age of eight (Kagan et al., 1973). A further point is that the presumed differences in language skills may be, in part, an artifact of testing situations which favour middle class children.

(e) Parents and teachers

What do teachers and parents know of a young child's grasp of vocabulary? The nursery school teachers in Quigley's (1973) study did not know the facts discovered by Quigley and in the study reported in this thesis the author found that mothers and teachers observing the testing sessions did not have accurate notions of what a particular child would be likely to understand, much less what could be expected of four-year-olds in general. Many mothers, observing the testing procedures, said after a child had been successful, things such as, "I didn't think he'd know that one!" Mothers reported that they generally used *big* and *little* rather than more specialised words when speaking to the child because that was what the child himself used. Other mothers were surprised when a child did not know a particular word. One said, when a child failed to identify *thick* and *thin*, "He should know that. We always have *thick* and *thin* bread".

(f) A comparison with general findings from other studies of the lexicon.

Comparison of results from the two samples confirms the existence of a developmental order for the acquisition of the words. This finding is in line with studies concerned both with the present words and with other words (see chapter 3). The positive polar words tend to precede the negative polar words which is, again, a familiar finding, and general terms (*big*, *fat* and *little*) are learned before more specialised terms.

SUMMARY

All children in the research sample understood the relational nature of *big* and *little*.

The general level of achievement in word recognition did not differ significantly between Maori and Pakeha samples although there was a significant difference with regard to performance on *low*. The order of word acquisition measured by ascertaining the number of children able to recognise a particular word was substantially the same for Maori and Pakeha with respect to the two categories of better known words and the rank order of achievement on all words did not differ significantly between the two samples. The pattern of positive and negative markers was the same for Maori and for Pakeha on the better-known words.

The oldest children in each sample performed better than the youngest children which indicates an association, although by no means a straightforward one, with age.

The children in this study exhibited an order of achievement on the tests that was similar to that reported for children in related studies carried out in Scotland and America.

CHAPTER 8

ANALYSIS OF PATTERNS OF RESPONDING TO THE POLAR COMPONENT TASKS

An analysis will be made of the children's patterns of choice on the polar component tasks in order to describe the strategies used in selecting referents for the words presented. It has earlier been noted that one suggestion arising from the semantic feature acquisition hypothesis is to the effect that features act as heuristic devices in the child's elucidation of word meaning. In this chapter, therefore, a variety of strategies including that of polarity will be examined using as data the choice patterns revealed in the polar component tasks.

Choice patterns

The polar component tasks are ones in which the child is asked to select, from a set of three, the *big, long, high,* etc., item, and the *little, short, low,* etc., item.

The choice patterns for the polar component set (items 1-9) have been coded in the following manner:

Code

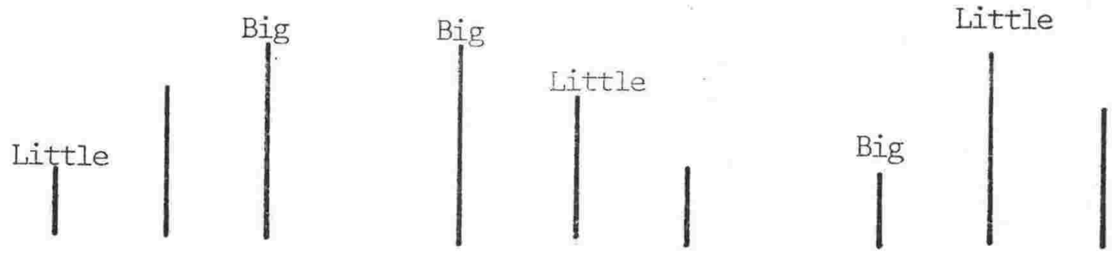
1 (+Pol) applied to big object
2 (+Pol) applied to middle object
3 (+Pol) applied to little object

1 (-Pol) applied to big object
2 (-Pol) applied to middle object
3 (-Pol) applied to little object

Since there are two choices on every item, one asking for the referent for the (+Pol) term, and one asking for the referent for the (-Pol) term the possible choice patterns (using the codes in the order (+Pol) and then (-Pol) irrespective of the order of presentation), and their meanings, are set out below.

Pattern	Interpretation
1,3	Correct use of both polar terms
3,1	Polar terms reversed
1,1	Both terms applied to the big object
3,3	Both terms applied to the little object
1,2	(+Pol) term applied to big object, (-Pol) term to middle object
2,3	(+Pol) term applied to middle object, (-Pol) term to little object
2,1	(+Pol) term applied to middle object, (-Pol) term to big object
3,2	(+Pol) term applied to little object, (-Pol) term to middle object
2,2	Both terms applied to middle object

Below are diagrams illustrating three of the pattern choices.



1,3 — Terms correctly assigned

1,2 — (+Pol) correctly assigned and (-Pol) assigned to (mid)-items

3,1 — (+Pol) assigned to the smallest item and (-Pol) to the biggest item

The distribution of choice patterns for the Maori and the Pakeha samples can be examined in table 8.1. The patterns of choice are arranged according to word pairs. The signs above each word pair indicate whether the (+Pol) term or the (-Pol) term was presented first.

What table 8.1 shows is that there is no statistically significant difference between the Maori and the Pakeha samples for any choice pattern except for pattern 1,1 (χ^2 = 7.01, 1 df, p. <0.01, calculated by comparing Maori 1,1 patterns with Pakeha 1,1 patterns in relation to all incorrect Maori and Pakeha patterns. However, since there were only 31 patterns of this kind out of 689, it seems best not to place much weight on this finding. The most important finding is that on the 1,3 pattern (both choices correct) and the 1,2 pattern (the biggest and the middle object) which together accounted for 479 of the observed patterns, differences were non-significant. The most reasonable conclusion to draw is that choice strategies are similar in the two samples and as measured by the polar component tasks, the two groups of children "think" alike.

Cohen (1969, 829), in discussing conceptual style and culture conflict, says that individuals differ in what they select as salient information in a given stimulus or situation. She is arguing for conceptual differences in children from different cultures. Undoubtedly there are differences. What this present review of strategies has shown, hwoever, is the striking similarity in conceptual style in the Maori and the Pakeha samples with respect to choices made in response to the spatial adjectives. The choice patterns

Table 8.1

The pattern of choices made by the Maori sample and the Pakeha sample in identifying referents for antonymous pairs of adjectives

	"Known" words												"Unknown" words							
	+ Big Little		- Long Short		- High Low		+ Fat Thin		+ Far Near		- Wide Narrow		- Deep Shallow		+ Thick Thin		+ Tall Short		Total	
Pattern	M*	P*	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P
1,3	40	40	20	20	9	25	21	21	23	27	11	12	9	10	5	2	2	5	140	162
3,1	0	0	2	1	3	0	0	0	0	0	1	3	0	1	8	5	2	1	16	10
1,1	0	0	3	1	6	3	0	0	2	0	3	0	7	3	2	0	0	1	23	8
3,3	0	0	0	0	0	0	0	0	1	1	3	0	0	0	2	6	5	0	11	7
1,2	0	0	11	12	18	10	18	19	7	6	3	5	12	11	8	7	16	14	93	84
2,3	0	0	1	2	1	1	0	0	2	1	6	9	3	5	4	6	2	3	19	27
2,1	0	0	2	4	2	1	1	0	0	1	3	3	4	2	5	1	3	3	20	15
3,2	0	0	0	0	1	0	0	0	5	1	7	5	1	0	5	10	10	8	29	24
2,2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
	40	40	39	40	40	40	40	40	40	37	36	37	36	32	39	38	40	35	351	338

Note: Instances in which children refused to respond to one member of the pair or where they chose more than one item have reduced the totals for some word pairs below the expected 40.

* M = Maori sample; P = Pakeha sample

displayed in table 8.1, therefore, will now be discussed for the combined Maori and Pakeha sample.

The first task will be to divide the (+Pol) words into two groups according to how successful the children were in recognising them. If *big* is omitted from consideration because it is so well known and cannot, therefore, shed light on the process of acquisition, the remaining (+Pol) words can be divided into two groups *long, high, fat,* and *far* which will be designated the "known" words, and *wide, deep, thick* and *tall* which will be designated the "unknown" words. There is an element of arbitrariness here in that *deep* is only slightly less well known than *far* but the procedure produces two sets of four words which, on the whole, differ in the degree to which four-year-olds are familiar with them.

In the discussion of choice patterns which follows, reference will be made to the "known" and the "unknown" words meaning, in each instance, the words as listed above.

Table 8.1 shows that

(a) The *biggest-smallest* (1,3) pattern of choice is the most frequent.

(b) The 1,2 pattern, (+Pol) to the big object and (-Pol) to the (mid)-object, is the next most popular pattern.

(c) The (+Pol) terms are more often correctly assigned than are the (-Pol) terms.

(d) There is a bias towards a choice of the big objects.

(e) There is an avoidance of little objects.

(f) The "known" word pairs have most of their wrong assignment in the 1,2 pattern category, whereas the "unknown" words are associated with choices made in most categories of patterns.

Wales and Campbell (1970, 381) have reported the patterns of choice for children performing tasks very similar to the present ones. The Edinburgh results exhibited exactly the same processes as those just listed. The Edinburgh children were presented with 4-item displays and they showed a preference for the bigger rather than the smaller of the middle-sized objects. A similar result emerged when the New Zealand children also made choices from 4-item displays and this will be reported in the next chapter.

Perhaps we can conclude, therefore, that in the absence of other constraints young children have a tendency to "choose the big". Townsend and Erb (1975), discussing the same phenomenon speak of the "more primitive non-linguistic preference for choosing the largest object without interpreting the sentence". This tendency will be referred to as a "perceptual strategy" to distinguish it from other strategies discussed rather than to suggest that this strategy is derived in the course of development solely from perceptual processes. Moreover, the word "strategy" will be used for all determinants of choice whether these arise from conscious or unconscious processes.

Interpretation of the patterns

What other kinds of strategies may the children have used in assigning the polar terms? When the patterns are analysed it can be seen that each one may express either polarity or no polarity;

logical identity or non-identity (A ≠ -A or A=-A); and either 0, 1, or 2 words. The pattern paradigm is set out in table 8.2. At the side of the table is shown the percentage contributed by each pattern to the total of patterns that were not fully correct. The correct patterns have been taken out of the calculations so that the strategies in the process of acquisition may show up more clearly.

Table 8.2

Interpretation of choice patterns

Pattern	Polarity	A≠-A	2 words	1 word	0 words	"Wrong" patterns (N = 360) %
1,3	+	+	+	-	-	.
3,1	+	+	-	-	+	6.9
2,3	-	+	-	+	-	12.3
1,2	-	+	-	+	-	45.6
2,2	-	-	-	-	+	0.3
1,1	-	-	-	+	-	7.7
3,3	-	-	-	+	-	4.6
3,2	-	+	-	-	+	13.7
2,1	-	+	-	-	+	9.0
	2	6	1	4	4	100.0

The children in the sample can be said to be working towards the 1,3 choice pattern, the "correct" one, for each word pair and the 1,2 pattern, the most frequent of the "wrong" patterns, appears to be a stage in this process. The 1,2 pattern implies that the child knows A $\neq$ -A, and he knows 1 word. He does not express polarity.

The next most popular patterns are 3,2 and 2,3. Pattern 3,2 is characterised by A $\neq$ -A, no words correct, and no polarity. Pattern 2,3 is characterised by A $\neq$ -A, 1 word, and no polarity.

The element of identity is the most common constituent of the patterns and must surely be the most basic. Words would appear to be next in frequency as a strategy for guiding choice. The 1,2 pattern, which is a word pattern which does not express polarity, can be compared with the 3,3 pattern which is a polar pattern but with neither word correctly assigned. The polar pattern accounts for only 6.9% of incorrect patterns. This finding gives little support to the idea of a polar strategy arising early in a child's development. However, it may be asked whether the final step from pattern 1,2 to pattern 1,3 is accomplished by a polar strategy. Further evidence on this matter will be presented later in this report.

Double choices and avoidance choices

There has been some discussion about the relationship between the object concept as described by Piaget and a child's linguistic development. Bloom (1973), for example, comments on her daughter's use of the word *there* which, according to Bloom, signified simply the presence of an object. It seems likely that the use of words as symbols is dependent upon this stage of cognitive development being reached. (Sinclair, 1971; Leonard, 1974). In the present project the question of stability of concepts arose in various contexts. For example, some children, especially younger ones, made more than one choice of the "leftovers" when asked to make a second choice. This suggests that the "leftovers" may have constituted a class of non-A items, where A stands for the object or relationship first identified. Also of relevance to whether children's concepts are or are not constant, is that the choice patterns in response to the polar component tasks showed that the children often referred to one object by two mutually contradictory words (they made double choices of the one object), thus suggesting that they did not have a stable concept of the relationship signified by the word. And yet, in other circumstances, the children acted as though they did have a stable concept of a particular relationship expressed by a particular word and avoided assigning a word to an object because they already had a word to match it. Both double choices and avoidance choices will now be examined.

Double choices (one object chosen in response to two terms) were a greater feature of other parts of the test series but there were examples of such choices in this polar section and they are worth examining for the light they shed on the children's way of thinking. Patterns 1,1 and 3,3 are ones in which one object, either the big object in the former pattern, or the little object in the latter pattern, was chosen twice. There are 31 instances of pattern 1,1 and 18 instances of pattern 3,3.

When the (-Pol) term was presented first, children sometimes, but by no means invariably, chose the biggest item. H. Clark (1973a) reports a similar phenonmenon. The distribution for pattern 1,1 (the biggest object chosen twice) shows that when (-Pol) is presented first the perceptual strategy of "choose the big" is often the result irrespective of whether the word concerned is one of the "known" or of the "unknown" set. When the (+Pol) term is subsequently presented, the child often knows it and therefore chooses the (+Pol) item without regard to the fact that he has already chosen that item. That is, his earlier choice does not affect choices later in the series.

An illustration of the 1,1 pattern can be given. When asked for *shallow* 10 children chose the *deep* water and later said the same water was *deep*. It is almost certain that these children did not know the word *shallow* at all, even in some minimal sense, and it would be over-interpreting the data to suggest that, like the Edinburgh children in a *more* and *less* experiment (Donaldson and Balfour, 1968) these children understand *shallow* to apply to a quantity. Some may have known this, but there was much hesitation in answering this item and some children said that they did not know and made a choice only in response to the experimenter urging them to "just try". It seems highly probable that the deep water was chosen for *shallow* because it was perceptually striking or was in some other way more attractive to the child than the shallow water, rather than because any special meaning had been attributed to the word.

Pattern 3,3 (the smallest item chosen twice), on the other hand, tends to occur when an unknown (+Pol) term is presented first. There is some additional information available regarding pattern 3,3. There were only 18 instances of this pattern and 13 of them occurred with regard to the words *thick-thin* and *tall-short*. In items to be reported later it was found that some children believed that *tall* was *small*. Obviously the sound similarities were causing some confusion and the largest number of reversals and substitution of one pole by the other (patterns 3,3; 3,1; and 3,2) occur with the *thick-thin* pair.

Another possible explanation for the 3,3 pattern is that the child avoids identifying the big object because he knows that it is *big* and it cannot, therefore, also be something else. An unknown term will, therefore, be assigned to an object partly by avoiding the known. (Vincent-Smith, Bricker and Bricker, 1974). Avoidance depends on word knowledge but is a lower order strategy than knowing the exact word which applies to a particular object, relationship, or person. Avoidance appears to operate with respect to very familiar words, that is, the child knows well the descriptive term for one or more of the items displayed, even though he does not know the particular word presented. There is asymmetry in that a child is not deterred from making a second choice of one item by the fact that he has already assigned a choice to that item, but that he may be deterred from making a first choice of a particular item if he "knows" that the item is *big*. The difference would seem to arise from the fact that in the first instance he is required to find a referent and in the second instance he finds one spontaneously. Observation of the children's behaviour also suggested that when a situation becomes very confusing, avoidance behaviour is replaced by a perceptual strategy, that is with a strategy of an even lower order.

Word knowledge

It would appear, therefore, that knowledge of a particular word (taking "word" to mean a fusion of form and content) is a higher order strategy which, in tests like the ones given to the children in the study reported in this thesis, helps a child to ignore any lure of size, and overcomes avoidance behaviour where this is inappropriate. However, the present issue is whether, how, and to what extent, knowledge of the (+Pol) term leads to knowledge of its antonym.

The "known" words, all (+Pol) terms, produced 74.5% of the correct pairs (pattern 1,3 with *big-little* responses omitted). These results show that there is a substantial difference between the two sets of words in the success rate for the antonyms. The better known words have better known antonyms. It would seem, therefore, that word knowledge is an important factor in the acquisition of an antonym pair but it is still not clear whether it is knowledge of the (+Pol) term that is the major determinant or whether it is knowledge of the (-Pol) antonym.

The order of acquisition of the (-Pol) terms appear to repeat that of the (+Pol) terms. Most of the former seem to enter the vocabulary about a year to eighteen months later than the matching (+Pol) terms. This may make it appear that a polar heuristic is the determinant. But this is not the pattern for *big* and *little*, nor from the present evidence, is it true of *near* and *far*.

The antonym pair *big* - *little*, or their equivalents, are learnt very early, and diary studies frequently report the use by children just under two years of age, of words to denote relative size. Taine (1971, 24), for example, records that his daughter "calls *bébés* all little figures; for instance, some half-size plaster statues which are on the staircase, and the figures of men and women in small pictures and prints". Sully (1971, 36) notes that, "Children often extend the names *Mamma, baby* to express any contrast of size, as when a small coin was called by an American child a 'baby dollar'". All the children in the present sample used *big* and *little* correctly and in a relative sense, that is, to refer to objects in relation to others rather than to the objects themselves. The early acquisition of this antonym pair obviously does not either form or release a polar strategy for the elucidation of the meaning of subsequently encountered members of the set of spatial adjectives.

In summary, one can say that knowing the (+Pol) terms appears to contribute to success with its antonym but certainly not to the degree one would expect if a polar strategy came into play when the (+Pol) term is acquired.

Effects of order

Does the order of presentation have an influence on the test results? It may be recalled that H. Clark (1970a) suggested that this might have been so in the case of the children's responses in the Edinburgh Cognition Project. (Some evidence on this has already been discussed in connection with double and avoidance choices.) When the (+Pol) term was presented first the percentage of correct responses (1,3 pattern) was 33.1. When the (-Pol) term was presented first the percentage of correct responses given by the combined sample was 36.2. It would seem, therefore, that there is no significant difference according to whether the (+Pol) or (-Pol) term is presented first if this factor is considered in isolation from other factors.

When (+Pol) first presentation was combined with a known word, however, 57.5% of the responses were correct for both poles. When (+Pol) first presentation was combined with an unknown word 8.8% of the responses were correct for both poles. When (-Pol) was presented first with a known word 46.25% of responses were correct for both poles and with an unknown word 25.25% of the responses were correct for both poles.

What this means is that knowledge of one of the words of the pair, in practice, the (+Pol) term, appears to contribute considerably more to success with both items than the order of presentation and this simply provides further evidence for "words" being above "choose the big" in the hierarchy of strategies.

However, these results refer to making a correct choice on both poles. It seems highly likely that at least some of the successes when the (+Pol) term was presented first were indeed due to the strategy of, "When in doubt, choose the big", and the 1,2 and 1,1 pattern choices are probably inflated in this way. This is almost certainly the case with *tall* and *thick* which were identified rather better in this component series than they were in subsequent tests. However, so far as a four-year-old is concerned, the inflation of successful choices owing to (+Pol) first presentation is probably not so great as would be the case with younger children because a four-year-old knows a number of words of the set very well indeed and he will not say, for example, that a particular object is *deep* if he is not familiar with *deep* and if he believes the perceptually striking object to be *big*.

Adjacency

It is common to find that when children are asked to make a second choice after a first one that they choose an item "next-to" the one first chosen. By studying choices for the *fat* - *thin* pair the strategies already discussed will become clearer and it will also be possible to examine the role of adjacency. We know that *fat* was identified correctly by all except one of the children. *Fat* (+Pol) was asked before *thin* (-Pol), the objects were men and not abstract shapes, and the men were arranged in serial order of size. If polarity were operating as a strategy it should work well in this particular instance. However, although 79 children identified the fat man only 42 identified the thin man correctly and 37 identified the (mid)-man as the thin one. One can assume for argument's sake that no child understood *thin* and these results would mean therefore, almost random assignment of choices on the two men left after choosing the fat one. But this argument seems far-fetched, especially in view of the fact that some 25 children identified *thin* in the *thick* - *thin* item using sticks, (+Pol) presented first, although this is certainly not so many as in the item using men. The 37 choices on the middle man and an almost complete lack of choices on pattern options rather than the 1,2 one means, surely, that most of the children identifying the (-Pol) item as *thin* did so because they knew what the word meant. Those who chose the middle man did so because they did not know the meaning of *thin*, because they did not have a polar strategy, and because they were using another strategy altogether. What might this strategy be? The following strategies would seem to explain the children's behaviour on this item.

1. The word *thin* does not refer to the fat man because the

child knows *fat* and the man it refers to. *Thin* must be, therefore, (-*fat*), and the fat man will tend to be avoided.

2. *Thin* must be, ipso facto, one of the remaining two items.

3. The choice for *thin* may then be determined by adjacency (the item next to the item chosen), by overall size of the remaining items, or by matching with the first choice. (For strategies of matching see, Campbell, Donaldson, and Young, 1976).

4. The popularity of the (mid)-item for *thin* supports the idea that adjacency is operating as a strategy but there may be a further explanation. Many children said of the thin man that he was a "little one", suggesting an intuitive processing of objects by means of word knowledge. If children believe the thin man to be *little*, and since *thin* is unfamiliar to most, the little man cannot be *thin* as well. If the child thinks that he knows one of the items, in this instance, the *little* one, then he will avoid this and choose the other one for which he does not know a term. The avoidance choice may also be reinforced by the young child's predilection for choosing the big item in situations of uncertainty and the (mid)-man is bigger than the little man. Avoidance, as a strategy, is used when the word presented is not familiar to the child, and when he does know a word for one or more of the items in the display.

Another reason for discarding the explanation that second choices are based on adjacency is that while children often explained that the little man was "little" none said that the (mid)-man was "next to" the fat man. However, adjacency may well be a lower level strategy used by some children in the item under discussion.

A matching strategy cannot be observed in the test results so far reported because choices were made from 3-item displays. The results from the next set of tests will, however, give an opportunity to study the process of matching.

There is yet another possible explanation for the (mid)-item choice in the *fat-thin* task and that is that the child may not register the unknown adjective and may instead be processing *man*. If this occurred then, having chosen the fat man, the child would choose for *man* the one that looked most normal.

Chance

The possible operation of chance can be gauged by looking at the second choices made by children after a correct first choice. The information will be drawn from table 8.1. If the choices for *big* and *little* are omitted the patterns can be examined for the other word pairs. Table 8.3 shows the distribution of choice patterns in which the first word was correctly assigned. Inspection of table 8.3 shows that there is nothing approaching equal distribution (1,3 patterns were produced 222 times, 1,1 and 3,3 patterns, 8 times and 1,2 and 2,3 patterns 123 times).

Table 8.3

Distribution of patterns in which first word is correctly assigned

(+Pol) presented first	1,3	1,1	1,2
fat-thin	42	0	37
far-near	50	2	13
thick-thin	7	2	15
tall-short	7	1	30
	106	5	95
(-Pol) presented first	**1,3**	**3,3**	**2,3**
short-long	40	0	3
low-high	34	0	2
narrow-wide	23	3	15
shallow-deep	19	0	8
	116	3	28

Even if the 1,3 patterns are omitted on the grounds that word knowledge may have influenced the second choice, there is still a very marked difference between those patterns (1,1 and 3,3) in which the same item was chosen twice, and those patterns (1,2 and 2,3) in which a (mid)-item was chosen following a correct first choice. This result reinforces the earlier findings. Random trial-and-error choices do not seem to be the child's preferred mode of attack. He has a prepared mind, and while his techniques are not those of an adult, they enable him to reach adult understanding.

SUMMARY

In this chapter the patterns of the choices made by the children on the polar component tasks were examined in order to describe the cognitive strategies used to select referents for the words presented. A hierarchy of strategies was suggested: a perceptual strategy "choose the big"; an identity strategy which led amongst other things to avoidance choices; and a strategy based on knowledge of the meaning of the words presented. It was suggested that random choice and choosing adjacent items were not major determinants of the choices.

Evidence was sought for a polar strategy guiding a search for word meaning and particularly for the meaning of (-Pol) terms. There are three main pieces of evidence against the existence of a polar strategy, the most common incorrect pattern choice is one in which the (+Pol) term is correct and the (-Pol) term is identified as the (mid)-item; a reversed polar choice pattern accounted for under 7 per cent of all incorrect patterns choices; and although the children all understood *big* and *little* and applied them correctly, the pattern for these was not transferred to unknown words.

It can be suggested that polarity is not used as a strategy prior to the acquisition of the antonymous pairs and that it becomes available to the child only as the (-Pol) term is learnt and then only with respect to particular pairs of words.

CHAPTER 9

SPACE, VOLUME, DIMENSION, ORIENTATION AND PROPORTION COMPONENTS

All the words of the Bierwisch set are marked with the feature (Space) but most, such as *long*, and *high* are uni-dimensional terms and are marked (1 Space). *Big* and *thick* are marked (*n* Space) because they can refer to (1 Space) or they can refer to more than one dimension. One can talk about a big ball and a big pole, a thick pillow and a thick sandwich. According to Bierwisch's analysis the abstract feature (Space) is processed before the other spatial markers.

The polar component tasks (the results for which were reported in the last chapter) included all 18 words of the Bierwisch set. The component tasks for the features volume, space, dimension, orientation, and proportion, test for a smaller set of words. *Fat* is omitted and although referents for the (-Pol) terms were incorporated in the displays, questions were not asked about them. The (-Pol) terms are, as we have seen, not known very well and testing for these as well as the (+Pol) terms would have made the procedure very wearying for the children.

METHOD

Materials

Whereas the polar component tests consist of sets of three objects varying along one dimension, the rest of the component tests consist of sets of four objects each organised on two features. The models for these items are illustrated below in figure 3. Nearly all the materials consisted of blocks of varying shape and size and

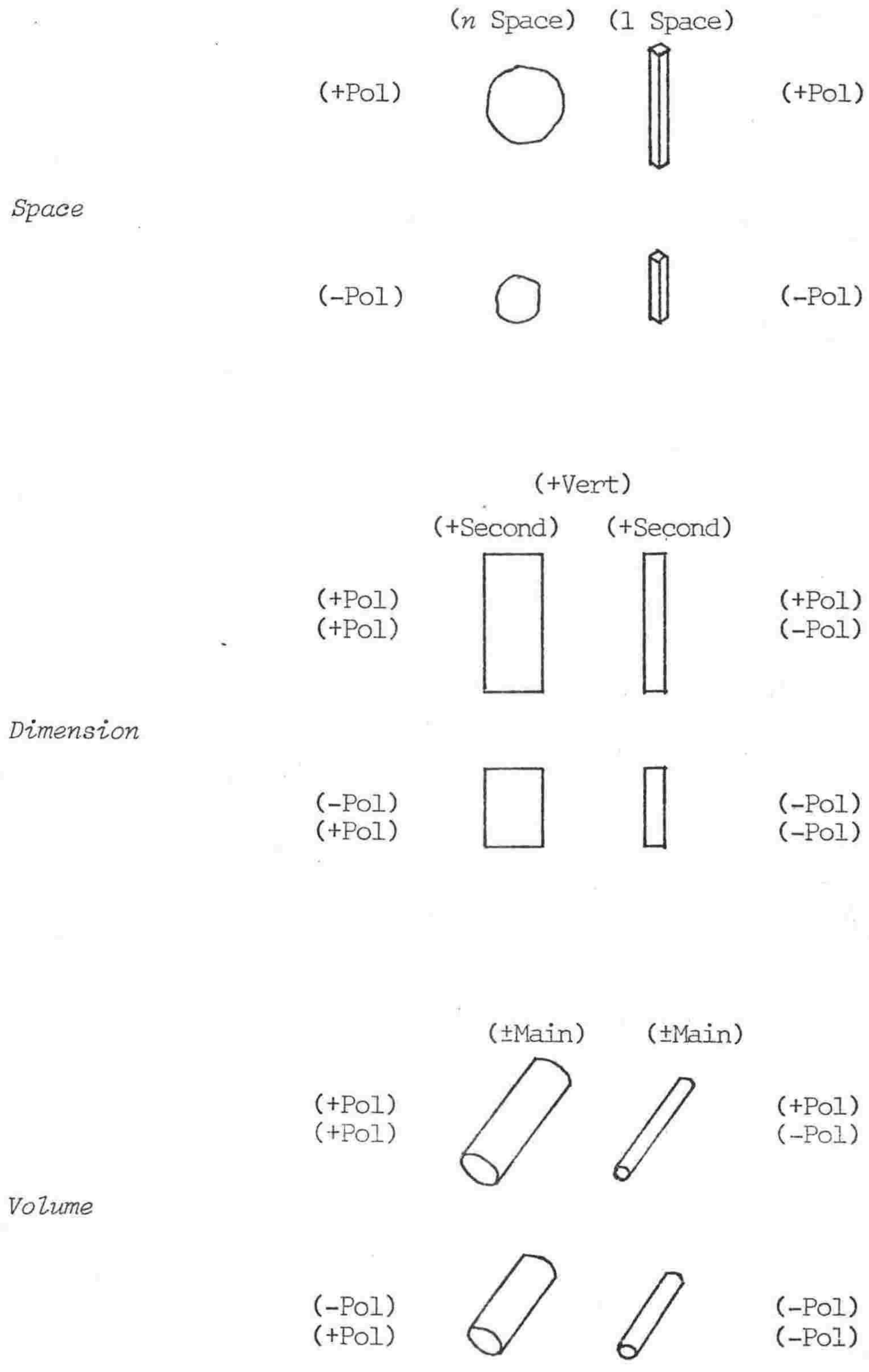


Figure 3 Models for space, dimension and volume component tasks

the blocks for each item were dyed a matching colour. (See appendix C.)

The items were designed to embody contrasts between features. Thus in the (Space) set *big* and *thick* objects were to be compared with *high, long, deep* and *far* objects and each property such as length, height, and so on is shown in both (+Pol) and (-Pol) versions. The dimension tests are of a slightly different kind. The markers (+Second), (+Vert), (+Inherent) and (+Max) serve to distinguish *wide, high* and *long* respectively. The marker (+Vert) implies (-Second) and (-Inherent). The marker (+Second) implies (-Vert) (-Inherent) and (-Max). A full list of the markers for each word would include all the implied negative markers. The marker (+Second), therefore, which is attached to *wide* is in opposition to (+Vert), (+Inherent) and (+Max) which in turn imply (-Second). It can be noted that although the displays for the space, volume and dimension components express polarity the objects do not form scales since there are only two objects expressing each component.

For reasons of length of administration it was not possible to have enough items so that each word might be presented in both a first question or questions and a second question or questions on every opposition. A compromise solution was reached on the basis of findings from the pilot study. Because *big* was known so well it was decided to put *big* in the second question on all items in which it occurred, and because *thick* was known so poorly, it was asked second on all items except one. This procedure meant that for the developing core of the set (*long, high, deep, far* and *wide*) variation in presentation could be arranged.

The number of questions asked with each item depended on the nature of the opposition. It varied from two to four.

The pattern of presentation is shown in table 9.1.

Table 9.1

Pattern of presentation in space, volume, dimension, orientation and proportion tests

	Number of Double Choices	Number of Single Choices	Total Presentations N = 38	Number of times presented first
Big	0	6	6	0
High	3	2	5	4
Long	2	3	6	3
Wide	5	0	5	3
Deep	3	2	5	4
Far	2	2	4	4
Thick	5	1	6	1
Tall	0	1	1	1

Whether or not, for a particular word, two choices of an object are possible depends on the nature of the word, that is, on its sense characterisation.

Using the patterns of the test items it is possible to make two choices for all words except for *big* although there may not be two choices for all words on all oppositions. To make a display exhibiting two items equally big would have broken either the (+Pol) v (-Pol) or the 4-item pattern. The number of double choices and single choices for each word is shown in table 9.1. *Tall* is included in a test item concerned with orientation and two choices would not have been appropriate in this item. An attempt was made to test for the components subsumed under the feature of orientation. These are (+Inherent), (+Observ) and (+Vert). It was not possible to develop these on the 4-item pattern for all oppositions. It is difficult, for example, to develop a 4-item pattern contrasting (+Vert) and (+Observ) that would make sense to a four-year-old. An item was developed to test (+Observ) v (-Observ) by means of two objects (item 26). It was possible to use four objects for (+Inherent) v (-Inherent), (item 27). The (+Vert) v (+Observ) contrast was carried out by means of a somewhat ambiguous picture of two adjoining hills and a valley (item 25), and (+Vert) v (+Inherent) by means of a drawing of three girls one of whom was lying down (item 24) and use of the word *tall*. Items 24, 26 and 27 were satisfactory and the results they produced were illuminating. Item 25 was not a good one but it tries to objectify a contrast which, as already mentioned, is difficult to express unless one considers tunnels or caves at different heights on hills or cliffs.

Proportion component tasks were even more difficult to devise (although the dimensional items imply proportionality) because the contrasts required include *wide* v *deep* in the horizontal plane and *long* v *deep* in the horizontal plane. These oppositions apply only to specialised objects like wardrobes and cupboards. A deep wardrobe is one that goes back a long way. The usage is comparatively rare even among adults. Children are not greatly interested in cupboards and item 28 had little appeal. The words *wide* v *deep* used in this context meant almost nothing to the children. The final contrast *deep* v *long* (item 29) was also exemplified by a picture of cupboards. While nothing definitive about semantic components was expected to come from this particular presentation the item was repeated in the set of implication tasks so that the two presentation modes could be contrasted. Also, an attempt was made to get children to show exactly how the cupboards were *long*, and a matching set of items concerning *long* appeared in the anomaly tests. The test results for *long* in item 29 were omitted from the calculations because *long*, as used in this setting, is anomalous and it was included simply to explore a child's interpretation of the word.

The requirement of choosing two items referred to by a particular word makes many of the tasks in the space, volume, dimension, orientation and proportion series of a different kind from those presented in the polar series in which only one choice was asked for. If a second choice has to be made it will almost certainly be made in relation to a first choice, and hence a child will select some feature of his first choice to match with a feature of another object in this display. An analysis of choice patterns (see chapter 10) reveals the nature of this matching and the strategies that seem to guide four-year-olds in making such choices.

Presentation

The position of the objects was randomised. The child was encouraged to handle all the objects and after they had been put in their correct position by the experimenter, the child was asked the first question, "Show me the long one. The longest one you can see".

When the child had identified an object he was asked to look at them all again and to,"Show me the big one. The biggest one you can see".

From time to time the investigator did not put a particular question to a child. He may have seemed tired or irritable, or he may have made an uncertain first choice and therefore a second choice might only have made him bewildered. Sometimes a child chose not to answer an item. There were a few children who gave double choices (for example, on *big*) when they were asked for only one. Some made two first choices simultaneously in which case both were recorded as first choices. These factors applied to Maori and Pakeha equally, they were not major factors on any particular item except for the later items asking for *thick* where the investigator dropped the second choice question if the first was incorrect. In view of these circumstances the number of responses to each question may be less or occasionally more than 40.

Predictions about order of acquisition

At this stage it is appropriate to consider the nature of the predictions about word acquisition that have been or can be made from a componential analysis. There appear to have been two main approaches: (a) number of markers per word (either value markers or additional features), (b) order of processing.

Eve Clark (1972), for example, says of the acquisition of the words of the Bierwisch set that the "order of acquisition is accurately predicted by the relative semantic complexity of the different pairs" (E. Clark, 1972, 758) and Harner (1975, 864) states Clark's position as, follows, "the primary determinant in developing word meaning is the acquisition of a set of semantic features". E. Clark (1972) supplies the following scheme of word pairs and markers.

big - small	*n* Space		
tall - short *high - low*	1 Space	+Vert	
long - short	1 Space	-Vert	
wide - narrow *thick - thin* *deep - shallow*	1 Space	-Vert	+Second

The order of acquisition is then predicted by Clark on the basis of the above scheme which makes it appear as though the bottom three pairs have more markers than the other pairs. Clark is using the Bierwisch analysis and if it has been modified there is no acknowledgement of this. In fact, in the Bierwisch system all the words except for *long* have three markers and *long* has four. Clark gives the marker (1 Space) for *thick* but Bierwisch offers the reading (*n* Space) for *thick* and the only marker that distinguishes *big* from *thick* in his scheme is (±Main). *Thick* can be used of a door (the example given by Clark) but also of items such as poles, pillows and cushions. The Bierwisch system is parsimonious and almost all markers, except (-Main) for *thick* and (-Inherent) for *far*, are positive on the adjectives, the assumption being that positive markers will block competing markers on the same level. If a prediction about word aquisition is to be made on the basis of number of components per word then *long* with four markers in the Bierwisch analysis should be harder to acquire in its full sense than all the other words.

On the whole, however, Bierwisch's analysis cannot predict an order of difficulty of word acquisition based on semantic complexity but since Bierwisch arranges the features in four processing levels, the words *big* and *thick* which appear only on the three top levels of the tree structure should be fully learnt before the rest of the set, if processing order equals acquisition order, and *big* should equal *thick* in difficulty since it differs in meaning only by a value difference on one feature (Main).

Analysis of the tests

It is apparent both from the present research and from the work of others that *big* is a very early acquisition, that *long* is an early acquisition, and that *thick* is a late acquisition. Perhaps then it would be more helpful to try to derive predictions about order of acquisition from an examination of the tests. The tests represent, in concrete form, the facts about language embodied in Bierwisch's analysis. What follows is based on an analysis of referents of the target words as these were objectified in the test materials.

Big is obviously an easy word. The objects to which it refers are perceptually salient and also, in any one display, there is only one type of object to which *big* can be applied and that is the biggest object in relation to all the objects. *Little* is a word of a similar kind. All the other words of the set however can apply to objects varying in size. High objects, for example, can be equally high but vary in width or bulk. There is a greater range of objects in any display which can be called *long* or *high* or *wide* or *deep* than can be called *big*. While this may increase a child's chances of selecting one of these correctly it may make it more difficult for him to learn the range of application from the truth value of his selections. In choosing *big* for a second time the child is required to make two perceptually similar choices but *long* objects varying in overall size and so do *high* objects and *wide* objects. *Big*, therefore should be easier to recognise in the displays than the specialised dimension words.

The markers (3 Space) and (1 Space) in the tests, represent a simpler distinction than do the volume markers (±Main) which when contrasted make a distinction in which the phenomenon being distinguished may be both (+Pol) and (-Big) with respect to one object as is the case with *thick*. The space distinctions are also simpler than the distinctions of the dimension set of tests. In the dimension tests two items involving *wide* entail applying two (+Pol) terms to one item and perhaps taking into account an additional marker, either (+Vert) or (+Max) (the greater axes) before *wide* can be identified. Like *thick*, a wide object is (-Big) in relation to the measure of the maximal axis but (+Pol) with respect to *narrow*. In other words it may be difficult for a child to assess the polarity of the *wide* dimension of an object. Although *high*, for example, implies not-*long* (that is, an object has a correct designation of either *high* or *long* but not both for the one dimension) *high* does not imply not-*wide* because an object can be both *high* and *wide*. It can also be both *long* and *wide*. A child who learns *wide* has to be able to be able to distinguish it in four special contexts, high and wide, low and wide, long and wide and short and wide.

Deep in the horizontal plane is both a rare usage and difficult to distinguish from the other words referring to horizontal measures, *wide* and *long*, as mentioned above.

The analysis of the tests just given suggests the following order of difficulty:

Big < all other words

Wide > high, long

Thick > big, high, long, deep, wide, far

Big = little

High = long

Deep (horizontal) > every other word

The resulting word order should be *big* and *little*, *high*, *long*, *deep* (vertical), *wide*, *far*, *thick*, *deep* (horizontal). We have already observed an order of somewhat this kind in the polarity tests and in this chapter we will observe whether the order is retained in situations requiring different discriminations.

RESULTS

The results for Maori and for Pakeha samples respectively are summarised in table 9.2 and table 9.3. The scores for each word on each of its tests are arranged in levels according to the Bierwisch analysis. All results are entered into the table except for *long* in item 29 in which *long* was used anomalously. In item 25 *deep* was used anomalously but a number of children realised this and said that there was nothing deep in the picture shown. The results were, therefore, included in the comparison of the two groups, but were omitted from the analysis of features.

Table 9.2

Maori sample's scores on words for each component test
(N = 40)

Feature	Word *Big*	*Long*	*Wide*	*High*	*Deep*	*Far*	*Thick*
Polar (+Pol)	(1) 40	(2) 34	(3) 19	(4) 33	(5) 32	(6) 31	(7) 17
Space (3 Space) (1 Space)	(10) 26 (11) 27 (12) 12 (13) 40 (14) 30	(10) 30 (16) 32	(12) 6 (17) 13	(11) 36 (15) 28	(14) 7 (19) 16	(13) 36 (20) 29	(15) 5 (16) 1 (17) 4 (19) 12 (20) 5
Volume (±Main)	(18) 36						(18) 4
Inherent (±Inherent)		(22) 25 (27) 32				(26) 22 (27) 31	
Ovserver (+Observ)					(25) 4 (28) 4 (29) 29		
Vertical (+Vert)				(22) 34 (23) 34 (25) 34			
Maximal axis (+Max)		(21) 34					
Second Dimension (+Second)			(21) 6 (23) 5 (28) 3				

Note:

(a) Bracketed numbers are test item numbers
(b) Features are arranged in Bierwisch's (1967) processing levels
(c) Only (+Pol) terms analysed by Bierwisch are presented
(d) Results for *long* (item 29) are omitted

Table 9.3

Pakeha sample's scores on words for each component test
(N = 40)

Feature	*Big*	*Long*	*Wide*	*High*	*Deep*	*Far*	*Thick*
Polar (+Pol)	(1) 40	(2) 34	(3) 20	(4) 38	(5) 30	(6) 33	(7) 9
Space (3 Space) (1 Space)	(10) 23 (11) 18 (12) 9 (13) 40 (14) 35	(10) 32 (16) 37	(12) 10 (17) 20	(11) 34 (15) 32	(14) 12 (19) 16	(13) 33 (20) 34	(15) 5 (16) 3 (17) 6 (19) 10 (20) 9
Volume (±Main)	(18) 35						(18) 12
Inherent (±Inherent)		(22) 16 (27) 32				(26) 27 (27) 35	
Observer (+Observ)					(25) 8 (28) 2 (29) 26		
Vertical (+Vert)				(22) 35 (23) 31 (25) 39			
Maximal axis (+Max)		(21) 33					
Second Dimension			(21) 13 (23) 20 (28) 12				

(The column heads *Big* to *Thick* are grouped under the heading "Word".)

Note:

(a) Bracketed numbers are test item numbers
(b) Features are arranged in Bierwisch's (1967) processing levels
(c) Only (+Pol) terms analysed by Bierwisch are presented
(d) Results for *long* (item 29) are omitted

Zubin's t was calculated for Maori and for Pakeha performance on the presentation or presentations of each word. There was a difference at the 0.01 level on *long* (v *high*) in favour of the Maori group. There was a difference significant at the 0.01 level on *wide* (v *high*) in favour of the Pakeha group.

The interpretation of these results raises two issues. In a series of 20 displays, 38 presentations of a word and over 60 questions one would expect some significant differences to emerge merely by the operation of chance. On the other hand, on most items the children had to answer two questions correctly and this procedure reduced the chances of achieving the correct response by random choice. Perhaps, however, one should err on the side of caution and accept only the Pakeha superiority on *wide* (which emerged in two separate items) as being a significant difference. However, one can also suggest that the superiority of the Maori group on *long* (v *high*) does not give any support to the idea that the semantic markers of the spatial adjectives in the Maori language contribute to a confusion of *long* and *high*.

Table 9.4 shows the achievement on word recognition for the space, volume, dimension, orientation and proportion components. The possible total for each child is 37. The range in the Pakeha sample was from 10 to 30 and in the Maori sample from 11 to 25. The mean of the Maori scores is 18.58, s = 3.78 and the mean of the Pakeha scores is 20.18, s = 4.53, t = 1.72, 78 df, ns for two-tailed test.

Table 9.4

Achievement on word recognition on the space, volume, dimension, orientation and proportion components

Number of items correct	Maori (N = 40)	Pakeha (N = 40)
30	0	1
29	0	1
28	0	1
27	0	1
26	0	0
25	1	2
24	1	3
23	4	2
22	2	4
21	4	4
20	8	4
19	4	2
18	4	4
17	2	4
16	2	2
15	1	0
14	1	2
13	2	1
12	1	1
11	3	0
10	0	1

Success rate on space, volume, dimension, orientation, and proportion series calculated by determining the average score for each word, and rank of words are shown in table 9.5. (Scores are shown in tables 9.2 and 9.3). Results for *tall* (item 24), *deep* (item 25) and *long* (item 29) have been omitted. Inspection of the table shows that the rank orders of the average scores for words are similar although not identical in the two samples.

Table 9.5

Success on space, volume, dimension, orientation, and proportion series and rank order of words

	Maori (N = 40) $\overline{X}$	Rank	Pakeha (N = 40) $\overline{Y}$	Rank
Big	28.5	4	26.7	4
High	33.2	1	34.2	1
Long	30.6	2	30.0	3
Far	29.5	3	32.3	2
Deep	14.0	4	14.0	6
Wide	6.6	5	15.0	5
Thick	5.2	6	7.5	7

The success rate on each word for the Maori and Pakeha samples combined is shown in table 9.6 in which the polar series and the space, volume, dimension, orientation and proportion components are compared.

Table 9.6

Success rate and rank order on the polar series compared with that of the space, volume, dimension, orientation and proportion series measured on the combined sample

(N = 80)

	Polar $\overline{X}$	Rank	Space, volume, dimension, orientation and proportion $\overline{Y}$	Rank
Big	40	1	27.6	4
High	35.5	2	33.7	1
Long	34	3	30.3	3
Far	32	4	30.9	2
Deep	31	5	14.0	5
Wide	19.5	6	10.8	6
Thick	13	7	6.4	7

A Kendall rank correlation coefficient was calculated for the rankings on the polar series and the space, volume, dimension, orientation and proportion series shown in table 9.6 (τ = 0.52, p. = 0.07). The rank orders, therefore, do not reach a correlation of an acceptable level, and the two series do not appear to be closely linked. Reasons for this will now be put forward.

There are a number of things which can be noted in the figures shown in table 9.6.

(a) The success rate is lower on all words in the space, volume, dimension, orientation and proportion series than in the polar series.

What this finding suggests, therefore, is that testing for polar oppositions, without further testing, tends to produce success rates for particular words which do not hold up when other types of semantic contrast are tested. Individual children who score well on (+Pol) v (-Pol) contrasts may not be so successful on others. The finding also supports the view that children acquire word meanings in bits.

(b) *Big* which was known by all children in the polar series appears in 4th rank in the space, volume, dimension, orientation and proportion series. It must be pointed out again that *big* was presented second in all the test items of this series whereas it was presented first in the polar series. Moreover, there were 6 items in the space, volume, dimension, orientation and proportion series which required the child to recognise a big item, whereas there was only 1 item in the polar series. Nevertheless, it can be said that *big* is not completely known by these children and that they tend to confuse it with *high, long* and *deep.*

In the case of *big,* at least, the semantic marker (+Pol) is not attached in a manner that makes it available in all circumstances and hence one is not justified in saying that a four-year-old "has" (+Pol) for all words; or even, in all circumstances, for the one well-known word *big.* To suggest that the child "loses" the (+Pol) marker does not make sense either. What occurs is that he chooses the biggest item when the contrast is with *little* but that he may not choose the biggest item when the contrast is with *high* or *long* objects which are themselves *big* with respect to other objects. Put this way it can be seen that the child is not equipped with abstract markers for words but with hierarchies of discriminations. In a *big* v *high* contrast he probably decides which series, *big - little, big - high* he should concentrate on.

(c) There are much larger drops in the success rate of *deep, wide* and *thick* than there are for *big, high, long,* and *far.* The drop in *deep* is caused in part by the difficulty of the horizontal meaning of *deep* (as used of cupboards).

This suggests that the words of the set differ among themselves in difficulty of meaning and that this may have little to do with the nature of a marker. Thus *wide* and *thick* are both marked (+Pol) but there is obviously very much greater difficulty in acquiring such a marker for *wide* and *thick* than for *high* and *long.*

(d) The predictions based on an analysis of the task materials about the order of word acquisition given earlier in this chapter agree reasonably well with the order of achievement on the polar word recognition series but become less convincing when the order derived from the space, volume, dimension, orientation, and proportion series is examined. The main reasons for this are that *big* does not hold its own in the presence of *high, long,* and *deep,* and that *deep* has two main kinds of meaning, one connected with water and the other not so connected. Young children start with the water meaning. Thus, the importance of context, or, in logical terms, extension, is shown. The predictions based on Bierwisch's order of processing seem wide of the mark as does the one based on number of markers per word.

Word recognition measured on all component tasks

In table 9.7 are shown the average number of successful responses for each (+Pol) word measured over all tests of the component series. The words fall into two groups. In the first group are *big, long, high* and *far.* In the second group are *deep, wide* and *thick.*

It can be seen from inspection of table 9.7 that the rank orders of the Maori and of the Pakeha samples are substantially the same. There is no evidence that one group or the other performs markedly better on all items or on some features on all items.

Table 9.7

<u>Achievement on (+Pol) words measured on all component tests</u>

	Maori (N = 40)				Pakeha (N = 40)					
	(+Pol)	Other Components	All Components	Rank	(+Pol)	Other Components	All Components	Rank	Total	Rank
Big	40	28.5	34.3	1	40	26.7	33.4	2	33.8	2
Long	34	30.6	32.3	3	34	30.0	32.0	4	32.2	3
Wide	19	6.6	12.8	6	20	15.0	17.5	6	15.2	6
High	33	33.2	33.1	2	38	34.2	36.1	1	34.6	1
Deep	32	14.0	23.0	5	30	14.0	22.00	5	22.5	5
Far	31	29.5	30.3	4	33	32.3	32.7	3	31.5	4
Thick	17	5.2	11.1	7	9	7.5	8.3	7	9.7	7

The main difference between the two samples is with respect to *wide* on the marker (+Second). Since (+Second) marks only *wide* it is uncertain whether this result is due to a difference in feature acquisition or to a difference in word acquisition. However, a glance at tables 9.2 and 9.3 above shows consistent differences between Maori and Pakeha of a roughly similar order for *wide* on both the (Space) and the (+Second) tests. This suggests very strongly that the word has something to do with these differences. Since Maori and Pakeha performed almost equally on *wide* in the (+Pol) test and, since they performed at a higher level than they did in the subsequent tests for *wide*, it can be suggested that the strategy of "choosing the big" helped both groups to produce the results in the polar series. Did the children, then, not really "know" the meaning of *wide* even when they chose correctly in the *wide* - *narrow* test? The argument that will be brought forward in this thesis is that such children are beginning to know *wide* and that the ability to "choose the big" is the start of such knowledge.

Ease of discrimination

What determines the ease with which one word is discriminated from another? Table 9.8 suggests that four factors are operating in determining the ease of discrimination. We shall confine our illustrationsto contrasts with *big*.

Table 9.8

Number of total sample able to correctly assign a word in a display representing also another word

(N = 80)

Target words	Represented words						
	Big	High	Long	Deep	Far	Wide	Thick
Big	–	45	49	65	80	21	71
High	70	–	69	73	–	65	60
Long	62	41	–	–	64	67	69
Deep	19	12	55	–	–	6	32
Far	69	–	66	–	–	–	63
Wide	16	25	19	15	–	–	33
Thick	16	10	4	22	14	10	–

Note: The results from item 29 asking for *long* have been omitted because this word was anomalous in the context presented. The results from item 24 (*tall*) and item 26 (*far*) have also been omitted because in these items neither word was in opposition to another.

(a) The situation of words within a semantic field. A word within a semantic field is more likely to be difficult to discriminate from other words within a field than from words outside the field. It seems likely that *far*, for example, is at best only a marginal member of the space set and as such is easily distinguished from *big* and vice versa.

(b) It is easier to discriminate one word from another if that word is known and the other is not. It is harder to discriminate one word from another if that word is unknown and

and the other is known. The *big* v *thick* discrimination seems to follow this pattern. *Thick* v *deep* in item 18 appears to be an exception but the display for this item consisted of two pieces of foam rubber, a china bowl and a china dish and the unfamiliar setting probably meant that *deep* "lost" its meaning.

(c) The closer the appearance of the objects to be discriminated the more difficult it is to discriminate them. *Big* v *wide* illustrates this principle.

(d) Two words within a semantic field both of which are well known and both of which refer to the same pole, are likely to be similar in ease of discrimination that is, be mutually discriminable. *Big* v *high* and *big* v *long* appear to fit this pattern and *big* v *deep* should, if this analysis is correct, develop towards a more even level of discrimination on both items. One would expect these pairs of words to develop from a level of partial discrimination to one of full discrimination.

Words, such as those in the set under study, are learnt with reference to each other.

It can be seen from the above discussion that the factors operating appear to be *perceptual*, *word knowledge* (in the sense of knowledge of referents), and relationship to other words in a *semantic field*.

Implications

The implications of this table and the previous one are that features, if they exist as psychological entities, cannot be "attached" to, or mark, words in the sense suggested by the semantic feature hypothesis since they appear to work unreliably and alter according to situational context. Certainly one could suggest that features are being acquired (that is, attached to words) and that at this stage they are unstable. But if this were the case, instability in word meaning might be explained by a mechanism such as shared markers (cf. the "modified semantic feature hypothesis" of Brewer and Stone, 1975). All the words of the space set share the space and polar features. But one can note the ease of discriminating *long* from *far* which are separated only by value on the marker (Inherent) according to the Bierwisch analysis. Much of the shifting of meaning as the (+Pol) words are acquired seems to be caused not by acquiring shared features of meaning but by passing from a stage of meaning in which a word's similarity to *big* is the criterion to the stage in which difference from *big* also has to be considered. One can see how a growing knowledge of other words might then bring about incorrect responding whereas at an earlier stage children had been responding correctly (see Donaldson, 1971, for an illuminating discussion of the correct - incorrect - correct developmental pattern).

Achievement on features

The levels of achievement on each feature are shown for Maori and for Pakeha samples in table 9.9. The average score for each feature has been calculated on the data in tables 9.2 and 9.3.

Table 9.9

<u>Achievement on features and rank order of features</u>

Features	Maori (N = 40) $\overline{X}$	Rank	Pakeha (N = 40) $\overline{Y}$	Rank	Combined Sample Total (N = 80)	Rank	Bierwisch order of processing
(Pol)	29.4	3	29.1	3	58.5	3	1
(Space)	19.8	6	20.9	6	40.7	6	2
(Main)	20.0	5	23.5	5	43.5	5	3
(Inherent)	27.5	4	27.5	4	55.0	4	4 =
(Observ)	16.5	7	14.0	8	30.5	7	4 =
(Vert)	34.0	1=	35.0	1	69.0	1	4 =
(Max)	34.0	1=	33.0	2	67.0	2	4 =
(Second)	4.7	8	15.0	7	19.7	8	4 =

A t test calculated on the means of the Maori and Pakeha distributions shown in table 9.9 produced t = 0.5 which is statistically non-significant. In the ranks for the combined sample one can see the discrepancy between Bierwisch's processing order and the achievement order.

It may be objected that the feature (+Vert), for example, involves fewer tests than (+Pol) and that perhaps, therefore, it should be easier to perform well on tasks involving this feature. In answer it can be said that the tests followed the oppositions postulated in the Bierwisch analysis and that these are supposed to show the oppositions in natural language use and processing.

The score of each sample, Maori and Pakeha, was compared with that of the other sample on each feature. On one feature (Second) the difference almost reached statistical significance (Zubin's t = 0.40, which does not quite reach the 0.05 level of probability). There is less difference between the two samples when the clusters of tests are combined (as they are in the analysis of features), than when a particular word is tested in a particular setting and hence this may lead to a spurious notion that there is some universal underlying entity whereas all one is looking at is an evening out of variance.

Rank order of features

Inspection of the Maori and the Pakeha orders of features in table 9.9 shows differences of only one place on three ranks.

SUMMARY

The general level of achievement in word recognition on the series of contrasts on space, volume, dimension, orientation, and proportion components did not differ significantly between Maori and Pakeha samples although there was a difference significant at the 0.01 level of probability in favour of the Pakeha sample with the word *wide* when it was placed in opposition to *high;* and a difference at the 0.05 level of probability in favour of the Maori sample with the word *long* when it was placed in opposition to *high.*

The order of word acquisition measured by ascertaining the number of children able to recognise a particular word in all its presentations was similar although not identical in the two samples.

The success rate was lower for all words in the space, volume, dimension, orientation, and proportion series than in the polar series.

The order of acquisition as measured by achievement on the space, volume, dimension, orientation, and proportion series differed from that measured on the polar series. The polar series results agreed better with predictions, based on analysis of the task materials, made about the order of acquisition.

When performance on features was compared no difference between the two samples reached statistical significance and the two means were not significantly different.

The rank order of performance on features was substantially the same for the two samples.

The results suggested that there was little support for the idea of semantic features as determinants of word acquisition.

CHAPTER 10

ANALYSIS OF PATTERNS OF RESPONDING TO THE SPACE, VOLUME, DIMENSION, ORIENTATION AND PROPORTION TASKS

In this chapter the responses will be analysed in a manner similar to the earlier examination of the polar tests. If the item involved two presentations of the word a child's response was marked correct only if he chose the correct objects on both presentations. In the following account the word which was presented first is listed first and the Maori and Pakeha patterns are shown separately.

SPACE COMPONENT

Table 10.1

Pattern of responding for *long* v *big*

						Total Correct*
Maori	*long*	30	2	8	0	30
	big	13	1	26	0	26
Pakeha	*long*	33	0	6	1	32
	big	17	0	23	0	23

* Discrepancies in the totals in this and subsequent tables may appear because of a child making either an extra choice, for example, by choosing two *long* objects, or of omitting a choice option.

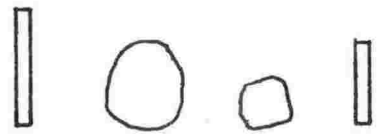
Item 10 *long* v *big:* (1 Space) v (*n* Space) (table 10.1)

One can note the avoidance of little objects in the choice patterns.

Among these children a long object is more likely to be called *big* than a *big* object is to be called *long*.

Table 10.2

Pattern of responding for *high* v *big*



						Total Correct
Maori	*high*	1	2	1	36	36
	big	0	27	0	12	27
Pakeha	*high*	1	4	0	35	34
	big	1	19	0	21	18

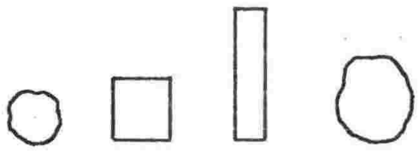
Item 11 *high* v *big:* (1 Space) v (*n* Space) (table 10.2)
The children in the Pakeha sample were more likely than the Maori sample to make a double choice on the (1 Space) object, that is, to call a long object both *long* (1 Space) and *big* (*n* Space) and a high object both *high* (1 Space) and *big* (*n* Space).

An examination of the choice patterns in the protocols of individual children for items 10 and 11 shows that there were 17 children who failed to identify *big* as the (3 Space) globular object when it was in contrast with (1 Space) *high* and, similarly, when it was in contrast with (1 Space) *long*. There were, on the other hand, only 3 children who failed *big* when it was in contrast with *high*, but not when it was in contrast with *long*, and 2 children who failed with *big* when it was in contrast with *long* but not when it was in contrast with *high*. The question with *long* preceded the one with *big*. It would appear, therefore, that the confusion exists with respect to the linear objects rather than with verticality as such.

It may be suggested that a double choice strategy, that is, being able to place two choices on the one object, precedes acquisition of meaning. An examination of double choices in the two preceding items as well as in subsequent ones showed that double choices occur mainly as a result of knowledge of a word for an object. This supports a similar finding from the 3-item polar series.

Table 10.3

Pattern of responding for *wide* v *big*



						Total Correct
Maori	*wide*	4	15	17	5	
	wide	5	8	8	2	6
	big	2	0	26	12	12
Pakeha	*wide*	4	17	15	4	
	wide	2	3	8	6	10
	big	0	1	30	10	9

Item 12 *wide* v *big:* (1 Space) v (*n* Space) (table 10.3)
In this display the bulk of the high object was increased relative to the high object in the earlier item, and the wide object was smaller than the high object. In the distribution of responses one can see the confusion produced by this pattern of objects. A child was scored correct if it chose the second

object from the left, or the second object and the fourth object (which had a diameter of the same size as the width of the block second from the left).

The children sought the "linear" objects in their choice of *wide*. This finding reinforces the conclusions drawn from the results from the two previous items that the children used a linear (1 Space) definition of the dimensional terms. Twelve children who identified *wide* correctly, failed with *big* and 17 children who identified *big* correctly failed with *wide*. The interpretation that will be placed on this finding is that young children have difficulty in working out the relationships between *wide* and *big* and, whereas *high* and *long* are "a kind of *big*", *wide* to a child may appear in some circumstances as "a kind of *big*" and in others as "a kind of *little*". This conforms with the explanation for difficulties with *wide* given in chapter 9 on the basis of an analysis of the test materials. The increased width of the *high* object (in comparison to the object used in the previous presentation, item 11) induced a greater proportion of children to say that it was *big* in comparison with the global (3 Space) *big* object. Perhaps, as Bausano and Jeffrey (1975) say, it is the relative difference in size which catches the child's attention and not absolute size. Augmentation of width in the vertical item accounted for a substantial increase in choices of *big* falling on the tall object in comparison with the choices made for item 11.

The results given so far suggest that *wide* is just beginning to be learnt and hence it is a good word with which to study the strategies of its selection. These strategies appear to be as follows:

(a) avoid the global (3 Space) object and choose one of the others

(b) avoid the little object

(c) choose the (2 Space) objects, that is the rectangular or "linear" ones

(d) of the (2 Space) items choose either

  (i) the perceptually bigger, or

  (ii) avoid the *high* object and choose the smaller, or

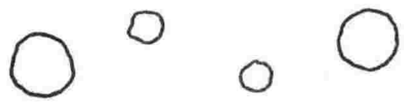
  (iii) if the word *wide* is known choose the small wide object.

The two dimensional object necessitated by the secondary dimension increases the overall bigness of the object but the *wide* dimension is the small measure relative to *high* or *long*.

The simplest explanation for the developmental delay in comprehending *wide* is that the child does not find it easy to distinguish from *big* and *little*.

Table 10.4

Pattern of responding for *far* v *big*



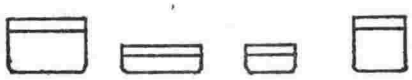
						Total Correct
Maori	*far*	2	1	14	28	
	far	1	1	22	9	36
	big	31	0	0	11	40
Pakeha	*far*	1	2	12	26	
	far	3	4	24	8	33
	big	27	0	0	16	40

<u>Item 13</u> *far* v *big:* (1 Space) v (*n* Space) (table 10.4)
Four-year-old children usually comprehend *far* and they can distinguish it very clearly from *big*. This is so much so that the two *far* objects, one big and one little, were chosen at random by both groups of children. Thus the *big* - *little* core which acts as an anchor for other words of the set has no such effect with *far*. The big objects, however, were selected more often in the near position than they were in the far one.

Having identified the *far* objects the next choice, *big*, was carried out on the principle of avoidance by the majority of the children and they chose the big object not yet selected. The children knew both words in the test item with a considerable degree of definition and the preponderance of avoidance choices suggests that there is a tendency, when selecting from a series of objects, to select unchosen objects in preference to previously chosen ones unless there are countervailing influences. Again, this strategy was noted in the analysis of the polar items.

Table 10.5

<u>Pattern of responding for *deep* v *big*</u>



						Total Correct
Maori	*deep*	32	3	2	3	
	deep	5	27	1	4	7
	big	30	5	0	4	30
Pakeha	*deep*	30	2	2	10	
	deep	4	21	4	8	12
	big	35	0	1	4	35

<u>Item 14</u> *deep* v *big:* (1 Space) v (2 Space) (table 10.5)

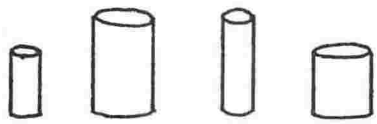
The testing of the *deep* v *big* opposition is again, an interesting one, since although *deep* is reasonably well known as applied to a quantity of water it is not fully separated from *big*. Sixty-two children first identified the pictured tank that was deep and big as *deep*. The most popular second choice for *deep*, however, was the long and low tank rather than the deep and narrow one. It would seem that *deep* is closely related in the four-year-old's mind with *big*. It is likely too that a degree of confusion led many children to an adjacency response for the second object.

The most interesting effect of the interaction of *big* and *deep* is shown by the fact that when the children were asked to indicate the big tank, 13 of them avoided the deep and big tank already chosen for *deep* although in earlier items we have seen considerable accuracy in the choice of *big* in varied settings.

This test was carried out by means of a picture and the objects pictured were explained to each child before the questions were asked. Nevertheless, it is possible that the picture form increased the difficulty of the task and it would be wise to repeat the test for this particular opposition with real objects in order to confirm or refute the present results.

Table 10.6

<u>Pattern of responding for *high* v *thick*</u>



						Total Correct
Maori	*high*	0	34	6	0	
	high	2	5	23	10	28
	thick	13	4	7	15	
	thick	10	1	2	5	5
Pakeha	*high*	0	35	7	0	
	high	1	5	25	7	32
	thick	13	4	8	15	
	thick	11	2	2	5	5

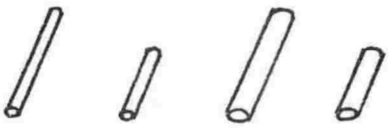
<u>Item 15</u> *high* v *thick:* (1 Space) v (*n* Space) (table 10.6)

The most popular first choice for *high* was the high and thick object. Seventy-nine children chose the biggest object. The second choice of *high*, however, produced only 48 responses on the high and thin object. That is, there were practically no errors on the first choice of *high* but there were errors on the second one. These data reinforce the point that has been made before that *high*, for young children, is a form or variety of *big*. Success on the first question is, therefore, probably due in part to a knowledge of *big*.

The second interesting thing about these results is the deflection of *thick* choices on to little objects.

Table 10.7

Pattern of responding for *long* v *thick*



						Total Correct
Maori	*long*	13	2	25	1	
	long	21	3	11	3	32
	thick	2	16	3	16	
	thick	2	12	1	3	1
Pakeha	*long*	11	2	26	0	
	long	27	0	11	1	37
	thick	1	19	5	12	
	thick	2	9	2	3	3

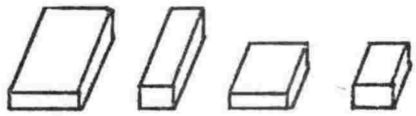
Item 16 *long* v *thick:* (1 Space) v (*n* Space) (table 10.7)

The tasks with *thick* were originally set up to test for volume as well as space but because *thick* was so poorly known only the opposition in which it is presented first has been considered from the point of view of volume and the remainder have been treated solely as space contrasts. In this and subsequent items involving *thick*, those children who did not answer *thick* correctly on the first presentation were not asked for *thick* a second time.

Long was asked for first. The pattern is substantially the same as for the previous item and shows a preference for the big and long object on the first choice and deflection of *thick* by avoidance on to unused objects. The second choices seem marginally closer to adult choices than those in the *high* v *thick* opposition.

Table 10.8

Pattern of responding for *wide* v *thick*



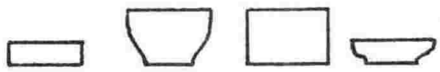
						Total Correct
Maori	*wide*	19	7	10	3	
	wide	6	14	11	3	13
	thick	4	8	11	11	
	thick	4	1	2	5	4
Pakeha	*wide*	20	5	12	4	
	wide	8	9	17	2	20
	thick	4	14	6	13	
	thick	3	5	2	9	6

Item 17 *wide* v *thick:* (1 Space) v (*n* Space) (table 10.8)

The most interesting thing about this opposition is that the spread of choices is broader than is the case with previous items. One would, of course, expect this with two words both of which are largely unknown to a four-year-old. One can note however, the avoidance of the very small object for *wide* and the avoidance of the biggest object for *thick*. There was a greater number of successes with *wide* with this particular set of objects than with other objects testing for *wide* presumably because of its coincidence with big items.

Table 10.9

Pattern of responding for *deep* v *thick*



						Total Correct
Maori	*deep*	2	22	14	3	
	deep	8	3	14	6	16
	thick	9	8	13	7	
	thick	8	0	1	2	12
Pakeha	*deep*	0	23	16	0	
	deep	9	3	6	7	16
	thick	19	2	10	7	
	thick	7	1	2	2	10

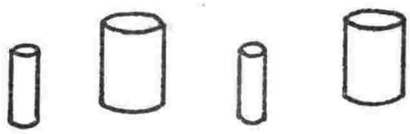
Item 19 *deep* v *thick:* (1 Space) v (*n* Space) (table 10.9)

It was not found possible to contrast *deep* and *thick* on the same kind of object. The pile of a carpet for example, is deep and thick, but in this context the meanings merge and there is no way of discriminating them. They are synonymous. The display for this item consisted, therefore, of a matching bowl and a dish differing in height (or depth depending on one's orientation) and made of thin china, and two pieces of foam rubber differing in thickness or depth. One bowl and the bigger piece of foam rubber came to the same height. The children were encouraged to handle the objects, to look inside the bowl and to press the foam rubber. Not all children made a second choice for *deep* but of those who did, the smaller piece of foam rubber was the most popular choice presumably because they tended to match it against a first choice of the big piece of foam rubber. *Thick* choices were made mainly on the foam rubber, 43 on the little piece and 26 on the big piece, although as table 10.9 shows other objects were also selected.

Perhaps all one can say from this item is that four-year-olds do not believe china bowls to be thick. One may also suggest that it demonstrates how children become accurate in their exclusion of objects to which words apply before they become accurate regarding inclusion. A further comment on this present item is that when presented with largely unknown words (for example, *thick*) or words in unknown contexts (for example, *deep* in this item) the child often reverts to the earliest strategy of choosing what is perceptually salient. The second choices for each word in this item (in which the objects were of two different types) was generally selected on a basis other than spatial qualities. Bowls were matched with bowls and foam rubber with foam rubber.

Table 10.10

Pattern of responding for *far* v *thick*



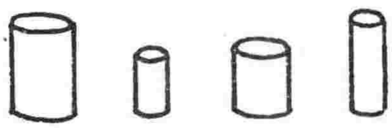
						Total Correct
Maori	*far*	2	4	9	31	
	far	6	2	24	1	29
	thick	15	12	3	4	
	thick	7	3	2	2	5
Pakeha	*far*	1	2	8	34	
	far	2	2	27	1	34
	thick	12	9	8	8	
	thick	4	5	1	4	9

<u>Item 20</u> *far* v *thick:* (1 Space) v (*n* Space) (table 10.10)
It is interesting to compare the results on this item with those from item 13: *far* v *big*. Once more the *far* objects were known by most of the children but whereas in the earlier item there was 100% success with *big* and about two-thirds of all choices of *big* went to the near object, in this present item the same proportion selected a near object for *thick* (67%) and a little over half of these choices were placed on the littlest object. Thus, by the time this item was reached, over half the children had either learned wrongly that the little object was *thick* and/or they classified the big and thick object as *big* and avoided choosing it.

VOLUME COMPONENT

Table 10.11

<u>Pattern of responding for *thick* v *big*</u>



						Total Correct
Maori	*thick*	14	10	3	12	
	thick	2	7	4	6	4
	big	38	0	0	3	36
Pakeha	*thick*	16	10	8	6	
	thick	7	10	8	6	12
	big	35	0	1	2	35

<u>Item 18</u> *thick* v *big:* (-Main) v (+Main) (table 10.11)
This is a good item with which to examine the evidence for an adjacency response because *thick* is not well known and the choices for *thick* are distributed over all the objects. There

were 30 first choices of the big object for *thick,* 20 first choices of the smallest object, 11 first choices of the low and thick object and 18 first choices of the high and thin object.

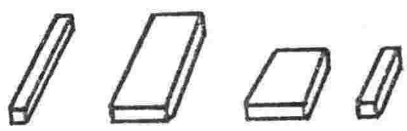
There were 19 adjacency responses (that is, a second choice of *thick* falling on an object next to the first choice) and 9 of these were Maori and 10 were Pakeha. If a child chose a thin object on the first choice he was not asked to make a second *thick* choice.

When the children selected the *big* they chose the correct object in 91% of the cases and choosing the well-known *big* overcame any lure of adjacency.

DIMENSION COMPONENT

Table 10.12

Pattern of responding for *long* v *wide*



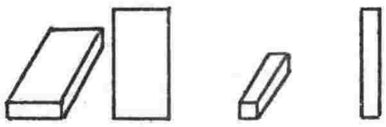
						Total Correct
Maori	*long*	20	17	1	1	
	long	16	20	2	1	34
	wide	5	4	22	9	
	wide	1	3	5	19	6
Pakeha	*long*	21	19	0	1	
	long	16	17	2	4	33
	wide	4	12	19	6	
	wide	2	5	11	16	13

<u>Item 21</u> *long* v *wide:* (+Max) v (+Second) · (table 10.12)
There was an even distribution of first choices for *long* on the narrow and long, and on the wide and long objects. This might be predicted for a word which is sufficiently well known to allow the child to ignore perceptual salience. In this item *wide* coincides with both the biggest object and with the bigger of the two "small" objects. When *wide* was asked for, there was a shift to preferring the bigger of the two remaining objects for a first choice object. The bigger of the two remaining objects is in fact wide. We have observed that a child can make double choices and that in the case of unknown words he avoids the objects for which he has words, and that he then selects from the leftovers. That is exactly what the children do in this item. They avoid the known, select the leftovers and select the biggest of the leftovers first. This pattern is probably broken only when the word begins to be known.

High seems to attract first choices to the high and big objects but *long* choices do not go so regularly to the long and big (results can be compared from items 15 and 22). The most reasonable explanation is that *long* means running length or linearity and that the slab block in this present item does not look as long as the rod block, whereas in item 16 both blocks are thin enough to appear linear.

Table 10.13

Pattern of responding to *high* v *long*



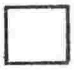
						Total Correct
Maori	*high*	1	27	1	11	
	high	4	10	1	23	34
	long	25	6	3	4	25
Pakeha	*high*	1	27	1	17	
	high	2	13	1	20	20
	long	16	8	4	11	16

Item 22 *high* v *long:* (+Vert) v (+Max) (table 10.13)

High and *long* are well known. They can each be selected by the children with or without reference to the overall size of an object and they are selected correctly even when the objects to which they refer have been selected as referents for a word previously presented. Until now these words have not been set in opposition to each other. *High* is selected correctly (38 Maori and 44 Pakeha) on the first selection, 54 or 67.5% of the choices on the bigger object and 26 or 32.5% of the choices on the smaller. The second selection is almost as successful. Only 4 children from the whole sample select a horizontal block for *high* on the first choice. *Long,* however, is selected correctly only 41 times (25 Maori and 15 Pakeha) and a further 29 choices for *long* went to a high object. On this item *high* is easier to choose than *long* since it is presented first and there are two high objects to choose from. In order to determine the relationship between *long* and *high* more fully this item needs to be repeated with *long* asked for first.

Table 10.14

Pattern of responding for *wide* v *high*

						Total Correct
Maori	*wide*	15	4	6	14	5
	wide	7	7	4	3	
	high	21	0	1	17	
	high	14	3	0	19	34
Pakeha	*wide*	7	8	2	25	20
	wide	9	15	3	8	
	high	19	1	1	20	
	high	18	2	3	14	31

Item 23 *wide* v *high:* (+Second) v (+Vert) (table 10.14)

Children used the usual approach of choosing the "big" and the two highest objects received the most first choices for *wide*, 39 for the wide and high object and 23 for the narrow and high object. There is an oddity here in the Maori and Pakeha distributions of choice. The Pakeha sample shows the expected bias towards the biggest while the Maori choices go equally on to the two high objects.

The high objects are identified correctly by almost all the children. It may be that here we are seeing stages in the acquisition of *wide*. Possibly, the Pakeha children are trying to link *wide* with *big* while the Maori children may be tending to avoid the big object because they know *big* and they do not know *wide*.

One can note again how four-year-olds are impressed by running length or linearity.

ORIENTATION COMPONENT

Table 10.15

Pattern of responding for *tallest*

					Total Correct
Maori	*tallest*	11	12	17	11
Pakeha	*tallest*	13	12	15	13

Item 24   *tallest:*   (+Inherent)   (table 10.15)

The experimenter said, "Here is a picture of three girls. They are sisters. One of them is having a rest on the ground. I know it is a silly thing to do but this is what she is doing. Which is the tallest one?" After the child had selected the tallest one he was questioned about the other choices. As with all the questions designed to elucidate answers and to get reasons for choices the child was not pressed to answer if he seemed reluctant. The results are shown in table 10.15.

Approximately half the children identified *tall* correctly in the polar component tasks. Only 11 (27.5%) of the Maori sample and 13 (32.5%) of the Pakeha sample identified the tallest girl in this item in which the usual orientation of *tall* was altered. Of all those who selected the tall girl correctly on this item only 4 did not choose the man in item 8. The loss of ability to select the *tall* between the polarity test and this test is almost certainly connected with the shift in orientation of the figure of the girl. One could say that for over half the children who selected the tall man correctly in the polar tests, *tall* was marked (+Vert) but not (+Inherent). But in saying this all one is saying is that this describes the language use and not that the child does or does not possess a cognitive ability or a deep structure feature.

The children were asked to comment on the picture and the comments together with the pattern of choices on both this and the polar item using *tall* (item 8) suggest the strategies used.

The 32 children who selected the small girl as the *tall* one gave two kinds of reason for this, (a) that the other girls were *big*, and, (b) that the chosen girl was *small*. Some children gave both reasons. Certainly, for some children the similarity between the sounds of *tall* and *small* had something to do with their choice. Leopold (1971, 99) says that "the linguistic accident of homonymy is a restricted phenomenon in [standard language] .... whereas it plays a considerable part in child language". One can suggest that the child both produces similar sounding words and interprets words he hears as being similar.

Five children said that the girl lying down was *small* or *little* but 18 children who commented on this girl said that she was *big*, *bigger* or *biggest*. The big upright girl was identified as *big* by those who chose one of the other items as *tall*.

There are three kinds of answer.

(a) The tall girlis *tall* even though she is lying down.

For children giving this kind of answer the use of *tall* appears to be marked (+Inherent).

(b) The small girl is *tall* because *tall* sounds like small and/or the other choices are *big* and therefore to be avoided for *tall*. *Tall* for such children is (-Big) and/or (+Small).

(c) The *big* upright girl is *tall* because the girl lying down is *big* and the other girl is *small*. For these children *tall* is marked (+Vert) (-Small).

The strategies of word knowledge, avoidance of known items can be observed in the responses. The effect of words similar in sound can also be noted.

Table 10.16

<u>Pattern of responding for *high* v *deep*</u>

					Total Correct
Maori	*high*	34	0	2	34
	deep	(15)	(1)	(16)	4
Pakeha	*high*	39	0	1	39
	deep	(12)	(1)	(20)	8

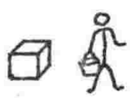
<u>Item 25</u> *high* v *deep:* (+Vert) v (+Observ) (table 10.16)

This item is anomalous for *deep*. To be correct for *deep* a child had to say that there is nothing deep in the picture or choose the hollow between the hills, which 2 children did. The responses for this item have been used in the comparison between Maori and Pakeha samples but were omitted from the earlier analysis of performance on features. Brackets have been used to denote answers to an anomalous question.

Thirty-four of the Maori children and 39 of the Pakeha children identified the high mountain correctly. Ten children said that there was nothing deep in the picture and 2 identified the hollow. Thirty-six others said that the lower hill was deep. Since *deep* is a reasonably well-known word the answers given must have come about because the children had identified *high* and therefore avoided it for *deep* and there was only one other perceptually salient object in the drawing. It would not be sensible to assume that *deep* was here marked (-Pol), because young children are suggestible, and even a hint that there was something deep in the picture would be enough to persuade them to choose a likely object. It is plain, however, that many children do not have a very firm grip on the meaning of *deep*. Comments from some of the children suggested that the picture was puzzling to them because no water could be seen.

Table 10.17

Pattern of responding for *far*

				Total Correct
Maori	*far*	22	17	22
Pakeha	*far*	27	13	27

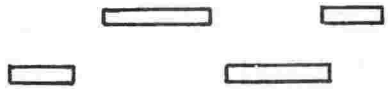
<u>Item 26</u> *far:* (+Ego) v (+Alter) (table 10.17)
In this test for orientation in which position is labelled (+Ego) v (+Alter) a model of a landgirl, a woman dressed in overalls and holding a bucket filled with some brown substance which protruded above its surface, was placed about 50 cm away from the child. (Most children claimed that the bucket contained water). The child was given a coloured block and asked to, "Put the block far away from the lady. Far, far away from the lady".

Far is a well known word and there were only 16 children who had earlier indicated (in the polar task) that they interpreted *far* as *near*.

To prevent the child from making an impulsive placing of the block near the woman, the experimenter held the child's hand in hers while she gave the instructions and then put the block into his hand. A number of children, when answering this item, began to put the block far away from themselves and near the woman, got halfway towards the woman and apparently thought the instruction through again. The child's hand wavered in mid-air and he brought his hand back and placed the block near himself. Forty-nine children placed the block correctly in relation to the model of the landgirl. One can suggest that perhaps some successes on this item occurred through a double error, some children confused *near* with *far* on the polar item. If they repeated this error and, in addition, failed to place the block in relation to the landgirl they would get the correct result.

Table 10.18

Pattern of responding for *far* v *long*



						Total Correct
Maori	*far*	3	5	17	23	
	far	2	0	15	9	31
	long	1	23	22	1	
	long	2	13	10	1	32
Pakeha	*far*	2	1	15	27	
	far	1	1	20	8	35
	long	2	18	26	0	
	long	4	20	6	0	32

Item 27 *far* v *long:* (-Inherent) v (+Inherent) (table 10.18)

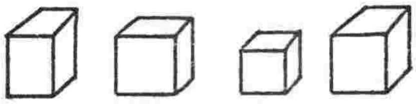
The children experienced very little difficulty in discriminating *far* from *long*. (Sixteen confused it with *near* on the polar test). Just as in the other tests with *far* the children's judgements in this item were independent of the size of the objects. Fifty first choices went to the smaller of the two *far* objects. It should be noted,too, that in this task many children, by now knowing the form of the questions, selected the two *far* objects together and not one after the other. Some followed the same procedure with *long*.

Far, therefore,does not seem to be acquired on the basis of its similarities to and differences from *big* a point which has been made earlier. One can see how different this is from the dimensional terms. *Long* is easily discriminated from *far*. This suggests that (if one uses the Bierwisch terminology) children do not confuse (+Inherent) with (-Inherent) and the postulated shared feature causes no difficulty in discrimination. It is likely that the gap or distance between the child and the object makes *far* so distinctive in this setting. It can also be suggested that a phrase like "a long way away", which is similar in meaning to *far* does not result in *long* becoming confused with *far* when the objects under discussion are sticks within the child's view.

PROPORTION COMPONENT

Table 10.19

Pattern of responding for *deep* v *wide*



						Total Correct
Maori	*deep*	7	10	8	15	4
	deep	6	11	3	4	
	deep	2				
	wide	8	13	5	8	
	wide	3	3	7	1	3
Pakeha	*deep*	8	19	1	20	2
	deep	6	9	4	2	
	deep	1				
	wide	5	8	7	20	
	wide	3	8	9	3	12

Item 28 *deep* v *wide:* (+Observ) v (+Second) (table 10.19)

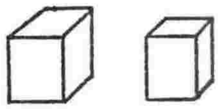
It is unlikely that any child was familiar with *deep* as applied to a cupboard, and the sample as a whole was very uncertain of *wide*. What may usefully be done is to have a look at the first choices for *deep*. The children should make selections on some basis other than word knowledge. One can predict that they will choose the biggest objects more often than would be expected by chance alone. It is the second choice that is, however, of most interest because in this item, size and adjacency are in conflict. If the child first chooses the largest object then what will be his second choice? Is it the second largest or the adjacent object that is chosen most often?

The most popular choices for both groups of children were the largest object for the first choice and the second largest object for the second. (Assuming that the two cupboards with the largest "face" appeared biggest to the child). These cupboards were not adjacent to each other. (See arrows in table 10.19). In both samples non-adjacent choices for the second object were more common than choices of the object next to the first choice. The preponderance of non-adjacency choices can be accounted for by postulating that the children used a perceptual strategy, "choose the next biggest" or "choose another big one" rather than "choose the next-to". There were, however, a number of adjacency choices, 9 of which involved the smallest object as second choice. Since other research workers have commonly reported adjacency responses this slightly different finding requires some explanation. One can suggest that the present series of tests oriented the child to looking for size rather than position cues, and that position cues are developed in seriated displays.

An interesting feature of the answers to this question was that 6 children refused to identify anything *deep* and pointing to the cupboards in turn classified them as *big* or *little*. One child said of the smallest cupboard, for example, "Not deep; little". Children may justify a choice by referring to other objects and naming them after the first choice has been made. The first choice may, however, have been made on grounds other than those suggested by the child after his choice has been made.

Table 10.20

Pattern of responding for *deep* v *long*



				Total Correct
Maori	*deep*	30	5	29
	long	(11)	(24)	
Pakeha	*deep*	26	10	26
	long	(18)	(18)	

Item 29 *deep* v *long:* (+Observ) v (+Max) (+Inherent) (table 10.20)
There were only two objects to choose from in this item and 56 children selected the deep cupboard almost certainly by following the strategy of choosing the "big". The responses to *long*, since the question was anomalous, probably illustrate only the mechanics of avoidance and/or "choose the big".

DISCUSSION

In this chapter the pattern of choices for each item have been examined in detail. Each actual choice can be thought of as a "figure" whose "ground" consists of the other choice or options. It is clear that the order of the presentation of the words for each contrast, and the nature of the preceding questions, have an effect on patterns of choice. And also that these factors interact with word knowledge.

What is the role of chance? It has been assumed in this study that lapses of attention, grabbing, and deliberately misinterpreting the goal of the task (all of which behaviours occurred in a small number of instances) may, like more purposeful responses, have relevance for semantic acquisition. The analysis has therefore proceeded on the assumption that all choices were determined by one or more strategies or principles of selection. Such a principle might be a very low level one such as putting out a hand and grasping the first thing touched (which has a good chance of being the largest thing) or a high level one such as selecting on the basis of a linear measurement along a single dimension. It was assumed in the research model, and appears to have been confirmed by results, that children's words may have partial meanings. Therefore, a hierarchy of strategies can lead to development of word meaning.

Do artificial tasks and artificial choice situations of the kind used in the component tasks correspond in any way to learning meaning in natural settings? The tasks clearly lack the motivating character of a child's own self-chosen activities. They cannot re-trace the natural development of word meaning but they can reveal the nature of the strategies children use in differing situations, and from these strategies can be built up a picture of how the meanings of these particular words may be acquired. It can be noted in passing that a child's particular choice of objects in the tasks is probably more revealing of his general ability than is his knowledge of particular words. Thus a child who chooses a small globular object, after a first choice of a large rectangular object, is less advanced than one who calls a tall thin object *big*.

A comment on "decrease in understanding" of big

Maratsos (1973) concluded that there is a decrease in the understanding of *big* in pre-school children and that while three-year-olds take *big* to mean globally big, at 4 or 5 years of age they substitute a "tall" definition of *big* for a global one.

Certainly children do experience confusion in their use of *big*, as has been reported earlier, but it may not be sound to suggest that this is a decrease in understanding. In testing for comprehension of a word whose meaning appears to be confused with that of another word it is advisable to (a) test for both words, (b) present each word first in at least one trial, and (c) have sufficient objects to allow for two choices of each word where this is possible. Had this procedure been followed in the Maratsos study it might have emerged (as it did in the present study) that four-year-old children do not so unequivocally call high objects *big*. (See analysis of item 11).

When the children do call high objects *big* they often believe that they are *high* (or *tall* presumably), as well. In other words four-year-olds may not be "tied to the vertical dimension" (Maratsos 1973, 75) but may have learnt an additional

(1 Space) definition of *big* which depends on the emergence of an ability to measure. It can be noted, for example, that Maratsos reports (ibid., 749) that children over 4;5 when faced with equal height rectangles of different widths, said things like, "They're both the big one!" and, "I can't tell, they're the same size". Obviously the children were taking a spontaneous measurement along the maximal lines of the objects and seeing whether the two objects "fitted" in this respect. It seems better therefore to assume the relevance of linearity rather than of a "top point". (Maratsos, 1974).

Acceptance of *high* and *big* as applying to one object means that a child must have learned that *high* is a certain kind of *big*. The Bierwisch analysis is helpful in suggesting that the child has to analyse (1 Space) and (+Vert). In essence a child has to perceive a line going up straight. Now, when a child has such a mental construct he can use it to measure one object against another. He can, if he wishes, use it to measure amorphous global objects but it is obviously easier to him to "measure" something if the line is already perceptually there. So he may, therefore, confuse the two uses, but this is because he has added to the meaning of *big* its application to (1 Space) rather than that he has lost some of its meaning.

Maratsos (1973, 749) says that, "*Big* seemed to mean *tall* for most over 4;5". An examination of the data from the present study (item 11) showed that 40% of the children between 4 years and up to 4 and a quarter years interpreted *big* as *high*, that 50%

of those in the next quarter year interval did so, that 40% of those in the next quarter year interval did so, and that 50% of those in the quarter year before 5 years did so. In this sample there is no sharp rise in the confusion rate after the age of four and a half so far as *high* and *big* are concerned. There was no item in the test battery contrasting *tall* and *big*.

SUMMARY

In the course of examining the patterns of choice in 38 word tests in 20 settings in this space, volume, dimension, orientation and proportion series several tendencies appear to have been identified.

(a) A tendency for young children to "choose the big" in this set of tests just as they did in the polar set.

(b) A tendency, when they are presented with an unfamiliar word, for children to avoid choosing objects for which they think they know the word. This again, repeats an earlier finding.

(c) A tendency, when finding referents for *high*, *deep* and *long* to choose "a kind of big".

(d) A tendency to work out a word's meaning in relation to either *big* and/or *little*. It was suggested that *far* was not learnt by reference to the *big* - *little* system.

(e) A tendency for confusion of meaning to be associated with confusion of the sounds of words (e.g., *tall* with *small*, and *thick* with *thin*).

CHAPTER 11

POLAR IMPLICATION TASKS

The block discrimination tasks which made up most of the componential series were not inherently appealing to the children and tended to produce signs of boredom. It was noticeable that as soon as any "real" materials were presented in the componential series (for example, the pools of water, the cardboard men, the bowls and the foam rubber) the children showed much more animation and interest. The "pure" materials were harder for the children to concentrate on and to think about. The implication series on the other hand used everyday objects (or models of these) and familiar situations. The tasks provided many clues to the solution of the problems and the children greatly enjoyed the implication series.

METHOD

Materials and presentation

The first implication series tested for polar components. The tests formed part of a story which was based in style, but not in content, on a story used in the production test in the Edinburgh Cognition Project (Wales and Campbell, 1970, 386-389). The story was memorised and told to each child. (The objects used with it are shown in appendix C). It can be noted that birthdays and birthday parties do not have the same significance in Maori culture as they do in Pakeha culture. On the other hand, it would seem more reasonable to those of Maori cultural background for a child to go by himself to a friend's place than it would to those of Pakeha cultural background. Neither situation, birthday party nor travelling alone, needed to be understood in order to answer the questions and no mother or child commented on or complained about any aspect of the story.

All the objects were presented in sets of three varying in overall size and on different dimensions. The objects were similar to those used in the polar component series and will be referred to as (+Pol) and (-Pol) objects in order to suggest this parallel. The positions of the objects in the series was varied as it was in the polar component series.

This is the story.

Riki's Story

I am going to tell you a story about a boy called Riki. Now Riki had a friend called John and it was John's birthday. Riki thought he would go to visit John and take him a present and have a piece of John's birthday cake.

John lived a long way away and Riki had to start early in the morning to go to John's place. Riki did not want to have a proper breakfast but he was very hungry and so he decided to eat an apple. [Child was shown picture of three apples.]

(30) Which apple did Riki eat?

Riki wanted to take some orange juice with him so that he could have a drink on the way to John's place. If you hold out your hand I'll show you the bottle for the orange juice. [A tiny glass bottle was placed in the child's hand.] What would happen if the bottle was full of orange juice and it tipped over like this? [The child was encouraged to say that the juice would spill or come out. If he failed to say this then the experimenter told him what would happen. Child was shown three corks.]

(31) How did Riki stop the orange juice coming out?

Here is the present Riki had for John. [A square parcel wrapped in birthday paper was placed in front of the child.] Riki thought that it looked very nice but he also thought it would look nicer tied up with red ribbon. Here are some red ribbons. [Red ribbons of differing length were placed in random order in front of the child.]

(32) Which one did Riki tie round the parcel? Try them and see. Here is Riki's bag. [Child was given small leather bag and was helped to fasten it.]

Riki liked to draw and so he thought he would take a drawing book with him. Here are some drawing books. I'll show them to you. [Three books of blank pages were shown to the child.]

(33) Which book did Riki put in his bag?

Riki began to walk along the road on his way to John's place when a man Riki knew came along in a Landrover. I'll show you the Landrover. [Child was shown a scale model of a Landrover.] The man in the Landrover said, "Hop in Riki, I'll take you in my Landrover". So Riki got into the Landrover and they drove along for some time until they came to a place where there were three roads. I'll show you the roads. [Child was shown a board representing roads and grass and questioned until it was clear that he grasped the symbolism involved.]

(34) Which is the best road for the Landrover? You can try it.

After a little while the driver of the Landrover said, "Well Riki, this is as far as I go. You will have to walk from here".

And so Riki got out and began to walk, and after a while he came to a place where there were three rivers. I'll show you the rivers. [Child was shown a board representing rivers and grass and care was taken to see that he understood what represented grass and what represented water.] Riki couldn't jumpover any of the rivers but he didn't want to get his feet wet and so he made a bridge. Here is the bridge. [Bridge was given to child.] You can try it. Hold it this way. [Correct orientation was shown to the child.]

(35) Which river does the bridge go over? Put the bridge over the river.

Riki went on a little further and he saw a family. [The child was shown three pipe cleaner figures varying in height.] Here is Daddy, and here is Mummy, and who do you think this is? They were all going for a walk and they came to a gateway. [Gateway was placed in front of the child.]

(36) Which person can walk through the gateway? Daddy, Mummy, or baby? You make them walk through.

Next the family came to a wall. Here is the wall. [A small "wall" was put in front of the child.]

(37) Which one can see over the top of the wall? Daddy, Mummy, or baby?

Riki came to a place where there were three pools. Here are the pools [Three plastic pools were filled with water and the child was questioned as to whether he could see how far the water came up inside each pool.] There was a little baby who wanted to go in the water. [Seated doll given to child.]

(38) Which is the best pool for the baby to sit in? Try them all.

There was a man who had a boat. [A boat was given to the child.]

(39) Which is the best pool for the boat to go in? Try them all.

Very soon Riki came to a farmhouse. Here it is. [House was placed in front of the child.] Look, you can see the farmer. He is a sheepfarmer and here are his sheep. Baa, baa, baa. [Three sheep are placed in a line equal distances apart pointing towards the farmer.] These sheep are all going to walk to the farmer.

(40) Which sheep will get there first?

(41) Which sheep will get there last?

The next thing that Riki saw was a man out collecting wood for his fire. Here are the bits of wood he found. [Three "logs" were placed in front of the child.] Now this man wanted a great big fire.

(42) Which is the best one to take home to make a big fire?

When you start a fire you need some little pieces of wood. The man thought he would take home some wood that he could break up into little bits. [Child was shown the three "logs" again.]

(43) Which is the best one for breaking into little bits?

It wasn't very long before Riki got to John's place and he gave John his present, and sang "Happy Birthday" to John, and had a piece of birthday cake. And that's the end of the story.

Care was taken to see that each problem was understood. For example, children who did not understand "river" were told it was "water" and the word *water* replaced the word *river* in the questioning. "Over" was expanded to "over the top of" if it seemed likely that this would make the meaning clearer. Questions were repeated once. Every child was encouraged to handle the materials and to demonstrate the answer by using the materials appropriately.

If a child would not handle the objects, his mother or the experimenter demonstrated each possibility in turn and took care to check for certainty as was done for the polar component items and the child was asked to indicate the "best one". The experimenter said something encouraging in response to all answers right or wrong. When the child had selected one of the options he was questioned about the others. Generally, he was asked something like this: "This one [pointing to opposite pole object], is no good is it? What is wrong with this one?" In the case of the "family" test items (items 36 and 37) the child was asked to, "Show me Daddy walking through the gateway". Or, "Can baby see over the wall? Why not? Make the baby see over the wall". The aim of this questioning was twofold, to get explanations from the child and to elicit words.

A comment on the tasks

The implication tasks were devised by thinking of everyday situations in which a knowledge of the features of verticality, proportionality and so on in their two polar manifestations would be required in order to solve the problems, and in which the words of the set might be elicited.

The first thing that one notices when developing tasks of this kind is that there is frequently difficulty in finding plausible and reasonably simple reasons for choosing both the big and the little objects of one set or series of objects. Thus, while it is relatively simple to find realistic reasons for choosing both a thick stick and a thin stick drawn from the same series, there are no compelling reasons (to a four-year-old that is) for choosing a little apple. In other words, setting up tasks based on selecting from similar objects the extremes of a uni-dimensional scale is not a task parallel to those a young child would meet in everyday life. Examination of the implication tasks concerned with (-Pol) objects shows that the *little, short, narrow* and *low* items are all concerned with whether or not one object fits another object. And it is not a difficult matter to perceive whether or not an object fits or overlaps its target object. The big cork was obviously not right for the little bottle and the long book jutted out past the edges of Riki's bag. On the narrow road the wheels of the Landrover went on to the grass. The size of the object to be matched provides a norm or measure so that a child can select the one that "fits".

This would seem to be the situation in natural conditions. One is generally required to choose a small object in contrast to objects of larger size in situations in which there is some constraint on size. This process of matching is less critical with big objects for once an object is past the "big enough" point it can, theoretically, be any size. Thus, in the parcel and ribbons task, a ribbon cannot fall into the range of sizes which will fail to go round the box, but once past this point the ribbon can be any size and still meet the demands of the situation.

RESULTS

Achievement on concepts

There were 14 tests in the implication series testing for polarity. It is proposed to use the word "concept" to mean the knowledge required in order to succeed with the implication tasks. In table 11.1 are shown the Maori and Pakeha distributions according to score on concepts.

Table 11.1

Number of concepts achieved on the polar implication tasks

Number of concepts	Maori sample (N = 40)	Pakeha sample (N = 40)
14	1	1
13	6	12
12	12	7
11	6	8
10	9	6
9	2	5
8	3	0
7	1	0
6	0	1

Maori sample: mean = 11.03, median = 11, s = 3.36. Pakeha sample: mean = 11.33, median = 11, s = 3.40. A t test carried out to ascertain difference in the means of the two samples produced t = 0.4, df 78, which is statistically non-significant.

Age trends

Age trends in performance on the implication tasks are shown in table 11.2.

Table 11.2

Means on polar implication tasks for four age levels

Age	Maori (N = 40) $\overline{X}$	Pakeha (N = 40) $\overline{Y}$
4;0	10.1	10.5
4;3	10.9	10.2
4;6	11.3	12.3
4;9	11.8	12.3

The table shows an association between age and performance which is closer than that shown earlier (table 7.3) to exist between age and word recognition.

The success rate for Maori and Pakeha samples on each concept is set out in table 11.3.

Table 11.3

Success rates on concepts and the ranking of these concepts in the polar implication tasks

	Maori sample (N = 40)	Rank	Pakeha sample (N = 40)	Rank	Total	Rank
"Big"	27	12	28	13	55	12
"Little"	36	5.5	38	3	74	3.5
"Long"	39	2	35	6.5	74	3.5
"Short"	40	1	39	1.5	79	1
"Wide"	35	8	36	4.5	71	6.5
"Narrow"	22	13	31	10	53	13
"High"	30	11	30	11.5	60	11
"Low"	36	5.5	33	8.5	69	8
"Deep"	36	5.5	36	4.5	72	5
"Shallow"	33	9.5	30	11.5	63	10
"Far"	1	14	10	14	11	14
"Near"	37	3	39	1.5	76	2
"Thick"	36	5.5	35	6.5	71	6.5
"Thin"	33	9.5	33	8.5	66	9

Zubin's *t* was ascertained for Maori and for Pakeha performance on each conept. Zubin's *t* for "narrow" = 0.52, p.<0.05, Zubin's *t* for "far" = 0.49, p.<0.05. In both cases the Pakeha performance was superior to the Maori performance. However, to accept these as genuine differences runs the risk of committing a Type I statistical error. In a series of this length one may expect difference of this order to occur by chance and one would not be justified in rejecting the null hypothesis, that there is no difference in performance between the two groups, on the basis of these two differences alone. Nevertheless, it can be noted that such differences exist in the performances of these two samples.

The rank orders of the concepts in the two samples are significantly associated. (Rho = 0.858, p.<0.01, N = 14).

An ordered list of concepts can be drawn up in a manner parallel to the words of the polar component series (see p.74) by dividing the concepts into groups on the basis of the success rate for the combined sample. The polar markings have been added.

(1) (-) "short", (-) "near", (+) "long", (-) "little", (+) "deep".

(2) (+) "thick", (-) "low, (-) "thin", (+) "wide".

(3) (-) "shallow", (+) "high".

(4) (+) "big", (-) "narrow".

(5) (+) "far".

The order of the concepts differs considerably from the word order derived from the polar component series. The combined rank order shown in table 11.3 was compared with the order for the matching words shown for the New Zealand sample in table 7.6. (Rho = 0.007, N = 14, ns). This suggests that the two series are tapping differing abilities.

The positive pole provides no special help in the implication series, and the children did very much better on this set of tests than they did in the component series. This was probably because the displays provided sufficient information with which to solve the problems.

Detailed results for each task will now be presented. The words of the set elicited during the administration of each task will also be shown.

Item results

Item 30 - concept of "big"

In item 30 the children were supposed to select a big apple because the boy in the story was very hungry. This was not an easy question and judging by the justifications given, some children probably chose the big apple simply because it was big rather than because it would satisfy hunger. An indication that the question was somewhat meaningless to the children is given by the kind of reasons offered for the choice made. There were remarks such as,"Because he was so hungry", and, "Because he's too hunger", which repeat the reason given in the story but which may, or may not, indicate a link in the child's mind between the apple chosen and the state of hunger. There were a number of reasons along the lines of, "Cos he wanted to", by children who produced more pertinent answers on other items, and a number of tangential reasons such as, "It's rotten", "It's a red apple and a green apple", "Cos he might get a sore tooth". One child answered, "Cos his mouth wasn't big", thus illustrating the idea of fitting or matching mouth to apple.

Big or *biggest* were elicited on 11 occasions, *little* (4), *small* (6), and *baby* (1). No other words were used to describe the size of the apples.

Item 31 - concept of "little"

In this item a child had to choose the smallest cork in order to fit a bottle. Some children seemed unfamiliar with corks but all were given an opportunity to try them and most children then solved the problem without further difficulty. The main reasons given for the unsatisfactory nature of the big cork were of the following kind, "It won't go in", or, "That doesn't fit", or, "It's too big".

The words of the set elicited were *big* (33), *little* (5), *small* (3), *fat* (2), *teeny* (1), and *long* (1).

Item 32 - concept of "long"

In this item the children had to choose from three ribbons which varied in length, the best one to tie around a parcel. It was fairly certain that many children first picked up the longest ribbon because it was big, but it was clear also that they could understand the relationship between the length of the ribbon and the girth of the box and notonly did they report that the longest ribbon was the right one but they affirmed, when they had tried them, that the other ribbons did not "fit".

The words of the set produced were *big* (2), *little* (10), *small* (16), *long* (2), and *short* (2).

Item 33 - concept of "short" in the direction of the maximum axis in the horizontal plane.

In this item the children had to select a book to go into a bag.

The books varied in length and two of the books were too long to go into the bag. Again, children found little difficulty in selecting the correct book and although each child was encouraged to try putting the books into the bag in order to find the correct one, most children matched the book and bag by eye and made a correct choice.

It is well known in psychology that recognition is intrinsically a less difficult task than any involving manipulation, symbolic or otherwise (see for example, Blackstock and King, 1973; Paivio, 1974). However, in view of Piaget's stress on the child's activity as a determinant of intellectual progress it is of interest to see whether activity, defined as physical manipulation, is related to the acquisition of words. In a study of the acquisition of concept names under controlled conditions (Nelson and Bonvillian, 1973), it was found that although eighteen-month-old boys manipulated the objects in the experiment more frequently (op. cit., 441) they acquired the use of the words more slowly than the girls in the study (ibid., 440). The respective roles of perception and manipulation in relation to word acquisition are far from clear.

In the present research each child was asked to put the book selected into the bag. Some children held the book in the correct orientation and slid it neatly into the bag while others got it the wrong way around and could not close the bag, or they managed to get it jammed athwartships and then proceeded to hit the protruding portion in order to press it into the bag. The book survived the testing but became rather dog-eared and so the experimenter bent the corners of the other books, too, so that the correct book would not look unduly different.

The words of the set elicited were *big* (29), *little* (2), *small* (3), *long* (1), and *short* (1).

Item 34 - concept of "wide"

In this item a miniature Landrover had to be placed on one of three roads which varied in width. Children usually chose the widest road just by looking at it but they followed this by putting the Landrover on the road and measuring the width between the wheels against the width of the road. Some noted, for example, that when the car went on the narrow road, "It's on the grass", or, "It's not on properly", or, "It's half going on the grass". Generally, they referred to the roads. The narrow road was said to be "too small", but some referred to the Landrover and said that it was "bigger" or "too wide".

The words of the set elicited were *big* (7), *little* (15), *small* (15), *fat* (3), *wide* (2) and *skinny* (3).

Item 35 - concept of "narrow"

In this item three rivers varied in width and a bridge had to be placed over one of them. The only one that the bridge would reach across was the narrowest one.

The representation of this problem was not entirely satisfactory. Whereas the roads in the previous item were covered with small stones and look reasonably realistic the rivers were represented by blue paint and did not appear greatly like water. Children were told that the blue parts were water but some perhaps did not grasp their significance. A tiny bridge was made from balsa wood. It, too, was not entirely satisfactory. Some children did not grasp the word "over" when asked to put the bridge over the river so that

Riki (the boy in the story) could walk over it and not get his feet wet. Some of the problems of this display were overcome. It was possible for the bridge to be given to the child in the correct orientation, the words could be explained if this seemed necessary, and the experimenter could place the bridge over each river in turn so that the child could see what occurred. Despite the experimenter's care, however, at least a third of the children were quite happy to place the bridge in the middle of the widest river, and others, even though they selected the correct river, appeared to be very uncertain of their choice. It seems unlikely that, had they been faced with a real situation of this kind, so many would have failed to solve it.

The words of the set elicited were *big* (21), *little* (1), *small* (3), *fat* (1), *long* (1), and *far* (1).

Item 36 - concept of "low" or "short" in the vertical orientation
Three pipe cleaner figures, Daddy, Mummy and baby, varied in height and only the shortest, the baby, could walk through a gateway without hitting his head. The children were asked to try making the figures walk through the gateway and to tell the experimenter which one could walk through. This was a popular item and the fact that when Daddy and Mummy were made to walk they hit their heads on the cross bar of the gateway proved particularly appealing to four-year-olds. Some solved the problem to their own satisfaction by putting Daddy and Mummy in a horizontal position and assisting them to "swim" through the gateway. Most children grasped that only the baby could walk through but they solved the problem not solely

by looking and intuitive measurement (because the space formed by the gateway and the size of the baby were not readily comparable) but by making a family member walk. If it was the baby who was chosen then the child tried him and finding that the baby could walk under the arch claimed, perhaps, that, "This can cos he's a baby".

Most of the comments referred to the Daddy and the Mummy and noted that they were "too big" or that one or the other "can't go" or "can't stand up". One child explained that Daddy could not walk through, "Cos look, he's got a big head".

The words of the set elicited were *big* (40), *little* (1), *small* (1), and *long* (1).

Item 37 - concept of "high" or "tall

The family used in the last item next encountered a wall and the problem was to find the person who could see over the top of it. The phrase "over the top of" was not understood by all children and this undoubtedly made the task difficult for some. Apart from knowledge of words there was the difficulty connected with putting oneself in the place of the baby and imagining its angle of vision. Some children placed the baby with his face up against the wall and assured the experimenter that the baby could see over and some solved the problem by insisting that the baby could see and then lifting him up to make the statement true. This was accepted as a satisfactory response only if the child agreed that Daddy could see over the wall while standing on the ground. Three-quarters of the sample selected Daddy as the one who could see over the wall and most explained that the baby was "too little". One child said of the baby that he couldn't see over it but, "He can jump over it and he might break his leg and go into hospital". One child said that the baby couldn't see over "because it can't get up". Another said that, "Mummy can't see over the top of the wall too", and yet another said, "No, cos he's too little. Mummy can't cos look see. Daddy's the cleverest, see".

The words of the set elicited were *big* (2), *little* (17), *small* (10), *long* (1), and *wee* (1).

Item 38 - concept of "deep"

There were three pools varying in depth of water and in height of container. Each child was asked to indicate the depth of the water by pointing to the line made by the surface of the water and which showed through the translucent sides of the plastic pool. Only when the experimenter was satisfied that the child grasped the variations in water level was he asked to find the best water for a baby to sit in. The child was given a baby doll arranged in a sitting position and was encouraged to see what happened when he placed the baby in the pools. Like the item in which Daddy banged his head this one also had strong appeal for a four-year-old because when the baby was placed in either of the two deeper pools it rolled forward and went under the surface of the water. This so delighted some children that they could hardly be persuaded to pay attention to the shallow water. Children commented that the baby "got drowned", "goes right under", and "she fall down".

The words of the set elicited were *big* (9), *little* (1), *wee* (1), *high* (2), *deep* (9), *full* (2), and *low* (1).

Item 39 - concept of "shallow"

The pools used for the previous item were used for this one in which the child was asked to put a small boat in one of the pools. The boat floated satisfactorily in two of the pools but the water was adjusted in the third so that the boat scraped on the bottom. Some of the comments were, "Won't float, too little", "Won't swim", "Can't fit in like that", "It can't move", "Too small" (of the water), "It's not enough water", and one child said, "It's too shallow".

The words of the set elicited were *little* (6), *small* (5), *wee* (3), *high* (1), *deep* (2), *low* (1), and *shallow* (1).

Item 40 - concept of "near" Item 41 - concept of "far"
Items 40 and 41 were of a different nature from the other items. There was a display of a house and a farmer and three sheep were placed in a line at varying distance (near, middle distance, and far from) the house. The child was told that the sheep were going to walk towards the farmer. At this point a number of children immediately picked up the sheep nearest to the farmer and moved it to him, they then picked up the next sheep and moved it towards the farmer, and, finally, the furthest sheep was brought forward. It was plain that they perceived the line of sheep as a series and that the series went in order from nearest to furthest away and that when the children started moving the sheep the furthest sheep could not be moved until the others were out of the way. The children were asked to indicate which sheep would get to the farmer first and which sheep would get to the farmer last. In other words the spatial relations "near" and "far" were converted into the temporal ones "first" and "last". (For some of the difficulties facing the child in the construction of temporal concepts see Piaget,

1969). The temporal term *last* caused difficulty but interest lies in why children should (with the exception of 11 of them) say that the middle sheep would get to the farmer last. There were very few comments on this item but what there were are interesting. One child explained his choice of the middle item by saying, "Because it's behind that one", pointing to the nearest one. One can suggest that the children see the sheep as a series which has to move in a topological manner, as one child put it, "After that one, that one, and after that one, that one". Another child pointed to the middle sheep as he explained that, "That one will be next". The topological notion was also expressed by two other children who said, "Because it's just about close to that one", and,"Cos that's by there". There was only one other remark in response to this item. One child claimed, when asked which sheep got to the farmer first, that, "All of them did", which is the only evidence counter to the "series" and topological explanations which seemed to be supported by what other children expressed.

Item 42 - concept of "thick"

Three sticks varied in thickness and the child was told that a man wanted to make a big fire. Which stick would he take home? There were few comments on this item.

The words of the set elicited were *big* (1), *little* (2), *fat* (1), and *thin* (1).

Item 43 - concept of "thin"

The same sticks were used as in the previous item but the child was asked to choose the one that would be easiest to break. Some children tried to make a practical test of their ability to break the thin stick but fast action on the part of the experimenter and the mother always saved the day.

The words of the set elicited were *big* (9), *little* (2), *small* (2), *fat* (2), *long* (2), *hard* (1) and *large* (1).

Word elicited

On 350 separate occasions the children used a word of the Bierwisch set or a closely related word. Forty seven percent of all instances of use of the words was contributed by use of the word *big*, 19% by use of the word *little* and 18% by use of the word *small*. The pools of water elicited the word *deep* on 11 occasions but otherwise there were only isolated instances of more specialised words. These children, Maori and Pakeha, made great use of *big*, *little* and *fit*. By using these words children indicate that the tasks represent ideas of size and measurement but they do not produce the more specialised words (which they showed that they could recognise in the component tasks) and whose ideas they could put to use in the implication tasks.

SUMMARY

Neither the distributions of the Maori and the Pakeha samples on number of concepts known nor the means of the two samples differed significantly.

The older a child the more likely, in general, he was to achieve well on the concept tasks.

On only two tasks, "narrow" and "far", was the difference between the Maori and the Pakeha samples significantly different and in both instances the Pakeha sample scored more highly. It was suggested in the discussion of these data that to accept, in a series of 14 items, these differences as genuine runs the risk of committing a Type I error.

The rank orders of the concepts in the Maori and Pakeha samples were significantly associated.

The rank order of the concepts differed significantly from the rank order of the words recognised measured over the whole sample. This suggests that these series are not made up of tasks equivalent apart from the fact that one series is linguistic and one cognitive. Performance on the concept tasks of the implication series exceeded performance on the word recognition tests of the polar component series and greatly exceeded the children's ability to produce the words in response to elicitation questions associated with the implication tasks.

The results from the polar implication tasks (items 30-43) show that the difficulty that the child experiences in comprehending (-Pol) terms, apart from *little*, is not the result of a similar difficulty with the concepts which these terms refer to insofar as the implication tasks do tap these particular concepts. The tasks involving the (-Pol) concepts are almost all concerned with "fit".

It is difficult to imagine how children could learn polarity, or contrary opposition, applied to single dimensions in everyday situations. Problems requiring a (-Pol) concept for their solution seem to depend primarily on determination of "fit". The (+Pol) concepts on the other hand seem to be based on the perceptual strategy - "notice the big", a simpler cognitive skill.

It must be stressed that polarity does not mean simply being able to recognise the *big* and the *little* but includes their relationship to each other. In the Bierwisch analysis outlined in chapter 2 it was shown that polarity implies a norm. In this chapter evidence has been given of how norms operate in the selection of appropriate objects. In chapter 15 further evidence will be offered on normativity.

CHAPTER 12

VOLUME, DIMENSIONALITY, ORIENTATION, PROPORTION AND NORMATIVITY IMPLICATION TASKS

This implication series followed exactly the same pattern as the polar implication series and provided "concrete" examples of the abstract realisations of the oppositions in the component tests for volume, dimensionality, orientation and proportion. (Space) tests are missing because, according to Bierwisch, this feature is an abstract one applying to all terms of the set. The speaker/hearer is supposed to decide whether to attend to 1, 2 or 3 dimensions. Contrasts on (Space) all involve contrasts with other features as well and hence it is difficult to decide to which particular feature any results can be attributed. The dimension tests are concerned with oppositions between "high", "long" and "wide" and although the terms for these concepts are marked by the features of orientation and proportion, special tasks were devised for these latter two features. (See appendix C).

Bierwisch deliberately eschews the use of a dimension marker and prefers to express the contrasts between *high, long* and *wide* as being based on the features (Max), (Vert), (Second), and (Inherent). The present writer found it difficult to avoid thinking in terms of dimensions and adopted the compromise of treating the special markers for *high, long,* and *wide* as a dimensional set. Normativity which, according to Bierwisch, is implied by the polar arrangement of antonyms, was tested for the first time in this series. Normativity does not mark words, but arises from their combination.

Achievement of each sample in the present series is shown in table 12.1. Normativity scores are omitted.

Table 12.1

Achievement on the volume, dimension, orientation and proportion implication tasks

Scores	Maori sample (N = 40)	Pakeha sample (N = 40)	Total
10	4	2	6
9	9	11	20
8	16	11	27
7	6	7	13
6	5	7	12
5	0	1	1
4	0	1	1

Maori sample: mean = 8.0, median = 8. Pakeha sample: mean = 7.7, median = 8.

The scores on each concept and the consequent ranks of these are shown in table 12.2.

Spearman's rho calculated on the figures in table 12.2 = 0.76, N = 10, $p.<0.01$, but an inspection of the table shows that the numerical difference between scores in different ranks is very slight since all scores for success on individual concepts except for 2 in the Maori sample and 2 in the Pakeha sample fall between 30 and 40.

Table 12.2

Scores on concepts on the volume, dimension, orientation and proportion implication tasks and rank orders for concepts

	Maori sample (N = 40)	Rank	Pakeha sample (N = 40)	Rank
"thick" (v "big")	33	6	32	6
"high" (v "long")	31	8	28	9
"wide" (v "high")	32	7	38	3
"high" (v "wide")	21	9.5	31	7
"long" (v "high")	21	9.5	12	10
Orientation (item 51)	34	4.5	30	8
Orientation (item 52)	40	1	40	1
Orientation (item 53)	34	4.5	37	4
Proportion (item 54)	39	2	39	2
Proportion (item 55)	38	3	33	5

There were 11 items in this series, 10 derived from the pattern of semantic components and one from normativity. On three items there were statistically significant differences in performance between the Maori and the Pakeha samples. On "wide" (v "high") in item 48 the Pakeha sample performed better (Zubin's t = 0.51, p.<0.05); on "high (v "wide") in item 49 the Pakeha sample performed better (Zubin's t = 0.54, p.<0.05); and on "long" (v "high") in item 50 the Maori sample performed better (Zubin's t = 0.48, p.<0.05). These results are interesting in view of the Pakeha sample's performance on *wide* and the Maori performance on *long* in the word recognition tests. Below are summarised the performances on the parallel series, component and implication, for the words and concepts in specific oppositions or (contexts).

Item 23	*wide* v *high*	Pakeha better than Maori	$p.<0.05$
Item 48	"wide" v "high"	Pakeha better than Maori	$p.<0.05$
Item 23	*high* v *wide*	Pakeha better than Maori	ns
Item 49	"high" v "wide"	Pakeha better than Maori	$p.<0.05$
Item 22	*long* v *high*	Maori better than Pakeha	ns
Item 50	"long" v "high"	Maori better than Pakeha	$p.<0.05$
Item 18	*thick* v *big*	Pakeha better than Maori	$p.<0.05$
Item 46	"thick" v "big"	Maori and Pakeha approximately equal	ns

The materials and presentation will be described for each feature in turn and the results will be given separately for each.

VOLUME

Method and presentation

Item 46 - "thick" v "big"

Story: The Tired Man

I am going to tell you about a man who is very, very tired. Here he is. [A pipe cleaner man is made to stand up and the experimenter demonstrates how tired he is by bending the wire.] Look how tired he is. He's bending at the knees and his head is drooping. All he wants to do is to go to sleep. I'll see if I can find some beds for him. Oh good! Here are some beds. [Three mattresses are placed in front of the child.] I want you to feel them all. The man wants to be comfortable. Which one does he want to sleep on? You put him to bed.

Results

Thirty-three children in the Maori sample and 32 children in the Pakeha sample chose the thick mattress for the man to sleep on. It will be recalled that the word *thick* was but poorly known. One mattress was big and thin, one was small and thin, and one was small and thick. In this item in which the concepts of "thick" and "big" were contrasted (unlike the polarity implication item 42 in which they coincided) the children generally chose the thick mattress and, therefore, one can ask whether this was because children thought it was thick even though they did not know the word, or whether they used some other basis for judgement. It can be assumed that in some sense children thought a mattress was thick or thin if it was the thickness dimension that they were noting.

Just over half of each sample made comments. First of all there were remarks about the thickness of the mattresses such as: "too skinny", "cos it's got nothing in", "too flat", "because that's nice and fat", "they haven't got much stuffing", "it's too thin", "it's soft", "squash", "it's bent down", "down a bit", "it's broken", "got no mattress inside", and "nothing in it too". All these phrases refer to the thickness of the objects. There were, in addition, many other responses that made use of the words *big*, *small* and *little*. How were children interpreting these words? If a child chose the thick mattress and said that it was big, one can assume that he was referring to its thickness because both the other mattresses were little in terms of thickness. If a child chose the big and thin mattress and said that it was big then his interpretation was in terms of surface area. Six children used *big* to refer to the thickness of the mattress and 13 children used *big* to refer to surface area of the big and thin mattress. How those who used *big* for the mattress with the larger surface area were employing the notion of fit is exemplified by the remark, "It's bigger for the Daddy". Children demonstrated that the big and thin mattress extended past the length of the man and some said that it was "too far up" and "too long". Because there are explanatory comments from only a little over half the sample one cannot decide in every case whether an individual child was using only the notion of fit, or the notion of volume as expressed by thickness, or whether the child used both. Nevertheless, it seems likely that to choose the thick mattress most children took thickness into account and fit as well. The child would choose the "thick" rather than the "thin"; and the shorter rather than the longer mattress to fit the man.

A further factor in choice selection must surely be the child's familiarity with an object and his expectations regarding its appearance. The thick mattress looked more like a mattress and some children demonstrated this by converting the little and thin mattress into a pillow and the longest into a cover and putting the man to bed.

The little and thin mattress was frequently said to be too small. Since it was too small in relation to both the other items it is not always easy to tell what aspect of the mattress the children were referring to. In some instances it meant surface area as when a child said of the small and thin item, "It's too small" and of the big and thin item, "It's too big". Only one child said that the big and thin mattress was "too small" and showed by pinching the mattress with his fingers that he meant "too thin".

One interesting result from this item is the finding that whereas *big*, as the children use it, seems to be diversified in meaning to the extent that it can be used of length, surface area and global thickness, *small* and *little* seem to be used in an undifferentiated global sense (apart from the child who demonstrated that he meant *thin* by *small*). Do the small words become differentiated from *little* and *small* just as the *big* words become differentiated from *big*, but at a later stage in development?

While the Maori and Pakeha performance on this task (item 46) were almost equal (Maori sample score = 33 and Pakeha sample score = 32) the Maori sample was more successful in identifying *thick* in the component series. The results for the whole sample show that it was rare for a child to identify *thick* correctly in the recognition test but not to be able to choose the thick mattress. Table 12.3 shows the patterns of *thick* and "thick" for both samples. This is by no means clear evidence for the concept preceding a word which refers to it in development since, as the quotations show, children may have other words to express the ideas required. On the other hand, the 5 children who made incorrect choices on the concept task were either unable to give a justification or they gave justifications in terms of *big* v *small* or they gave responses irrelevant to size. In other words, those who failed the concept task gave answers that suggested that they were viewing the mattresses in an undifferentiated global fashion.

Table 12.3

Comparisons of *thick* and "thick" for
Maori and for Pakeha samples

+ Concept + Word		+ Concept - Word		- Concept + Word		- Concept - Word	
Maori	Pakeha	Maori	Pakeha	Maori	Pakeha	Maori	Pakeha
14	6	19	26	2	3	5	5

In these data there appears to be a closer relationship between word and concept than was revealed in the polar implication series.

DIMENSION

Method and presentation

Items 47 - 50

Story: Making a Town

I want you to help me to make a town. [The base was produced and placed in front of the child.] A man came to this town and he wanted to build a house. He had a lot of children and so he wanted to build a big house. The only place he could find to build his house was there. [Experimenter pointed to a gap between two houses.] Here are some houses. [Three houses were shown to the child.]

(47) Which one is the best for the man? You can try them all and see what happens.

[The child was encouraged to place the houses on the site.]

A man lived in this house here [experimenter pointed to one of the houses] and he had a dog. Unfortunately the dog didn't have a house and at night he used to walk around the town howling. Here, I'll show you a picture of the dog. See he's very fat. You make yourself fat like that dog. Look, like this. The man decided to give the dog a house and he found these ones. [The child was shown four kennels with differently proportioned doors.]

(48) Which is the best house for the dog?

A little boy came to live in this house. [A tall house was placed on the board.] He was playing with a ball and it went up on to the roof. Show me the roof. The boy went to get a ladder so that he could climb up on to the roof. Here are the ladders he found. [Four ladders were placed in front of the child.]

(49) Which ladder is the best one to get the boy's ball?

These people [indicating a row of houses] didn't have a fence. They wanted to have a fence that they could see over the top of. See the windows in their houses. They wanted to be able to sit inside and look out over the fence and see the hills. Here are two pieces of wood. The experimenter showed them to the child. [Planks held end to end.] Some people make fences like this. [Planks held vertical and side by side.] These people wanted a fence they could see over the top of.

(50) Show me how they made the fence. [Planks were passed to the child in a diagonal position.]

There now you've made a town. There is the house for the man with lots of children. And there are the houses for the dogs. And if anyone loses a ball on the roof there are ladders to help get it back. And there is even a fence for these people. Now would you like to help me to put the things away so that another boy or girl can play with them.

Results

Item 47 - concept of "high" v "long"

The houses were high and narrow, long and low, and low and narrow. Thirty-one children in the Maori sample and 28 children in the Pakeha sample chose the correct house. Only one child out of 80 chose the long low house. The rest of the children rejected it on the grounds that it did not fit or that it was too big. Of the two explanations, that of fit was the more common and *big* probably meant that the house was too big to fit into the space.

For some children the notion of fit was all-powerful and they rejected the tallest house on the grounds that it did not fit, that is, that it stuck up above the other houses. Those who selected the smallest house ran their fingers over the roofs in a straight line to show how it fitted but one child looked at the small house and, pressing it up against the side of its neighbour, noticed a gap on the other side and said, "It doesn't fit, see". Another child said of the small house, "Same size. That fits", and of the tall house, "Its too high". The idea of fitting the concrete object perceptually present into the space provided seemed to precede the idea of fitting a large family into a big house. Children solved the problem by combining both ideas.

These results can be compared with some findings of Donaldson and McGarrigle (in press) who, in reporting an experiment in which children were required to place cars in rows of garages, comment that there is "something peculiarly fundamental and compelling about the notion of fullness, so that it can override other criteria and powerfully influence the judgement of truth value". There is something equally compelling about the notion of fit.

Item 48 - concept of "wide" v "high"

One kennel had a high and narrow opening, one a low and narrow opening, one a low and wide opening, and one a high and wide opening. A child was counted as solving the problem if he selected either of the kennels with wide openings. Thirty-two children in the Maori sample and 38 children in the Pakeha sample selected a wide opening. There was a picture of the dog which needed a house but it was not a cutout and hence could not be tried physically, but only in imagination, against the openings in the kennels.

The explanations concerned the narrow openings. For most children these were seen as "too little". One child classified the doors in the following way, "Those one's too skinny, those two are just right". Since the "just right" doors varied in height the child must have been referring to their width.

A few children, as the following quotations show, tried to express the idea of narowness.

That door's all squashed up.

This is a wee bit little and that's a wee bit fat.

Can't get through a little door.

They're nearly together. (Referring to the sides of the opening.)

The children experienced little difficulty in selecting a wide opening but the child's natural tendency to select something big would help him to choose a correct item without a need for the child to process the *wide* dimension.

Item 49 - concept of "high" v "wide"

One ladder was high and wide, one high and narrow, one low and wide, and one low and narrow. Twenty-one children in the Maori sample and 31 children in the Pakeha sample selected a high ladder. Once more the answers revealed the extent to which four-year-olds make us of *big*, *little*, *small*, and *fit*. Children were counted as being right only if they chose the narrow ladder. The wide one was the width of the house. A number of children disregarded width and looked only to height.

Some children used the term *reach* to express the idea of fit with regard to the matching of linear measurement. In view of the results from the last two items one can say that when they are required to focus on the secondary dimension they have little difficulty in solving problems about width, but when the focus is height, they do not notice width. This is in agreement with Piagetian findings.

Item 50 - concept of "long" v "high"

The children were required to make a fence either by placing the planks end to end or by placing them upright and side by side. Twenty-one children in the Maori sample selected the correct dimension "long" and 12 children in the Pakeha sample did so. There were hardly any spontaneous comments on this item and the experimenter was so busy organising the little pieces of wood for the fence that she was not very successful in eliciting explanations. Another problem was that there was not a fixed display of items that children could be questioned about. Instead, the child was given the choice of two arrangements for the same pieces of wood and he had to construct one of them and children probably selected the arrangement which looked right to them without full regard to the constraints of the task.

ORIENTATION

Item 51

Method and presentation

Story: Giving a Doll a Cup of Tea

I'd like to show you my doll. Her name is Cathy. [A doll was introduced to the child.] She usually has a cup of tea now. Look I'll get her cup and saucer. She likes to talk to someone while she has a cup of tea. I'll put her where she can talk to your mother. [Doll was placed with her back to the child and facing another person.] Will you give the doll a cup of tea? Put it where the doll can get it. She wants to talk to your mother.

Results

This task involved the orientation of an object in relation to an observer who was not the child. It did not involve change of plane. Thirty-four children in the Maori sample and thirty children in the Pakeha sample placed the cup of tea in front of the doll and where she could reach it. Twelve children produced a compromise (4 Maori and 8 Pakeha) by putting the cup at the side of the doll where the child could still see it. Three children tried to turn the doll around and one boy refused to have anything to do with cups and dolls. Others spent some time putting the cup to the doll's lips and one or two complained about the lack of a teapot. The experimenter generally responded to this complaint by producing one.

The writer feels that the children's behaviour on this item was not recorded as well as it might have been but until the testing had gone some distance the experimenter did not realise the variety of behaviour that children might exhibit in response to these directions. Both this item and the next one to be described should really have been recorded on videotape in order to analyse in full the variation in response and the time taken to reach a solution.

Item 52

Method and presentation

Story: A Man Moves a Piece of Wood

I know a man who had a big piece of wood. Here it is. [Small "beam" shown to child.] And he wanted to get it through this doorway. Here is the doorway. [The piece of wood was propped against the side of the doorway.] Show me how the man put that piece of wood through the doorway. Give it to me. [Experimenter held her hand in a receiving position and on the far side of the opening.]

Results

This task involved a change of plane. Twenty-eight children in the Maori sample and 25 children in the Pakeha sample solved the problem of change of orientation with little difficulty. The others solved it eventually. This orientation task was more difficult than the last one (which involved orientation with respect to the self or another but without change of plane). Although the results do not show it, children had more trouble solving the stick and doorway problem than they did the doll and teacup one and there was considerable banging of the stick against the door. Only 4 children had difficulty with both items suggesting that the tasks are not related by any underlying feature.

The experimenter held one hand on the far side of the opening to receive the stick and the word *through* was accompanied by pointing. Some children delivered the stick simply and easily into the experimenter's hand. Others left the stick projecting fore and aft under the arch. At first the experimenter was inclined to put this behaviour down to the minimum effort characteristic of shy children. However, as some of the children who produced this response were by no means shy it did not seem an adequate explanation. A better one is that some children interpret the meaning of *through* as "in and under" in the present context. Perhaps it meant partly through but not right through and therefore retaining some kind of contact with the object to which it is related by the word *through*. One child, after he had placed the stick in this position looked at it jutting out fore and aft and said, "Haven't you got a little bit?"

Again with this item, the writer feels that the recording was inadequate. Some children picked up the piece of wood, immediately changed its orientation from vertical to horizontal and pushed it through the opening. Others held the stick upright and banged it against the top of the arch saying, "It won't go, it won't go". One or two looked at the display and without attempting to move the stick said, "It can't". Because the task required more than visual matching, manipulation of the objects was necessary in order to solve the problem. These comments can be compared to those for item 33 in which the child had to put a book into a bag and in which skill in manipulation seemed largely irrelevant (see chapter 11). One can suggest, therefore, that motor actions are necessary for the development of understanding of certain meanings whereas perceptual actions are sufficient for others. In this present task visual matching of the two objects could not lead to a solution.

Item 53

Method and presentation: blocks and cupboard

This item was similar to item 29 but instead of asking the child to find a deep cupboard he was asked to find the one that would accommodate the most blocks. He was shown a picture of two cupboards differing in depth and the experimenter said, "If you had lots and lots of blocks to put away, which cupboard would you put them in?"

Results

Thirty-four children in the Maori sample and 37 children in the Pakeha sample chose the cupboard with the greatest depth. There was general consensus of opinion that the deep cupboard was big and that the other one was "too small" or "too little". Thus the children used *big* and *little* as anchor terms. Two children ran their fingers along the depth dimension thus indicating that by *big* they meant the distance that the cupboard went back. One or two children said that the small cupboard would be suitable for small blocks. For example, "Too small, you could put a few in there - only little ones". When the results from the proportion tasks are presented this matching of size of objects in relation to the size of another object becomes more marked. In the quotation just given the child believes that the blocks should be both fewer and smaller.

PROPORTION

Item 54

Method and presentation

Story: The Stone

A little boy wanted a stone to roll along the ground. The only stones he could find were these ones. [Two "stones" made from smooth grey self-hardening clay were placed in the child's hand. One was spherical and the other was a sphere elongated and flattened slightly.] Which is the best one to roll along the ground?

Results

All children except for 2 (1 in the Maori sample and 1 in the Pakeha sample) selected the round object. They were then asked to say why the elongated object was "no good". Many said that, "It can't roll", and one, stuck for words, said, "Can't, just can't". Other explanations which tried to express why the object would not roll included the following:

> This one won't roll because its got these parts behind.
>
> Wants a roller on it.
>
> Can't go cos its got squares.
>
> Cos it's flat.
>
> Too square there.
>
> It was not round.
>
> Too big.
>
> Fat.
>
> It's all down like that.
>
> Because it's got both ends like that.
>
> Cos it's too long.
>
> It's got edges, sides and things like that.
>
> It's not a circle.
>
> It's got a bit straight here.
>
> Because that one won't roll because that one's a rectangle and that one's a round one.
>
> Cos it's too crazy.

Item 55

Method and presentation

Story: The Wheel

A man lost the wheel from his car. The only wheels he could find were these ones. [Two cardboard "wheels" were given to the child. One was circular and the other was oval.] Which is the best wheel for a car?

Results

Thirty-eight children in the Maori sample and 33 children in the Pakeha sample chose the round wheel.

The children commented on the flattened wheel as follows:

> That just like an egg. You should have made a wheel.
>
> That one can't do the roll around.

It's too flat.
Cos it can't fit on a car.
Go round and round bang, bang.
Got a nail in it.
For a tractor.
Too crooked.
That a football one.
Too small.
Big one.
Got a flatty.
It's all in a funny round.
It's too long.
That one's crooked.
It's a bike one, where's the car.
It's got a puncture.
It's bald.

The above are not all the comments but they are representative. Children grasp the difficulty in rolling the oval wheel but, in a manner typical of four-year-olds (who are loath to waste experience), they try to find a use for the wheel - on a tractor or a bike perhaps, or they produce some plausible reason for the wheel's sad state, "Got a flatty". Or they recognise that something is wrong with it without knowing exactly what it is. They compare it to things they know such as an egg and football. They know it should be round and yet it is not and they try to make sense of this by drawing on their own experience.

Both this item and the preceding one indicate that four-year-olds are intuitively sensitive to proportion when this concerns familiar spherical and circular objects. The child's sensitivity to proportion in linear objects will be reported later (chapter 16).

NORMATIVITY

Item 44

Method and presentation

Story: Boy and Shirt

Here is a boy. [The child was given a cardboard cutout of a boy wearing socks, shoes and short school trousers.] Can you see what he is wearing? That's right .... He isn't wearing a shirt, is he? This boy's mother told him to go and find a shirt to put on. The only shirt he could find was this one. [The child was given a paper shirt too big for the boy.] Does this shirt fit him?

Item 45 Girl and Dress

Here is a girl. [The child was given a cardboard cutout of a girl wearing a dress.] She is wearing a dress but she has been wearing it for days and it is dirty. This girl's mother told her to go at once and find a clean dress. The only dress she could find was this one. [The child was given a paper dress too small for the girl.] Does this dress fit her?

Results

The results will be given for both items together.

The differences between the performance of the Maori sample and of the Pakeha sample on both items were non-significant.

These items were directly concerned with the notion of fit. The children were also asked why the garment did not fit if, in fact, the child acknowledged the lack of fit. The pattern of responses is shown in table 12.4.

Table 12.4

Number of children stating that garments did not fit

	Maori sample (N = 40)	Pakeha sample (N = 40)	Total
Boy's shirt too big	23	25	48
Girl's dress too small	38	37	75

There is a statistically significant difference between the answers to each of the questions. (Items 44 and 45). (Zubin's t = 0.81, p.<0.01). The children in both samples find it easier to deny that the little garment fits than to deny that the big garment fits. The reason for the relative ease of judgement in the case of the dress rather than the shirt is almost certainly a perceptual one. The big shirt covered the outlines of the boy so that they could no longer be seen and the child had to look for clues in other directions, for example, to see that the shirt came down to the boy's knees or that the sleeves looked very big in contrast to the arms. The dress, on the other hand, simply sat in the middle of the doll's body and the cardboard outline extended all around it. The child was being asked to deal with a situation present before his eyes rather than with an abstract question for which there were no immediate referents and for which the child had to compare objects mentally. It can be noted that for some children *fit = touch*.

SUMMARY

There were no significant differences in achievement between the

Maori and the Pakeha samples on the volume, dimension, orientation, and proportion, implication tasks. There were more marked order differences between the two samples than appeared in other task series but the concept scores were so close together that the order differences can probably be disregarded. It is more important to note that there were statistically significant differences with regard to three oppositions. The Pakeha sample did better on "wide" (v "high") and "high" (v "wide") and the Maori sample on "long" (v "high"). It was noted that these differences paralleled ones which had emerged with earlier word recognition items.

There was further evidence for judgements of "fit" and its combination with judgements of size.

Orientation was examined in two tests, one concerned with reversal of direction in the same plane and the other with change of plane. It appeared that the two abilities tapped were not linked by any underlying feature.

The children were sensitive to proportion in relation to familiar spherical and circular objects.

The children found it easier to deny that a "too-small" garment fitted than to deny that a "too-big" garment fitted.

CHAPTER 13

POLAR ANOMALY TASKS

A traditional way of searching for relationships amongst words is to use the technique of verbal association. This is a simple and effective way of discovering words which seem to adhere together. Unfortunately, the technique is difficult to use with children as young as four. Adults know the right kind of answer but children find it difficult to discover this. Young children generally do not know what a word is nor what kind of answer is required. (Francis, 1972, 956). During the pilot testing for this project verbal association was tried out. Some children could respond in the manner required but some could not. Those who could not found the experience very frustrating and were subsequently unwilling to carry on with the testing programme.

Up until about the age of seven, children give syntagmatic responses in verbal association tests and not until after this age do they tend to produce paradigmatic responses. If one is looking for relationships within a semantic field it is necessary to elicit paradigmatic responses.

METHOD

Materials

For the reasons just given it was decided to develop another method of tapping a semantic field it if existed. This was done by preparing a series of cards each depicting three objects of identical size, shape, and colour. (See appendix C). These objects were then paired with words from the Bierwisch set which were anomalous when used in the contexts provided by the pictures.

There appears to have been little research attention given to a child's sensitivity to semantic anomaly so far as this is concerned with lexical usage. Howe and Hillman (1973), however, found that children are able to detect some types of anomaly before other types. For example, anomaly is detected in sentences with animate subjects before it is detected in sentences with animate objects. (See also, Shultz and Pilon, 1973, for children's sensitivity to the related area of linguistic ambiguity).

For reasons of length of administration only half the words of the Bierwisch set were used in the polar anomaly tasks. The words consisted of four (+Pol) terms, four (-Pol) terms and *big*.

The objects with their adjectives were as follows:

Item 56: low elephant
Item 57: tall house
Item 58: fat chair
Item 59: narrow fly
Item 60: big pear
Item 61: short chair
Item 62: far man
Item 63: thick apple
Item 64: shallow wheel

It can be seen that the degree of semantic anomaly varies and that while some of the word combinations are decidedly odd, for example, *shallow wheel*, others are possible in certain contexts and it is probably not possible to use *big* as a qualifier of a noun in any semantically anomalous combination of words. The pictures contributed cognitive anomaly to the task. In the first place the objects did not fulfill the expectations of the qualifying adjective. The tall houses were not tall and the fat chair was not fat. Secondly, all objects were of the same size and hence gave no assistance in the selection of any particular one.

Presentation

The child was asked questions of the following form. "Can you see a low elephant?" Four-year-olds are not distressed by anomaly, either semantic or cognitive, and, if asked to select a low elephant from a display of three similar elephants they are willing, even eager, to pick one. (The same cannot be said of the mothers many of whom were very puzzled by the tests).

The experimenter said "Good" when the child had selected the elephant he believed to be low. The experimenter then pointed to the other elephants and said, "These ones aren't low are they?", stressing *low*, and, having waited for the child's agreement to this proposition, then said, "What are they?" The question was repeated if the child did not respond and if he did not wish to respond to one or more items he was not pressed to do so.

RESULTS

In presenting the results from this portion of the testing, words merely imitated are omitted. Thus, if in answer to the *low elephant* question, a child said that the others were low elephants, the word *low* is not recorded. The child may have grasped the similarity of one elephant to another but it is far more likely that he imitated the adjective he heard without implying that the elephants were low. In effect, he is saying, "They are all elephants". One child used *only* four times and another used *just* twice to qualify nouns. These responses were classified as if they were noun only responses.

Table 13.1

Range of responses on the polar anomaly test

Types*	Maori sample (N = 35)	Pakeha sample (N = 37)	Total
0	9	9	18
1	8	5	13
2	9	10	19
3	7	5	12
4	2	3	5
5	0	5	5

* A "type" is one of the words of the Bierwisch set or a synonym of these.

Five Maori children and 3 Pakeha children did not answer any of the questions. Four refused to respond and four were not given the test because of the child's fatigue, slowness in completing earlier sections, or absence from this testing session. Table 13.1 shows the variety of words elicited. With the frequencies of non-response included a median test of the two distributions resulted in χ^2 = 0.8, 1 df, which is non-significant. The

Pakeha children used a greater range of the adjectives of the set.

Five Pakeha children each produced one more adjective type than any other Pakeha or Maori child. These 5 children were all in the last quarter of their fifth year. The number of tokens produced (excluding imitations of stimulus word) was 542. The Maori sample produced 276 tokens and the Pakeha sample produced 266. The average number of tokens per child was 7.53 (Maori 7.89 and Pakeha, 7.19). The children in the two samples were, therefore, equally willing to produce words in response to the questions.

The quality of the responses can be gauged by looking at the types produced. In the Maori sample 71 responses and in the Pakeha sample 49 responses consisted only of a repetition of the noun. In other words about a fifth of all responses were noun-only responses and a higher proportion of Maori responses than of Pakeha responses were of this kind.

The 15 adjective types elicited are set out below, excluding imitations, together with the frequency with which they occurred. No child used *wide, deep, far* or *shallow*. Table 13.2 shows the elicitation of each of the words of the set by the Maori and by the Pakeha sample.

A 2x4 table was constructed by combining the bottom 12 categories (χ^2 = 13.14, 3 df, p.<0.01). The distributions are significantly different and it is interesting to note a greater use of *low* and *high* by Pakeha and greater use of *long* by Maori. These differences are not great but they fit in with previous results from the recognition series.

Table 13.2

Elicitation of tokens according to Maori and to Pakeha samples

Adjective Types	Maori (N = 35) Tokens	Pakeha (N = 37) Tokens	Total Tokens
little	77	59	136
big	45	49	94
small	12	29	41
low	4	10	14
skinny	5	8	13
fat	2	4	6
high	0	6	6
long	5	1	6
tall	1	2	3
thin	0	2	2
thick	1	1	2
near	1	1	2
narrow	0	1	1
close	1	0	1
short	0	1	1
	154	174	328

About 30 other types of adjectives were elicited. These included colours and words connected specially with the object pictured such as *rotten* and *eating* for apple and *circus* and *strong* for elephant. These accounted for 9.40% of all adjectival responses.

The type to token ratio of the adjectives of the Bierwisch set and synonyms was 1 : 22.

The ratio of words of the set to words outside the set, calculated without imitations and repeated nouns, was 328 : 39. This gives strong support to the idea of a related set of words which might be said to constitute a semantic field.

Polar markers

The expected frequencies of polar responses in all responses should be (+Pol) 146 and (-Pol) 182. The polar markings of words elicited however were 117 (+Pol) and 211 (-Pol) terms. This difference from the expected distribution is statistically significant at the 0.01 level. (χ^2 = 10.02, 1 df, p.<0.01). It arises, however, mainly because *big* produced a large number of *little - small* responses and to a lesser extent because *fat* operated in the same manner. Only the item with *low* elicited a substantial number of (+Pol) tokens and this is almost certainly because children associated *big* with *elephant* rather than because they sought the (+Pol) of *low*. Elephants, for example, were desribed as *big* 22 times and as *little* or *small* 8 times. Flies, on the other hand, were described as *big* only 6 times but as *little* or *small* 15 times.

Little and *small* account for 83.9% of all (-Pol) responses and *big* accounts for 80.3% of all (+Pol) responses.

In table 13.3 are set out the types of response in relation to the varying stimuli.

Table 13.3

Distribution of all responses according to stimulus

Stimulus	Adjectives of set	Other adjectives	Imitations	Nouns	Total number of responses
low elephant	34 (47.2%)	4 (5.5%)	4 (5.5%)	30 (41.6%)	72 (100%)
tall house	46 (68.7%)	0 (0.0%)	6 (9.0%)	15 (22.4%)	67 (100%)
fat chair	42 (60.9%)	3 (4.3%)	7 (10.1%)	17 (24.6%)	69 (100%)
narrow fly	28 (48.3%)	6 (10.3%)	8 (13.8%)	16 (27.6%)	58 (100%)
big pear	54 (69.2%)	1 (1.3%)	7 (9.0%)	16 (20.5%)	78 (100%)
short chair	43 (79.6%)	3 (5.6%)	2 (3.7%)	6 (11.1%)	54 (100%)
far man	31 (63.3%)	6 (12.2%)	3 (6.1%)	9 (18.4%)	49 (100%)
thick apple	34 (63.0%)	5 (9.3%)	3 (5.6%)	12 (22.2%)	54 (100%)
shallow wheel	28 (60.9%)	5 (10.9%)	5 (10.9%)	8 (17.4%)	46 (100%)

Table 13.4 shows, in greater detail, the nature of the adjectival responses for each stimulus context. The children managed to produce the correct antonym only with *big pear* a stimulus for which the antonym phrase *little* (or *small*) pear is entirely appropriate. Only with respect to the phrase *big pear* was the children's frequent use of *little* or *small* on target. Only in the answers to the *big pear* anomaly task do appropriateness to object and appropriateness to language come together.

Table 13.4

Distribution of adjectival responses according to stimulus

	Antonym	(+Pol) term other than antonym	(-Pol) term other than antonym	Total number of responses
Low elephant	3	23	8	73
Tall house	0	22	24	67
Fat chair	11	12	19	69
Narrow fly	0	9	19	58
Big pear	48	3	2	78
Short chair	3	17	23	54
Far man	3	5	23	49
Thick apple	2	10	22	54
Shallow wheel	0	10	18	46

In tables 13.3 and 13.4 *fat* is treated as a synonym of *big*, *small* as a synonym of *little*, *skinny* as a synonym of *thin*, *close* as a synonym of *near,* and all these words are classified, therefore, as adjectives of the set.

An examination of table 13.3 shows that *big pear*, the non-anomalous combination, produced the greatest number of responses. It did not, however, produce the greatest percentage of adjectives of the set, nor the greatest percentage of adjectives, nor the lowest percentage of noun-only responses. In other words the greatest effect of a meaningful combination may be to increase a child's confidence in responding.

But why was this combination meaningful? Because it was non-anomalous? Or, because it contained *big?* The latter is the more likely explanation since the children gave no sign of being put out by the displays and the main effect of the *big* phrase was on number rather than quality of responses.

Table 13.3 also suggests that the ability to produce an adjective in the anomalous combinations is affected by the linguistic context. *Narrow fly,* for example, which includes the poorly understood term *narrow* had only about 59% adjectival responses while *short chair* had about 85% such responses.

Associative links

The operation of contiguity can be observed in the results of this set of tasks. The word *low* was used 14 times after it was presented in the stimulus item, *fat* was used 6 times after it was presented but not before, and *narrow* was used only once and this was after its presentation.

A comparison

In E. Clark's study of antonyms (the children were asked for opposites) she concludes that "the pairs are learnt as pairs and not as single items, and that this is a highly reliable finding". (E. Clark 1972, 755). The first thing that can be noted about Clark's results is that only 49% of the responses recorded were true antonyms and 63% were semantically appropriate. The responses classified as semantically appropriate were, by and large, *little* and *big*. Clark also classified phrases such as *not deep* as semantically appropriate (as an antonym of *deep*) although they are hardly appropriate in the same sense as *big* and *little* are. The present results do not support the idea that the Bierwisch adjectives are learnt as antonym pairs. The anomly tasks, reported in this chapter, are very different from the verbal elicitation task used by Clark, and hence there is little point in trying to compare relative performance in the two studies. What the anomaly tasks do show, however, is that the words of the set are learnt in relation to objects as well as in relation to words, that in these four-year-olds an object match takes precedence over a word match, and that if the words are learnt as pairs, it is at first in relation to *big* (and probably *little*) rather than to their own antonym.

SUMMARY

Maori and Pakeha samples were equal in willingness and ability to make a response in the polar anomaly elicitation tasks.

The children in the Pakeha sample produced a greater range of types than did the children in the Maori sample. Children in the Maori sample made more noun-only responses than did children in the Pakeha sample. Neither of these differences reached statistical significance.

Little, small and *big* account for over half of all responses including imitations and noun-only responses. Appropriateness to object is far in advance of appropriateness to semantic constraints and selection rules. Appropriateness to the object is gained, by and large, by use of *big, little* and *small.*

CHAPTER 14

SPACE, VOLUME, ORIENTATION, PROPORTION AND DIMENSION ANOMALY TASKS

This set of tasks was developed on the same principle as the polar anomaly tasks in that the child was asked a question inappropriate to the display. (See appendix C). In the first task (item 67) the child was shown a picture of two (3 Space) objects and the child was asked to find a (1 Space) referent. Because the answers cannot be right or wrong no calculations have been made of differences in achievement between the two samples of children. However, differences in patterns of response on each item were tested and none reached statistical significance at the 0.05 level. A difference which appeared on the first calculations for choices on geometrical shapes disappeared when choices were classified only as curved or straight sided (item 74, item 75, item 76).

The method and results will be presented for each item separately.

SPACE

Item 67

Method and presentation

The child was shown a picture of two bowls similar as to depth but varying in diameter. The child was asked "Can you see a deep bowl?"

Results

Thirty-two children in the Maori sample and 29 children in the Pakeha sample said that the bowl of greater diameter, the big bowl, was *deep*. Almost all responses classified the bowls as *big* or *little* or *small*. One child said that the smaller bowl was *shallow*. Children responded to the misleading situation by using the primitive response of choosing the perceptually big. The children were not concerned that depth does not distinguish the bowls from each other.

VOLUME

Item 68

Method and presentation

The display was a picture of two persons, one fat and one thin. The question was, "Can you see a wide person?" If the child said he could see something wide he was asked to say what this was.

Results

In this item it was expected that children would be familiar with a word for the fat person but less familiar with *wide*. Would these terms come into conflict? Only 18 children in the Maori sample said that the fat person was wide and 17 said that the thin person was wide. Of the children in the Pakeha sample 24 said the fat person was wide and 12 chose the thin person. One can suggest that in comparison with the responses to item 67 there is less certainty in the present item that one should choose the big. The reasons for this can be sought in the children's comments. The children appeared to be avoiding what they knew. The big person was almost invariably referred to as *fat, big* or *big fat*. The other figures were *little, small* or *skinny*. One child avoided choosing the thin figure and said, "That's Mrs A. at playcentre", working, evidently, on the principle that if she was Mrs A. she couldn't be wide as well.

The children in the Pakeha sample showed a greater willingness than did the Maori children to call the fat person *wide*. It has been noted earlier that Pakeha children were more familiar with *wide* and this may account for these results.

Item 69

Method and presentation

In this item two jugs which differed only in height were pictured. The child was asked, "Can you see a fat jug?" and was then asked to comment on the jugs.

Results

Thirty-one children in the Maori sample and 32 children in the Pakeha sample said that the big jug was *fat*, suggesting a synonymous relationship between *big* and *fat*. The smaller jug was most commonly identified as *little* or *small* but 2 children thought it was *skinny* and one said it was *thin*.

Item 70

Method and presentation

A picture showed two cakes differing only in thickness. The child was asked, "Can you see a fat cake?"

Results

Again 31 children in the Maori sample and 33 children in the Pakeha sample chose the big cake. The smaller cake was referred to as *little*, *small* and *skinny*.

These last two sets of results suggest that *fat* and *big* are generally thought to be interchangeable whether the extended dimension of the object is in the vertical or the horizontal direction. It can also be noted that a few children were stimulated to produce the antonyms *skinny* and *thin* and, thus, they were responding to the linguistic cues.

ORIENTATION

Item 71

Method and presentation

A picture showed a tree with three apples on it and two on the ground. Three of these apples were elongated in the vertical direction and two were of normal proportions. The child was asked, "Can you see a tall apple? Can you see another one?"

Results

In both samples there was a preference for the elongated apples (Maori sample 13 and Pakeha sample 16) and much less support for the little apples (Maori sample 8 and Pakeha sample 6). The apples were defined by the children as *big*, *little* and *small* with only slight variation from responses like these. The majority of choices for elongated apples is probably an example of choosing the big rather than a genuine distinction about a maximal axis, but it suggests (as will be discussed more fully in the chapter on proportionality) that a sense of proportion, like the words of the set under discussion, develops from an understanding of *big*.

Item 72

Method and presentation

A picture showed three men of identical height one of whom was standing on a box. The child was asked, "Can you see a tall man?"

Results

Sixteen children in the Maori sample and 12 children in the Pakeha sample chose one of the men on the ground as the tall man. Eighteen children in the Maori sample and 23 children in the Pakeha sample chose the man on the box as the tall man.

Once more the remarks show the use of *big* for the man on the box and *small* for the men on the ground. There was some confusion between *small* and *tall* which has been noted earlier with respect to item 24 and some children chose a man on the ground, "Cos he's small". Many, however, pointed to the man on the box sometimes adding, "That's a big". One child said, "Them two are small because they're on the ground and that one's on a tall box", suggesting that the child was trying to make sense of the whole display and while realising that the man on the box was not tall, decided that the box was tall.

These results can be compared with those of Piaget, Inhelder and Szeminska (1960) in experiments to determine children's geometrical understanding. In one experiment identical towers were placed on different levels and the children were asked which was the taller. Children of four and five tended to think that the higher tower was also taller. Piaget et al. speak of "the problem of the relation between base and top" (op. cit., 38) and say that, "We infer that these objects vary in height with every variation in the height of the surface on which they stand", (ibid.). The Piagetian explanation is that the children lack conservation of length.

Maratsos (1974) performed an essentially similar series of experiments, in this case using pairs of animals varying in size. "In this study a small turtle became 'the big one' when placed on top of a box that was higher than the head of a distinctly larger elephant". (Maratsos, 1974, 368). Thus elevated objects are seen as *bigger* as well as *taller* and this phenomenon, according to Maratsos, appears in children of about 4;5. The explanation given by Maratsos differs from the Piagetian one.

> The most parsimonious explanation for this growth in influence is that top point acquires greater salience as a perceptual categorisation as children grow older. (Maratsos, op. cit., 373).

The present results are not so unambiguous as those of Piaget and Maratsos. One of the reasons is possibly the rather poor understanding of *tall*. Another, the use of a picture rather than objects. Another, that there was no right answer. However, "top point" if it exists, certainly did not exert an overpowering influence on the children in the sample and from the remarks made, it is possible that many children did not experience the problem as one of conserving length. Many were able, for example, to focus on the man rather than on the box and at least one of the children, in the example recorded above, gave evidence of being able to decompose the display into the elements of man and box and hence did not fuse them in one linear construct.

Item 73

Method and presentation

A picture showed three boys differing in height. The question was "Can you see a high boy?"

Results

Almost all of the children who answered this question identified the tall boy as *high* (33 out of 36 in the Maori sample and 35 out of 37 in the Pakeha sample) suggesting that they were using *high* in the (+Inherent) sense.

PROPORTION

Item 74, Item 75, Item 76

Method and presentation

The displays consisted of three sets of geometrical shapes made of cardboard. Each set was a different colour. The first consisted of a square, a star, and a circle, the second, a square, a triangle, and a circle, and the third, a star, a triangle and an oval. The child was asked "Can you see something long?" and he was then encouraged to explain how the chosen object was long.

Results

Results are set out in table 14.1. Those who said there was nothing long or that all were long are not included in the figures. The essential findings are that on the first two items, the circle tends to be avoided in favour of the straight sided figures and in the third item (item 76) the elongation of the circle persuaded almost half the total sample who responded to select it rather than a straight sided item.

Table 14.1

Objects selected by Maori and by Pakeha samples as being *long*

	Sample	Square	Star	Circle	Total
Item 74	Maori	12	19	5	36
	Pakeha	19	7	6	32
		Square	Triangle	Circle	Total
Item 75	Maori	17	10	9	36
	Pakeha	17	8	6	31
		Star	Triangle	Oval	Total
Item 76	Maori	13	8	15	36
	Pakeha	11	4	16	31

These data show linearity in relation to *long*. Linearity is easy to perceive if it is formed by the edges or opposing points of a figure. Some children ran their fingers round the perimeter of the straight edged figures to show their length. (One is reminded here of Piaget's experiments with the construction of a projective straight line). The children chose straightness in some part of the figure rather than roundness. However, since almost half the sample selected the oval shape in the last item, it is clear that a substantial proportion can see this linearity within a figure with rounded edges.

This set of three items was specially popular with the children who immediately set about classifying the shapes as "star", "moon", "square", "a round", "window", "ball", "triangle", "a flat wheel", "a plane", "egg", and "like a shortbread". With this item there was scarcely any mention of *big* and *little*. Children noticed points and edges. As one child said, "One edge, two edge, three edges and another one. That's four edges".

DIMENSION

Item 77

Method and presentation

A picture showed an apple tree with three apples placed at different heights on the branches. The child was asked, "Can you see a tall apple?"

Results

Twelve children in the Maori sample and 10 children in the Pakeha sample chose the highest apple, and 29 chose one of the lower apples (18 Maori and 11 Pakeha). In this item, size cannot act as a discriminator. It is hard to see what kind of principle is at work here except that the high apple is not overwhelmingly appealing in the way that something big is appealing. Eight children (1 in the Maori sample and 7 in the Pakeha sample) answered *no* to the question.

Item 78

Method and presentation

A picture showed a child sitting down with three flowers growing at varying distances from it but with the middle flower out of alignment. The child was asked, "Can you see a long flower?"

Results

The flower furthest from the pictured child was the most popular and 12 children in the Maori sample and 17 children in the Pakeha sample chose this one. Thirteen children (7 Maori and 6 Pakeha) chose the near flower and 15 (11 Maori and 6 Pakeha) the middle flower. One can suggest that the far away flower tended to impress the children because the drawing showed the greatest distance to be between the pictured child and this particular flower. Thus, while *far* and *long* are normally visually separated, in this particular context there is more clearly a similarity between length and distance. However, it did not strike all the children this way and 7 children (2 Maori and 5 Pakeha) answered *no*.

Item 79

Method and presentation

A picture showed two flowers one longer than the other one, the long flower placed above the shorter one. The child was asked, "Can you see a far flower?"

Results

Twenty-three children in the Maori sample and 29 in the Pakeha sample, chose the long flower, one child saying, "That's the father flower", and probably confusing *father* and *farther*. Another child said, "That's right back", thus defining *far* and then applying it to the flower. (It will be recalled that *far* was a well-known word). Another child made sense of the display by saying, "Cos it's far away from the other flower".

This item would have been improved had the small flower been above the other so that when the picture was in front of the child the long flower would have been near him.

Discussion

Because there were a number of children who did not answer some or all of these questions (which came at the end of the testing sessions) detailed analyses of word use are not justified. It can, however, be noted once more that the children in the Maori sample produced fewer varieties of words than did the Pakeha sample.

There is evidence in this section, once again, for a *big - little* system and for these words to act as antonyms and synonyms for other words of the set. The importance of physical size as a factor in the young child's pattern of choice can also be noted again.

SUMMARY

The data from this section of the testing tend to confirm those from the polar anomaly series.

There were no statistically significant differences in the patterns of choice of the Maori and the Pakeha samples.

It will be recalled that Katz and Fodor said that the ability to detect semantic anomaly was a linguistic ability. These children, as hearers, were not noticeably sensitive to anomaly. As speakers, however, they were quite skillful in avoiding anomalous statements. (Kuczaj and Maratsos, 1975b, 104, comment on error free use of syntax). The means by which children avoided semantic anomaly were (i) by using the widely substitutable *big, little* and *small,* and (ii) by matching the word to the object, that is to the objective facts of the situation. A loosely structured semantic system appears to exist. The words are related associatively and are, to some extent, interchangeable.

CHAPTER 15

NORMATIVITY

What do four-year-old children imagine to be the size of different objects and how is the judgement of size, as expressed in words, affected by the form of question used to elicit the response, and the child's familiarity with the object in question?

As Kotyrlo (1964, 119) says, in order to tell whether an object is large or small or high or low we mentally compare it with a concrete object or with our general ideas of large and small or high and low objects. It takes children some time to develop accuracy in this kind of judgement and the young pre-school children tested by Kotyrlo when asked, "How high is a dog?" gave answers such as, "Up to the ceiling", and, "As high as the locker".

METHOD

Tasks and presentation

In item 80 the child was asked "Is a ________ big?" The blank was filled successsively by *cow, cat, mouse, you, house, dog,* and *stick*. In item 81 the same objects were named in the same order in the following form of sentence, "Is a ________ little?" The investigator was interested in assessing,

(1) whether children operated by means of a norm or norms such that some items would be seen by most children as being above a norm whereas others would be below a norm,

(2) whether stability in the assessment of size varied in relation to the type of object,

(3) to what extent differences in response would be brought about by differing forms of questions,

(4) whether there would be any difference in responding associated with comprehension of *big* and *little*,

(5) whether there would be any difference in responding associated with a question requiring the answer *yes* and one requiring the answer *no*.

The question "Is a _________ big?" expects an answer of *yes* or *no*. The form is that of a *yes* - *no* question (a polar interrogative) and the child must be able to comprehend its requirements. In order to answer *yes* or *no* the child must be able to judge the truth value of the underlying proposition "A _________ is big". (See Suppes 1974, 103-104, for a discussion of the concept of truth in semantics). This in turn implies understanding the words and, especially, the predicate terms of the sentence. In order to be able to judge its truth value the child must have in his mind some norm of size appropriate to the object referred to. Moreover, the child was asked to perform this task without reference to objects perceptually present. The task contains the following basic elements.

Element	Value		
Reference object	Familiar	or	Unfamiliar
Truth value of underlying statement	True	or	False
Question	Requires *yes*	or	Requires *no*
Predicate term	*Big*	or	*Little*

RESULTS

The calculations were made for Maori and for Pakeha samples separately. The data are presented in table 15.1.

Table 15.1

Responses of Maori and of Pakeha samples to questions

	Is a ____ big?				Is a ____ little?			
Object	Maori (N = 38)		Pakeha (N = 38)		Maori (N = 38)		Pakeha (N = 38)	
	Yes	No	Yes	No	No	Yes	No	Yes
Cow	38	0	38	0	20	17	22	16
Cat	13	25	8	30	4	32	9	29
Mouse	10	27	6	32	4	32	2	36
You	29	8	31	5	27	9	30	6
House	37	0	38	0	26	10	30	8
Dog	32	5	29	8	18	18	24	13
Stick	32	5	30	6	14	22	19	17

In order to determine whether there were any significant differences between the Maori and Pakeha samples' response rates for any question on any item Zubin's *t* was ascertained. On no comparison did Zubin's *t* reach statistical significance. Chi-square was calculated for differences in the consistency of answers between Maori and Pakeha samples (that is, whether the two groups were equally able to maintain the original judgements in response to the *no* form of each question). Again, no statistically significant difference was revealed.

Evidence for a norm

The responses of the group of children as a whole can be used to shed some light on the existence of a norm above which the objects named are classified as *big* and below which they are classified as *little*. The following scale shows the measure of agreement, calculated by adding responses from both series of questions on the size of the objects and selecting the size (big or little) for which there was the greatest agreement. (N = 76).

	Mouse	Cat	Norm | Stick	Dog	You	Cow	House
Little ← → *Big*							
	83.6%	76.3%	62.5%	67.8%	76.9%	77.6%	86.2%
Number of responses	127	116	95	103	117	118	131

The norm occurs between *cat*, which more than three-quarters of the sample regarded as little, and *stick* and *dog*, each of which received about two-thirds agreement as being big. This scale does not indicate the actual ordering of the objects in a cognitive ranking but only the measure of agreement that a group of four-year-olds expressed regarding the size of the objects concerned. It conforms remarkably well, however, with an objective scale and indicates four things of interest.

(1) Four-year-olds generally claim to be big.

(2) Agreements on size are affected by objective size.

(3) There appears to be a norm.

(4) The norm comes between cat and dog if stick is disregarded.

We are assuming that in this series of questions the children did use a common scale but since *big* and *little* are relational terms theycan enter into a variety of normative scales. Children do not necessarily always work within one scale or with one norm any more than adults do. (Osgood, 1964, 198, comments on the variety of scales and de Villiers and de Villiers, 1974, comment on shifting frames of reference for *this, that, here* and *there*). The four-year-old son of a colleague described a glass as big and a teaspoon as small. He said that his older sister was big, presumably with reference to a norm other than the one applicable to a glass. The next day he said that his sister was big and small. (My thanks to Cedric Croft for these observations).

Stability of verbal judgement

To what extent were children able to both agree in the first series of questions that an object was, for example, *big*, and then to deny in the second series that it was *little?* Some children answered the *big* question but did not answer the *little* question.

They have been included in the group of those who did not maintain their judgement. The difference in the answers to the *big* question and the *little* question have been calculated for each object by determining how many children did not keep their first judgement stable in responding to the second question. The child was required to answer *yes* to one question and *no* to the other but the order varied according to the object named. Unstable judgements could be two *yes*, two *no*, or a missed response.

The second series began with *cow* and in order to give a "stable" answer, the child had to deny that a cow is little. The child may have taken one question to settle down and grasp the requirements of the second series and hence the figures for *cow* in table 15.2 may be slightly inflated.

Table 15.2

Number of children who altered verbal judgement of object

(N = 76)

Object	Number of children who changed judgement
Mouse	16
You	17
House	18
Cat	23
Cow	33
Dog	34
Stick	41

Table 15.2 suggests that knowledge of an object (*you*)

increases the chances of a stable verbal judgement. Items at the extremes of the size scale presented earlier (*mouse* and *house*) are also associated with a stable judgement. It is noteworthy that *stick*, which was put into the scale because of the ambiguity associated with its size produced the greatest number of switched judgements.

The effect of differing question forms and predicate terms

Four objects were chosen for which the earlier calculations had shown over two-thirds agreement on size. Two of these (*house* and *cow*) can reasonably be said to be big to a four-year-old and two (*cat* and *mouse*) can be said to be little. In other words the calculations on which table 15.3 is based rest on the assumption that children of this age do perceive cats and mice as small and houses and cows as big, but that difficulties of language or of logic may interfere with the correct communication of their ideas. With the responses related to these objects calculations were made to assess the differing effects of questions whose underlying truth value was true and thus requiring a *yes* answer, and questions whose underlying truth value was false and thus requiring a *no* answer, questions using *big* as the predicate term, and questions using *little*.

Yes questions produced fewer errors of verbal judgement than did *no* questions and questions with *big* as the predicate term appeared to be easier to answer than questions with *little* as the predicate term.

Table 15.3

Responses to questions about two big objects and two little objects

(N = 76)

	Little-yes	Big-yes	Little-no	Big-no
House		75	56	
Cow		76	42	
Cat	61			55
Mouse	68			59

Total deviations in *No* cells (20 + 34 + 21 + 17) = 92

Yes cells (1 + 0 + 15 + 8) = 24

Little cells (15 + 8 + 20 + 34) = 77

Big cells (1 + 0 + 21 + 17) = 39

The number of errors derived from questions with *yes* as the expected answer and *big* as the predicate term = 1; from *yes* as the expected answer and *little* as the predicate term = 23; from *no* as the expected answer and *big* as the predicate term = 38; and from *no* as the expected answer and *little* as the predicate term = 54. These results can be summarised as follows:

little + *no* - 54 errors

big + *no* - 38 errors

little + *yes* - 23 errors

big + *yes* - 1 error

If the 116 errors were distributed by chance the incidence according to each combination should be 29.00. The difference between the observed frequencies and the expected frequencies is highly significant ($\chi^2 = 52.6$, 3 df, $p < 0.001$). There are two comments that should be made about these results. First is that they have been calculated on the assumption that the children's cognitive judgements of the objects referred to have been held constant and this may not in fact be true, and second, that the difficulty with the *little* answers may have been inflated by the position of *cow* as the first in the *little* series. Nevertheless, the differences are sufficiently large to suggest that they would remain significant even if errors had occurred from the circumstances just mentioned.

The effect of objective knowledge

We know that this sample of children can use *big* and *little* and *yes* and *no* with considerable accuracy when the questions are asked about themselves.

The item *stick* is also of special interest in this context. Presumably a child is less familiar with the attributes of sticks and also with the relative size of *stick*, since sticks come in a range of sizes. An adult asked to state whether a stick is *big* would say that it depends on the size of the stick. Four-year-olds, however, in answering such questions, assume that there is some special size for stick and that a stick is therefore big or little. Their uncertainty about whether it is big or little is revealed by the children who said that a stick was both big and little. It should be noted that they did not claim that a stick was either big or little and, thus, that it varied. They agreed that it was big and, later, when asked whether it was little, they agreed to this proposition too. We would be entitled to say that these children did not know the size of a stick nor that its size varied. Knowledge of an object serves to stabilise both the *yes* - *no* syntactic system (the ability to confirm or deny statements accurately) and the *big* - *little* lexical system (the ability to refer accurately to relative size). Thus, contradictory answers are reduced when the object is known well. But this brings up the issue of what "knowing well" means. In this present context, knowing the size of an object well would seem to be influenced by both familiarity with, and the perceptual quality of, the objects and thus there is less wavering, as has been shown, over the extreme items *house* and *mouse*, than over the items intermediate in size.

Modes of agreement and disagreement

Lack of cognitive skill affects verbal judgements since once a statement is out a four-year-old tends to believe it. And perhaps the four-year-old is not alone in this. He accepts his own suggestions just as he accepts the suggestions of other people. Children often say *yes* to a question and then think of a reason to fit their affirmative, but incorrect, answer. An example of this, in answer to, "Is a cow little?", is, "[Yes], little calves are little". A few children simply nodded or said "yes" to everything. One of the features of the responses to these questions was the substitution of a positive statement for a denial of a statement. This involved one of two processes. The child gave an affirmative response to something which he must have had reservations about and then he made a statement that fitted his response. For example, in answer to, "Is a cow little?" children said, "A little moo in a paddock", "A calf is", "When it's born", and, "Little wee ones are little". While answers like these suggest that the child is thinking of variation in size, in fact, this would not seem to be the case since over 30 children, in both samples, used forms of this kind and almost all of these were in circumstances where a denial would be expected. There were, nevertheless, two statements which seemed to embody ideas of variation and indeterminacy. One child when asked about *stick* answered, "Some of the sticks are", to both the *big* question and the *little* one, and another said of a stick, "It's a middle-sized big".

In a study of children's acquisition of semantic constraints James and Miller (1973) report that when younger children were presented with the sentence, "The big spider skated across the room", two thought it was meaningful because, "A spider can have little tiny skates", and "Spiders can skate if they have skates". One can agree with Barten and Blank's (1971, 8) comment in their summary of Russian research that "the child often loses the meaning of the word when he must treat it apart from its referent", and add that when faced with a word without a clear referent the child does his best to give it a plausible meaning.

In the second type of process, the child denied the proposition by producing an antonym. Thus, in answer to, "Is a mouse big?" the child said, "It's a little one". In this type of answer the child gave a negative by means of a contrary proposition.

The types of answer given by these children in dealing with propositions which require the answer *no* would seem to be as follows:

(1) say *yes*,

(2) say *yes* and after realising the discrepancy of the answer give an example that proves a *yes* answer correct. (This may bear some relationship to the "command" function of language as described by Luria 1961, and Luria and Yudovich 1959. See also Bronckart 1973 for a critical commentary on interpretations of Luria's work; and Beiswenger 1968, 267),

(3) negate the question by producing a correct positive statement about the object,

(4) say *no*.

The first two answers would seem more immature than the latter two. Types 3 and 4 may be stylistic variations or individual preferences. Klima and Bellugi-Klima (1971, 419) report that by Stage II (Mean Length of Utterance 2.25 morphemes) children used negatives to contradict propositions and they give as an example,

Mother: Did you play in the snow?
Child: No, play sunshine.

One can see how a form such as this can be delivered with the same semantic intent as either "No", or, "Play sunshine". Both are negative statements although the second does not have negative markers of any kind. Wason and Johnson-Laird (1972) noted that adult subjects converted a negative sentence into an affirmative one before responding to it.

Donaldson (1970, 398) says, "Very little is known .... about the ontogenesis of the ability to make - or process - negative statements in formal tasks". She notes that adults have more difficulty with negatives than with positives in a variety of formal situations. (See for example, Wason and Jones 1963, Carpenter and Just 1975).

It is often difficult to find support in other language studies for data revealed in one's own. This is not because other workers have not looked into the same matters but because they have gone about things in different ways. Much of the evidence on child language is from spontaneous speech. This is particularly so regarding the study of negation. Affirmative sentences appear to be developmentally prior to negative ones (Brown and Hanlon, 1970) but the word *no* seems to emerge before *yes*. Jesperson (1971, 58) says that when a child begins to express negation, "it does so often in the form 'Bread no', often with a pause between the words, as two separate utterances". He quotes also from Frederick Tracy who noted that in young children "negation was often expressed by an affirmative sentence with an emphatic *no* tacked on at the end". These instances seem to be similar to Bloom's (1970, 15) examples of anaphoric *no* in juxtaposition to an affirmative utterance. Bloom (1970, 170-220) has made a detailed study of the development of syntactic and semantic development in the language of three young children and distinguishes three semantic functions of negative syntactic elements; to signal non-existence, to signal rejection, and to signal denial. Non-existence and rejection appear to be much more frequent than denial in early speech. Suppes and Feldman (1971) found that negation substantially increases the difficulty of commands embodying logical connectives. (It also increases their length).

Potter (1966, 125), discussing results from an experimental study of perceptual recognition, says that at all ages explicit negation was uncommon but that there was a consistent increase with age. The youngest children who were five years old produced such a negation only 1% of the time, and high school students 6% of the time. This was in a formal situation like the present one but the negatives were denials of the child's own previous propositions, a circumstance which differs from the present task.

Shaking the head as a negative signal appears early in development. Spitz (reported in Brown, Cazden, Bellugi-Klima, 1971, 391) says that shaking the head as an intentional negative signal occurs from about the age of 15 months. Early use, however, would seem to be confined to what Bloom calls rejection. Brown, Cazden, Bellugi-Klima (ibid.) record that in Stage I Adam used both head shaking and *no* to resist imperatives and to answer *yes* - *no* questions.

However, this kind of evidence is peripheral to the present matter for none of the work discussed has been similar in setting, age of child, or technique to the testing for normativity presented here and the Russian report mentioned above (Kotyrlo, 1964), which seems closest in style, contains only brief mention of children's comments.

NORMATIVE PHRASES

There is a set of phrases which express normativity (Bierwisch, 1967). The structure of these phrases in relation to each other can best be illustrated as follows:

too little/small	Just right Big enough	too big

The norm is expressed by *big enough* but not by *little enough*. The *big* in *big enough* loses its comparative or relational sense and expresses the unmarked form of measure of quantity. This usage can be compared with the related forms, "How big is the train?" and "How little is the train?" in which the first question asks, "What is the size?" without assuming any particular size whereas the second question assumes that the train is little.

If one negates *too big* by saying "They aren't too big. They're ________", two contrary propositions are possible, *just right,* which negates the proposition that objects extend beyond the norm, and *too little,* which maintains that objects do extend beyond the norm but in the reverse direction. It is possible that *just right* refers more directly to the objects perceived and that *too little* is a response to the linguistic system.

If one negates *big enough* in the same manner, "These aren't big enough. They're ________", the response expected is *too small* or *too little*.

METHOD

Two tasks in the anomaly series (items 65 and 66) were designed to explore the child's processing of linguistic statements embodying normative expressions. (See appendix C). The first question included *big enough* and therefore asks whether an object comes up to, or reaches, a norm. Item 65 asked "Can you see a shoe which is big enough?" The card which accompanied this question showed three shoes of identical size and hence the child, in answering this question, had to depend on his own system of thought. The children readily agreed that one of the shoes was big enough. The experimenter then said, "The other shoes are not big enough, are they?" When the children had agreed to this they were then asked, "These shoes are not big enough. What are they?"

Item 66 followed the same pattern as, and was presented in a similar manner to, item 65, but it included the term *too big* for which the negation is *just right* or some other phrase suggesting the norm, or *too little* or *too small*. The pictured objects were shirts. The question was, "Can you see a shirt which is too big?"

RESULTS

The results for item 65 are set out in table 15.4

Calculations made on table 15.4 produced $\chi^2 = 2$, 3 df, ns, which indicates that there is no statistically significant difference in the performance of the two samples.

Elicitation produced only 3 responses (*too small*) that would, by adult standards, be considered correct. However, it would be unwise to conclude that children do not have the phrase *too small* available to them. All that can be said is that this particular test failed to elicit *too small* as the paraphrase of *not big enough* and that the majority of the children either attended to the adjective only and thus produced *little* or *small* or *big* or they ignored the adjective and said *shoes*.

Table 15.4

Distribution of responses on normative anomaly task *(big enough)*

Response	Maori sample (N = 40)	Pakeha sample (N = 40)
Shoes	8	9
Little and other adjectives	19	16
Too small, little, enough big, big enough	13	15
Omitted	8	7

The results for item 66 are set out in table 15.5. For this table $\chi^2 = 1.5$, 3 df, ns. The four-year-olds in the sample gave what would be the adult response to these tasks (*too small,* or *too little,* or *just right*) in only 10% of cases.

The greatest proportion of answers (44%) was contributed by responses *little* or *small*. A noun-only response was elicited in about one fifth of cases. Noun elicitation is the only response type which appears to differ according to whether *big enough* or *too big* is used in the question. It is possible that the *big enough* form, less familiar than *too big*, tends to reduce comprehension of the question as a whole leaving a child to concentrate on what he knows best - the noun.

Table 15.5

Distribution of responses on normative anomaly task *(too big)*

Response	Maori sample (N = 40)	Pakeha sample (N = 40)
Shirts	5	6
Little and other adjectives	19	16
Too small, big, too big	7	11
Omitted	9	7

Material elicited in the polar implication tasks

The material elicited during the polar implication tasks (items 30-43) will now be examined in order to find evidence of normative expressions and to note their form and the context in which they were used. The polarity implication tasks were, it may be recalled, set in the context of a story in which a boy encountered a series of incidents in which there were generally three possibilities for choice.

The investigator asked every child on the first item why he chose that item and if the child found it difficult to answer this form he was asked to say why he did not choose the opposite polar item. This question also has it hazards since a young child when asked, "Why didn't you choose this one?" or "What's wrong with this one?" frequently interprets this question as a statement, "You should have chosen this one", and promptly alters his choice. At all stages of the testing programme the investigator tried to make the procedure enjoyable and smooth both for the child and the mother. Therefore, she tried to find out at the beginning of each series which type of question the child responded to most readily and if he found it a struggle to produce justifications and began to sigh deeply, then the justification questions were omitted. If he showed a tendency to alter his choice in response to, "Why didn't you choose this [other] one?", the experimenter pointed to the other item and said, "This one's no good is it? What's wrong with it?"

This procedure meant that justifications were sometimes elicited and sometimes not, that they were more likely to be elicited on earlier items than on later ones and that the questions sometimes cued a response referring to the object chosen and sometimes to the object or objects not chosen. However, although the elicited material was subject to the kind of contingencies just discussed, the question regarding first choice of an object was put in a standardised form and the fact that no justification was elicited does not imply that the child did not make a choice. (One is not justified, however, in comparing the performance of Maori and of Pakeha samples).

The commonest phrase used in justifications was a "too-phrase" such as *too small, too big, too fat,* and *too long*. One may question whether this use of *too* is in fact normative especially in view of the fact that some children use *so* instead of *too*. Certainly in some contexts *too* seems to mean *very*. However, there is good evidence that most of these children grasped normative meaning. In the first place, the "too-phrases" were appropriate to context, and secondly, there was much use of the word *fit* as in *won't fit, can't fit* and *doesn't fit*. Other ways of expressing this normative relationship were; *won't go, can't go*. While there is no absolute proof that the children were expressing normativity it is highly likely that they were and this point is strengthened by finding examples such as, "Won't go, too big", and,"Too big, won't fit", in which the second statement could reasonably be interpreted as a paraphrase of the first. The percentages of normative phrases in relation to all phrases elicited in each context are listed below. The total number of comments is in brackets. Apples 13.56% (59); corks 62.90% (62); ribbons 84.21% (57); books 79.66% (59); roads 63.89% (72); rivers 67.39% (46); gateway 77.05% (61); wall 64.58% (48); pools 40.74% (54); pools 44.44% (54); sheep 0.00% (5); sticks 1,50.00% (6) and sticks 2,40.00% (25).

The last four items resulted in little elicitation partly because both investigator and child were becoming tired, and partly because these items were less easy to talk about. Nevertheless, it is significant that the sheep and house item which asked the child to find the first and the last sheep to reach the house and which is not clearly normative did not produce any *too, fit* or *won't go* explanations. It can be seen that percentages of normative statements did vary according to context and that the larger percentages above, are derived from settings in which objects had to be measured either tacitly, or in practice, or both, against other objects, whereas there was no concrete sense in which the apples could be measured. The pools offered the possibility of some kind of measurement and one child sat the doll outside the pool to show that the child's height did not equal the depth of the water. However, many children saw this particular task as one of matching object to purpose rather than one of practical measurement. The same was true of the stick problem too.

The readiness with which normative phrases were used appropriately in implication tasks can be contrasted with the difficulty in elicitation in the anomaly setting. Once more it has been shown that linguistic processing, at least in four-year-olds, depends very much on cognitive processing of the objects in the environment (cf., comments by Webb, Oliveri and O'Keeffe, 1974, 990).

SUMMARY

No statistically significant differences were found in the performance of Maori and Pakeha samples on any of the normativity tasks.

It was shown that the children tended to believe that *house, cow, you, dog* and *stick* were big and that *cat* and *mouse* were small. A norm appeared to be operating between *cat* and *dog*.

An analysis of the order of difficulty of denying and affirming and of comprehending *big* and *little* as predicate terms in *yes - no* questions showed that it was easiest to affirm that an object was *big* when it really was big, next easiest to affirm that an object was *little* when it really was little, next easiest to deny that an object was *big* when it really was little, and hardest to deny that an object was *little* when it really was big. These results are statistically significant at the $p. < 0.001$ level.

Results from an anomaly task using normative phrases *big enough* and *too big* showed that children had great difficulty in producing responses appropriate by adult standards. Evidence was presented from the polar implication tasks to show the ease with which children use normative phrases when the context aids the verbal message the child is required to send.

CHAPTER 16

PROPORTION

Bierwisch (1967, 18) says that,

> Although it seems natural that expected proportionately determines our conceptions of objects rather deeply, it is not easy to decide whether it is one of the basic features that govern our interaction with the surrounding world or not.

Bierwisch has specified a marker (±Max) to deal with proportionality as part of "the semantic description of spatial structure". He also specifies, somewhat tentatively, a further marker (±Main) which also seems to bear some relationship to proportionality although possibly not in such an obvious fashion as the (±Max) marker.

What kind of behaviour would a child exhibit if he were using proportionality as a feature of cognitive organisation? This was the first question asked in developing tasks to tap this dimension of spatial understanding.

Chapman (1975) agrees with Piaget and Inhelder that an understanding of proportion which is, essentially, a ratio, arises rather late in development. With four-year-old children one can expect no more than an intuitive understanding and it was decided to test for a child's sense of rightness regarding objects of differing proportions.

METHOD

Materials and presentation

The materials consisted of six pictures each of which represented two objects which differed in proportion. The pictures were of doors, sticks, cars, tables, pencils and spoons. (See appendix C).

The child was asked, "Which is the best _________?" If the child did not respond to the question in this form he was asked, "Which one do you like the best?" (The experimenter was working on the assumption that to a young child, these questions are roughly equivalent). Following the child's answer he was asked why he had chosen in the manner that he did, or, if that question failed to elicit a response, why he had not chosen the other items. The experimenter did not press a child to answer and, if a child seemed tired or unwilling, he was not asked for a reply to *why* questions on all items. However, this set of items was a popular one and most children enjoyed choosing an object. It can be seen that the objects differ in proportion and also in size. The items differ too, in that adults selecting the "right" object, would probably select the bigger object of the two in two instances, the smaller object in two instances, and choose on some criterion other than size in another two instances. In other words, *big* and *small* are opposed in the test materials as a consequence of placing in opposition objects which differ in proportion. The pattern of adult choices would probably be as follows:

Item 82: 2 doors of which the *bigger* or *taller* door is also the correctly proportioned.

Item 83: 2 sticks of which the *bigger* or *longer* stick is also the correctly proportioned.

Item 84: 2 cars for which there is no correct choice solely on the basis of proportion.

Item 85: 2 tables for which there is no correct choice solely on the basis of proportion.

Item 86: 2 pencils of which the *smaller* or *shorter* one is correctly proportioned.

Item 87: 2 spoons of which the *smaller* one is correctly proportioned. The spoons differ in proportion of bowl to handle and not in overall length.

RESULTS

There were three ways of responding to each question. The child could choose the bigger item, the smaller item, or both items. In some instances there was no response on one or more items. The three modes of response are abbreviated in table 16.1 as *big, little,* and *both.* One child in the Pakeha sample and 2 in the Maori sample were not given the test.

Zubin's t was used to ascertain the significance of the difference in the Maori and the Pakeha samples' responses to each item. Differences for the answers to the door item, the rod item, the table item, and the pencil item were statistically non-significant. On the spoon item the Maori sample chose the smaller (and correctly proportioned) spoon more frequently than did the Pakeha sample. (Zubin's $t = 0.63$, $p. < 0.01$). On the car item the Maori sample again chose the smaller item pictured. (Zubin's $t = 0.49$, $p. < 0.05$). There

Table 16.1

Nature of choices on proportion questions

	Doors		Rods		Cars		Table		Pencil		Spoon	
	M*	P*	M	P	M	P	M	P	M	P	M	P
	(N = 38)	(N = 39)	(N = 38)	(N = 38)	(N = 38)	(N = 39)	(N = 38)	(N = 39)	(N = 38)	(N = 39)	(N = 38)	(N = 37)
Big	33	37	35	36	26	34	27	33	26	31	24	33
Little	3	2	2	2	10	4	7	5	10	5	9	3
Both	2	0	1	0	2	1	4	1	2	3	5	1

* M = Maori sample; P = Pakeha sample

was no reason to prefer either car on the grounds of proportion alone.

It can be seen from table 16.1 that:

(a) Maori and Pakeha responses are very similar with the exceptions noted for the car and the spoon items.

(b) There is a marked tendency to choose the big object on all items.

(c) There is a difference in responses between those for items 82 and 83 in which correct proportion and overall size coincide, and those for the other items where correct proportion may or may not coincide with largeness. Thus over 90% of the children made "big" choices for the door and rod items but for cars, tables, pencils and spoons, the percentages are in the 70s. Do children become sensitive to proportion, as they do to the terms of the adjectival system being studied, by seeing its relationship to *big?*

It has been stated that the children made "big" choices most of the time. Does this imply that they, in fact, viewed the objects as big and little? Information on this item is provided by the material elicited in the questions asking why the children did or did not choose a particular item. There were three main kinds of justification, (a) size, (b) measurement, and (c) purpose. For every item the preferred justification for the object chosen was based on size. The children said that that the object was "big" or "so big" or that it was "little", "small", or "too little" or "too small". Examples of the other two categories are given below.

Measurement justification

Several children tried to match the objects pictured to other objects of varying size.

Doors: of the big door, "A man go in there", and of the small door, "A little boy go in there".

"The big men can't get in there". (Little door)

"Because it's for people to go in". (Big door) "[for] dogs". (Little door)

"For little childs to get through and that one's for big people".

"It's a dog one". (Little door)

"That one's big. That would be all right for me to go through".

"If a cat goes in there".

Rods: " [for] the boy". (Little rod)

"Cos that one" (Little rod) "can catch fish but that one can't because sharks can get up there".

"That's for a little, and that's for a big boy".

Cars: "Because a man go in there. The little boy go in there".

"I can't fit in it". (Little car)

"That's for little children and big men".

"Because they have lots of children". (Big car)

"That one wouldn't hold a lot of people and that one would".

"That's a postman's truck this one and this one a post lady's car".

Tables: "Big table for the boys and girls and Daddy".
"And this one the boys and Daddies".
"It can't fit anything. It can fit a little bit". (Little table)
"For the big people. For the little child".

Pencils: "That for the boys and that for the Daddies".
"Mum has the big pencil".
"If you have a little packet [of pencils] little girls can have it".
"Cos that one would hold much more ink". (Big pencil)

Spoons: "That's the girl one and that's the Daddy one".
"Little babies can use that one". (Little spoon)
"That could be Father Bear's". (Big spoon)

Purpose justification

Some responses referred only to the purpose or function of the object pictured and not to its size. For example, of the rod, "Because it can catch the fish. Can put the string on these. You put a hook. Then you catch one". Of the spoon, "Cos it wants to go in our mouth". Of the table, "To put the cups on and the sugar".

There were, of course, some "other" answers which included the use of adjectives other than *big* and *little* such as *wider* for door (1), *long* for rod (3), *long* for car (3), *longer* for pencil (1), and *long* for spoon (1). In two instances, "wider door" and "long spoon", the adjectives were incorrectly applied. One child used the phrase "big and long" correctly of a rod. "Too square", and, "It's square and it's too small", referred to the door. (There were only 2 children who gave answers, like the ones just given, which express proportion.)

There were recategorisation answers such as, of the big door, "For the kitchen", and of the small door, "A cupboard". The small car was classified as a van, a jeep, a bomb, and a truck, and these were the grounds for not choosing this particular car. There were two answers expressing the child's feelings about the testing situation, "Cos that one's too dumb", and, "Cos that one's crazy".

It is interesting to note that *broken* was used to explain why the short rod (1 response) and the short pencil (2 responses) were as they were. One child referring to the pencils said, "Because that one's writes", which may be a sound confusion between *right* and *write*.

Discussion

The general results from this section indicate that four-year-old children are not noticeably sensitive to proportion, at least as it was depicted in the pictures used. Although over 90% of the children chose the correctly proportioned door and stick (according to the usual type of door and for the purpose of a fishing rod respectively), over 70% chose the incorrectly proportioned pencil and spoon. When the pictures of the car and the table were shown nearly 80% of the sample chose the bigger of the two items. All one can say is, that where there is no cogent reason for choosing the big item, the children were slightly more likely to choose the little object rather than the big one, but not that they made a positive judgement on the basis of proportion.

It would be desirable to repeat these items using real objects rather than pictures.

PROPORTION AND LINE

Proportion would seem to depend on a sense of linearity. In choosing the "better" of two pictured objects which differed in proportion it was plain that the four-year-olds were, as usual, deeply impressed by the size of an object. This does not necessarily imply that they could not note the main axis of an object, merely that it may not have seemed to them worthy of note in certain contexts. It was decided, therefore, to see whether children could indicate the main axis of some common objects. (Items 88 and 89) The results have been put in this section on proportion but the tasks are also imagery ones and hence are related to the results to be presented in chapter 17.

METHOD

Kotyrlo (1964, 115) reports that three- and four-year-old Russian children spontaneously spread their arms to show the size or bulk of an object. In the present chapter, the experimenter said, "I want you to show me something with your hands. Like this. Show me. How big is an apple? Show me with your hands". The experimenter shaped her own hands into a globe shape and encouraged the child to do likewise. The experimenter gave no further help but continued with the other questions, "Show me. How big is a motor car? Show me with your hands". The same form of the question was asked about a tree, the child itself ("you"), and a stick. When the series using *big* had been completed the child was asked, "Show me. How big is a little apple? Show me with your hands". A similar formula was used with the other objects.

The present task was developed on the assumptions that the instruction would cause the children to represent the main axis of different objects if in fact they understood (in the sense of intuitive understanding) an axis as a property of an object; and that the axis chosen would remain the same irrespective of whether the question required the child to represent a big or a little example of the object. Therefore, the four things to examine are:

(a) Whether a child is capable of indicating a main axis.

(b) Whether a child has control of both horizontal and vertical axes.

(c) Whether the axis is orientated appropriately.

(d) Whether the axis represented for each object is stable in that it is represented in the same orientation whether the child is responding to an instruction to indicate a big object or a little object, and irrespective of the correctness of the orientation.

RESULTS

Ability to indicate an axis

The investigator assessed the child as being able to indicate an axis if he arranged his hands or arms or body in any way that suggested length or height.

There were 12 children altogether (6 Maori and 6 Pakeha) of those who responded, who could not reproduce any axis on any item, and there were many more who could define an axis for only one or two items. When children did not clearly indicate an axis they usually arranged their hands in one of a variety of ways, for example they placed the palms downward with the fingertips touching, held their clenched fists together or pointed the index finger upward or slanting. A little more than half the sample (Maori sample 50% and Pakeha sample 59%) were able to indicate two axes and 83% could indicate at least one axis in at least one setting. In table 16.2 are shown the number and percentage of each group who indicated 1, 2, or no axes. Difference in distribution between the two samples is non-significant ($\chi^2 = 0.81$, 2 df).

Table 16.2

Number and percentage of the Maori and of the Pakeha samples who indicated one, two, or no axes

	Maori (N = 36)	%	Pakeha (N = 34)	%
1 axis	12	33.3	8	23.5
2 axes	18	50.0	20	58.8
No axis	6	16.7	6	17.7
		100.0		100.0

Agreement on orientation of main axis

Only if the axis conforms to its usual orientation can one take it as any indication of proportionality. How sensitive were the children to the usual orientation of the main axes of these objects? In assessing correctness of orientation, the axis examined was the one given in answer to the *big* question. If no clear axis was shown in response to this question then the answer to the *little* question was taken. In other words the child's first indication of an axis for each item was the response used. The results are shown in table 16.3 where the percentages are calculated for the sample of those who were able to indicate an axis for each object.

Table 16.3

Percentage agreement on the horizontal or vertical axes of four objects

	Car (N = 44) %	Tree (N = 50) %	You (N = 50) %	Stick (N = 49) %
Horizontal axis	93.2 (41)	22.0 (11)	18.0 (9)	32.7 (16)
Vertical axis	6.8 (3)	78.0 (39)	82.0 (41)	67.3 (33)
	100.0	100.0	100.0	100.0

Of all children who answered the question, over 80% of the sample were able to indicate at least one axis in at least one setting but the percentage able to indicate the usual axis was 60% for car, 57% for tree and 62% for "you".

One can note the high degree of agreement shown by these four-year-olds regarding the orientation of the maximum axis of things familiar to a child and, once more, the division of opinion regarding *stick* which has, of course, no fixed orientation.

Stability in judgement of axes

Did the children show certainty as evidenced by stability in their responses? Table 16.4 shows the stability of responses on each item.

Table 16.4

Stability of axis related to ability to indicate an axis

	Car (N = 68)	Tree (N = 68)	You (N = 66)	Stick (N = 67)
Number of children indicating an axis	39	39	46	42
Number giving same axis on each question	29	27	41	25

It can be seen from these data that being able to indicate an axis is one ability and being able to give the same orientation to an axis in answer to different questions is another ability. Both would appear to be affected by the nature of the object in question but stability appears to be more sensitive to the nature of the object that it is to the child's ability to indicate an axis for it. It should, however, be noted that there is a slightbias in favour of the items presented first because to measure stability one needs two answers from each child and a few children became tired before they could answer the second question. This could have affected the responses for *stick* in three cases. Neither ability, being able to indicate an axis, nor being able to keep this axis stable in response to questions of differing kind, is independent of a child's information about the world and its objects.

The *little* set of questions did not appear to cause more difficulty than the *big* set except that, because the *little* set came after the *big* set, some children lost interest before the end and therefore did not answer all questions in the *little* set.

SUMMARY

Patterns of choice in the Maori and Pakeha samples, when the children were asked to choose the better of two pictured objects which differed in proportion, differed significantly on 2 items out of 6. In response to these two items the Maori sample showed a preference for the smaller item and the Pakeha sample for the bigger.

The judgements of the appropriateness of the pictured objects showed little sensitivity to proportion, at least where it conflicted with overall size, and the children's reasons for judging as they did suggested that the basis for almost all judgements was largeness. These results differ from those given earlier (chapter 12) for judgements of appropriateness related to spherical and circular objects.

The ability to indicate a main axis by spreading the arms did not differ significantly between the Maori and the Pakeha samples. In this situation, in which a child is not distracted by a competing subsidiary dimension, a majority of the children who were capable of indicating an axis indicated the usual main axis. Hence in this situation in which line was built into the task, many children were able to select the main axis.

CHAPTER 17

IMAGERY

> The development of symbolic imagery can, of course, never be grasped directly but must be approached through actualisations, such as drawings, gestures, selections from among a series of drawings representing both correct solutions and typical errors of different ages, and verbal comments.
>
> (Inhelder, 1965, 5).

METHOD

Each child was asked to produce a drawing. The experimenter said, "I want you to draw something for me. Do you think you could do that?" Most of the children said, "Yes". Then the experimenter said, "I want you to draw me something big and something little. Something big and something little. I'm not going to tell you exactly what to draw. Now what is it you are going to do? You are going to draw something big and something ________". The child generally chimed in with "little". If a child, affronted by the suggestion, refused to draw anything, the experimenter said, "It doesn't matter. Perhaps you will draw something for me another time". Six Pakeha children refused to draw anything and so did two Maori children. A piece of drawing paper approximately 26.5 cm x 18.5 cm and a black ball point pen were then given to those children willing to do a drawing. The child's name was written in the top right hand corner of the paper and the paper was presented to the child with the long axis running across. When the child had finished the drawing he was invited to tell the experimenter what he had drawn and to say what in the drawing was "big" and what was "little".

RESULTS

Nineteen children in the Maori sample and 20 children in the Pakeha sample drew human beings and/or other subjects. They probably used their customary drawing schemas and adapted them to the needs of the task. Fourteen children in the Maori sample and 9 children in the Pakeha sample drew abstract shapes such as circles, lines and squares. Five children in the Maori sample and 5 children in the Pakeha sample drew zig-zag patterns and indeterminate forms. These data are summarised in table 17.1 The differences between Maori and Pakeha in type of form are statistically non-significant. Calculations made on the data shown in table 17.1 with the two bottom categories combined produced $\chi^2 = 2.00$, 2 df.

Table 17.1

Type of form shown in the drawings of the Maori and of the Pakeha samples

Type of form	Maori	Pakeha
Human and/or other objects	19	20
Abstract shapes	14	9
Zig-zag patterns and similar	5	5
Refusal	2	6
	40	40

The drawings were classified, as far as possible, according to the child's interpretation of the drawing. There were 22 instances of a human subject (that is, 22 human subjects appeared in the children's drawings). These were made up of 2 babies, 14 men, 3 girls and 3 "ladies". Seven of the human figures were drawn by children in the Maori sample and 14 by children in the Pakeha sample. Some children drew more than one figure. Two thirds of all the human figures depicted were, according to the children, male.

There were several animals in the drawings: 1 cow, 2 horses, 2 bunny rabbits, 1 mouse, 2 elephants, 1 "chook". These were all drawn by children in the Maori sample. Two children in the Pakeha sample drew fish and 1 drew a caterpillar. Six children (4 Maori and 2 Pakeha) drew a house. Six children (3 Maori and 3 Pakeha) drew a vehicle of some kind. There was also a varied collection of other objects each one drawn, usually, by only one child. Some children drew more than one type of subject, for example, a man and a car. It can be seen from these results that there were no marked differences in general choice of subject by the children in the Maori sample and the children in the Pakeha sample although some difference in choice of animals emerged. This could possibly be accounted for if one knew the books the children were familiar with because many of the creatures appeared to be derived from book illustrations. About half the children drew objects and the most popular of these in both Maori and Pakeha groups were people, vehicles, animals and houses.

(A study by Smart, Gordon and Smart, 1972, of the drawings of older Maori and Pakeha children showed more marked differences of approach in each sample).

How did the children make a distinction between big and little things? There were two ways of doing this; to draw the objects on the page different in size irrespective of their differences in real life. This was by far the most common approach and many drawings, but not all, also corresponded to objective size relations. A popular approach, for example, was to draw a big man and a little man. There were also examples of such things as a girl drawn large and a car drawn small. There were only 4 children who drew objects which differed objectively in size but which appeared as the same size or with the big item smaller on the child's page. Thus, one child drew a man and a baby and said that the man was big, whereas his drawing of the baby was larger than that of the man. This type of representation has been called "conceptual only" in the accompanying table. The most common way of representing size difference, by making it different on the page, has been called "perceptual". Eight children did not manage to represent any size differences. These data are summarised in table 17.2. The difference between Maori and Pakeha samples is non-significant (χ^2 = 2.4, 1 df calculated with the two bottom categories and the top category combined).

Table 17.2

Type of distinction between *big* and *little* shown in drawings by the Maori sample and by the Pakeha sample

Type of distinction	Maori (N = 40)	Pakeha (N = 40)
Conceptual only	0	4
Perceptual	33	27
Neither conceptual or perceptual	5	3
Refusal	2	6

The most popular method of representing *big* and *little* was to draw two separate objects, but 10 children compared one part of an object with another part or one part with the whole. The methods of portrayal are summarised in table 17.3. The difference between Maori and Pakeha samples is non-significant (χ^2 = 0.35, 1 df, calculated with the bottom three categories combined).

Table 17.3

Methods of portraying difference between *big* and *little* shown in drawings by children in the Maori sample and by children in the Pakeha sample

Method of Portrayal	Maori (N = 40)	Pakeha (N = 40)
By comparison of separate objects	32	28
By comparison of parts	5	5
No real comparison	1	1
Refusal	2	6

Some children made a clear distinction between the big object or part of an object and the small object or part of an object. This was often the case with abstract shapes like sticks and circles. Other children produced only slight variations in size.

The relationship between *big* and *little* in the drawings

Twenty-seven of the total sample drew sticks and circles, or objects so like circles that they could be considered the same. In order to look for a particular ratio between *big* and *little* drawings the object drawings and the geometrical figures were measured. The size and shape of paper had a degree of control over the size of the drawing but the children were not instructed to "fill-up the paper". The measuring was only approximate since young children's lines waver and gradually peter out and their circles are far from regular. In the circle drawings the diameter of the big circle was first measured and the little circle was measured in a parallel position.

There was greater agreement on the size of *little* than on the size of *big*. The big objects varied from 1.5 cm to 17.5 cm with examples spread evenly over the range. The little objects varied from 0.2 cm to 6.5 cm but half of the little objects measured between 1 cm and 2 cm. The spread of the size of the big objects and the clustering of the little ones means that no particular proportion or relationship between *big* and *little* could be detected.

SUMMARY

No statistically significant differences could be detected in the methods used by children in the Maori and the Pakeha samples to portray *big* and *little*.

CHAPTER 18

RELATIONSHIPS BETWEEN BACKGROUND AND PERFORMANCE VARIABLES

In order to look for possible relationships between the background variables that were established during the interview with the mother, and the child's performance on the tests, three categories of performance variable were established.

Performance variables

1. Words recognised: The set of spatial adjectives which the children were asked to recognise in the polar component series (items 1-9). There were 9 antonym pairs of words in the test.

Performance on these words was scored from 0-18 and the scores ranged from 6 to 18 with a mean of 11.24 and a median of 11 words. Calculations were made with the scores divided into 4 categories as follows,

1 14-18 words
2 12, 13 words
3 10, 11 words
4 6 - 9 words

When, during the calculations, the expected frequencies in cells fell too low for chi-square analysis, categories 1 and 4 were combined and so were categories 2 and 3.

2. Concepts: In the polar implication series (items 30-43) the children were asked to solve problems, the solutions to which required the concepts to which the spatial adjectives refer.

Performance on concepts was scored from 0-14 and the range was from 6-14. The mean was 10.2 and the median, 11 concepts. Calculations were made with the scores divided into

4 categories as follows,

1	13, 14 concepts
2	11, 12 concepts
3	9, 10 concepts
4	6 - 8 concepts

When, during the calculations, the expected frequencies in cells fell too low for chi-square analysis categories 1 and 2 were combined and so were categories 3 and 4.

3. Elicited words: These are the words of the set (types) elicited in the polar anomaly series (items 56-64). In this test the non-verbal context gave little support to the child's processing of the words.

Performance on this test was scored from 1 to 6 with a further category of children who did not respond. Calculations were made with the scores divided into 4 categories as follows,

1	0 adjective of 1 adjective elicited
2	3 or 4 adjectives elicited
3	4 or 5 adjectives elicited
4	No response

When, during the calculations, the expected frequencies in cells fell too low for chi-square analysis, categories 1 and 4 were combined and so were categories 2 and 3.

Cross tabulations were prepared from the three performance variables with each of 15 background variables. The calculations for one background variable, the ethnic identity of the child, have been reported earlier in this thesis. The other variables are, community type, age of child, sex of child, length of time the child has been at pre-school, the language or languages heard in the home, mother's identity, father's identity, child's ancestry, mother's education, father's education, father's occupation, mother's occupation before marriage, mother's age, and child's place in family. The tables on which the calculations were made are shown in appendix E. In this chapter only the results will be given.

Because some of the data are dichotomous (for example, the sex variable) some are nominal (for example, mother's identity), and some are ordinal (for example, father's occupational rank) it was decided to use chi-square analysis for all sets of data.

Results

The performance on word recognition showed the expected association with father's occupation ($\chi^2 = 6.14$, 2 df, $p.<0.05$). When the calculations were made on the Maori and Pakeha samples separately, however, the association between the performance of the Maori children and the occupations of their fathers was non-significant. Only the Pakeha sample showed a statistically significant association with father's occupation (at the 0.05 level). The age of the child was significantly associated with concepts ($\chi^2 = 12.62$, 3 df, $p.<0.01$) and with words elicited ($\chi^2 = 15.03$, 3 df, $p.<0.001$). The older the child the more competent he was likely to be.

The child's place in the family was significantly associated with words recognised ($\chi^2 = 6.39$, 2 df, $p.<0.05$). Contrary to the usual findings, middle children did best, the youngest child did next best, and the oldest did the least well. There are a number of possible reasons for this result. One is that the association between eldest children and advanced language abilities has been noted in tasks requiring the child to produce words. The recognition tests of this present project did not rely on production. Perhaps the particular words of this present study are not affected by a child's place in family. Perhaps, too, the idea that eldest children are most advanced in "language" depends in part on a misunderstanding of the process of language acquisition. If it is thought that language is learnt by being taught to young children and consequently by a child's opportunities for frequent contact with an adult who speaks to him and to whom he speaks in return, then it is only logical to believe that eldest children will be the most advanced in "language" because they have greater access to adults than do subsequent children. If, however, one believes that language is acquired by a variety of means, that it is learnt but not taught, that all sources of language (peers, television and overheard conversation) are important to its development then there is no special reason to believe that the eldest child has any advantage in acquiring language although he may be more used to speaking in the presence of adults.

None of the other associations tested reached statistical significance.

Partial correlations were calculated (McNemar, 1956, 166) with father's occupation and child's identity as the independent variables and word recognition as the dependent variable.[1] With child's identity partialled out the correlation between father's occupation and word recognition = 0.25. With father's occupation partialled out the correlation between the child's identity and word recognition = 0.08. Thus socio-economic status as measured by father's occupation is much more strongly correlated with word recognition than is the ethnic identity of the child. However, it must be kept in mind that the fathers of Maori and of Pakeha children are not distributed equally over the range of occupations and that low socio-economic status parents tend to be Maori and high socio-economic status parents tend to be Pakeha.

It is, nevertheless, highly probable that differences in language use and in knowledge of words are closely related to the socio-economic status of a child's family and, since no evidence was found in this research for differences in the patterns of meaning components, there is no support for a link between language difference and Maori language background. However, while one can say that Maori language background does not appear to have caused differences between the two samples one cannot say that socio-economic status causes differences. There is a range of factors associated with socio-economic status which are likely to alter the conditions under which words of different kinds are experienced. One must also consider such factors as minority or majority group status within a larger

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1. The first order correlations were computed using the SPSS Computer Package produced by the National Opinion Research Centre (NORC), Chicago.

society. Status helps to control access to sources of language acquisition, the confidence that one group feels to speak in the presence of the other, and it contributes to the formation of social groups which develop differences in language use.

Partial correlations were calculated with the variables of mother's education and father's occupation in relation to word recognition. When mother's education was partialled out the correlation between father's occupation and word recognition = 0.29. When father's occupation was partialled out the correlation between mother's education and word recognition = 0.06.

CHAPTER 19

RESULTS FROM TESTING THE HYPOTHESES

Maori and Pakeha samples were established by asking the mothers to give the ethnic identity of the child. The children were divided into two groups, a Maori sample, which contained children who were reported by their mothers to be *Maori* or *Maori and Pakeha* and one child who was from the Cook Islands; and a Pakeha sample which contained children who were reported by their mothers to be *Pakeha* or "just a child". Throughout this report these groups have been referred to as the "Maori sample" and the "Pakeha sample" rather than as the "Maori children" and the "Pakeha children". It must now be asked whether the Maori sample is representative of those who in some circumstances call themselves Maori. The answer to this would seem to be that the sample is of this kind, apart from the Cook Islands child included because of his similarity of language background to many of the Maori children, and furthermore, that the sample contains children who will call themselves Maori in all circumstances. The Pakeha sample, contains children who will call themselves Pakeha in all circumstances and some who may call themselves Maori in some circumstances. This is, in fact, what the Maori and the Pakeha social groups in New Zealand are like. One is more justified in calling such groups *Maori* and *Pakeha*, and thus suggesting that they are representative of the larger Maori and Pakeha groups, than would be the case if the sample consisted only of children with two Maori parents, or two Pakeha parents; or, only of children who had attended *hui* or had a Maori name; or, only of children of half or more Maori blood. The sample in the present study, established by report of the mother, corresponds to those who feel themselves to be in one or the other ethnic category, or in both, and this feeling, in turn, stems in part from society's bases for judgement of the issue, and acceptance by society of an individual's claims to ethnic identity. Since society's judgement may be that of Maori society or of Pakeha society (McDonald, 1976) it is inevitable that those whom one associates with will affect one's judgement of ethnic identity. It is no loss of scientific rigour to accept that this is what ethnic groups are like and that the boundaries of ethnic groups may shift. Samples chosen for purposes of investigation must reflect the composition of what is generally held to be the Maori group and the fact that individuals within the sample may later change ethnic identity is of no relevance. It is claimed that the present sample, without the Cook Islands child, is representative of the Maori group. And the Pakeha sample, similarly is representative of the Pakeha group.

Hypothesis 1

That there will be no difference between four-year-old Maori and Pakeha children with respect to,

(a) *level of achievement in the referential use of the Bierwisch set of spatial adjectives.*

This was tested in the series of *component tasks* which asked the child to recognise each word in a variety of settings determined by the Bierwisch analysis.

In the polar series the Pakeha sample did better on 11 word tests and the Maori sample on 2. The means of the two samples did not differ significantly. There was a significant difference ($p. < 0.01$) with regard to one word of the series, *low*, on which the Maori sample did not score as highly as the Pakeha sample although in a series of 18 tests this could have been due to chance. In the space, volume, dimension, orientation and proportion *component tasks,* which used only (+Pol) terms, the Pakeha sample did better on 20 oppositions and the Maori sample on 12. There was, again, no significant difference in the means of the two samples. There was a difference significant at the 0.01 level in favour of the Pakeha sample on the word *wide* when it was in opposition to *high*. The Maori sample did better than the Pakeha sample in discriminating *long* from *high* ($p. < 0.05$).

This section of the hypothesis is supported with the exceptions noted above.

(b) *The order of the acquisition of the referential use of the Bierwisch set of spatial adjectives.*

This was tested in the series of *component tasks.* In the polar series the rank orders of the words recognised by each sample were significantly correlated ($p. < 0.01$). The rank orders of words in the space, volume, dimension, orientation and proportion series could be seen, by inspection, not to differ significantly.

This section of the hypothesis is, therefore, supported.

(c) *The level of achievement on the semantic features marking the Bierwisch set of spatial adjectives.*

This was tested in the *component tasks.*

The Pakeha sample did better on 4 features and the Maori sample did better on 3.

There were no differences which reached statistical significance and this section of the hypothesis is, therefore, supported.

(d) *The order of acquisition of the semantic features marking the Bierwisch set of spatial adjectives.*

This was tested on the *component tasks.*

In the polar series the order of positive and negative markers was identical when measured on the 8 best known words (that is, those words known by over two-thirds of each sample). Both Maori and Pakeha learn the (+Pol) terms first (except for *wide* and *thick*). Of the (-Pol) words only *little* and *near* are well known. For the 10 lesser known words the pattern of markers differed on only two rank positions.

In the space, volume, dimension, orientation and proportion series, using only the (+Pol) terms, the feature orders differed by one place on three ranks and the two orders are not significantly different. This section of the hypothesis is therefore supported.

Hypothesis 2

The achievement levels and order of acquisition of the semantic components of the set of spatial adjectives will be the same for Maori and for Pakeha children of four years of age irrespective of the nature of the task used to test for these components.

This hypothesis was tested on *all task series.* The results for the component series have already been reported.

In the polar implication series the Pakeha sample did better on 6 concepts and the Maori sample on 5. Neither the distributions of the Maori and the Pakeha samples on number of concepts known, nor the means of the two samples differed significantly. On only two tasks, "narrow" ($p.<0.05$) and "far" ($p.<0.05$) was the difference between the two samples significant and in both instances the Pakeha sample scored more highly.

The rank orders of the concepts in the Maori and Pakeha samples were significantly associated ($rho = 0.86$, $p.<0.01$).

The rank order of the concepts differed significantly from the rank order of the words recognised ($rho = 0.007$ measured over the whole sample). This suggests that the task series, component and implication, are not tapping common "features". For example, little things are comparatively easy to judge while *little* words are relatively difficult to acquire.

There were no statistically significant differences between either the means or the distributions of the Maori and the Pakeha samples on the volume, dimension, orientation and proportion implication tasks. The Maori performed better on 5 tasks and the Pakeha on 3. There were more substantial order differences between the two samples than appeared in other task series (rho = 0.76, p.<0.01) but the concept scores were so close together that little can be taken from the order difference. There were statistically significant differences with regard to 3 separate oppositions. The Pakeha sample did better on "wide" (v "high") (p.<0.05) and "high" (v "wide") (p.<0.05), and the Maori sample on "long" (v "high") (p.<0.05). These differences paralleled ones which appeared on the component (word recognition) items.

In the polar anomaly tasks there was a difference in the range of types elicited in favour of the Pakeha sample although this did not reach a level of statistical significance. There was no significant difference in the number of tokens produced.

In the space, volume, orientation, proportion and dimension anomaly tasks there were no significantly different patterns of performance.

No statistically significant differences were found in the performance of the Maori and the Pakeha sample in any of the normativity tasks.

In the proportion tasks, the pattern of choice differed significantly on 2 items (one at the 0.05 level and the other at the 0.01 level of probability) out of 6. On these two, the Maori sample showed a preference for the smaller object and the Pakeha sample for the bigger. The ability to indicate a main axis by spreading the arms did not differ significantly in the Maori and the Pakeha samples.

A comparison of four terms on five task sets

There were four terms (*high, long, wide* and *thick*) which appeared in five different sets of tasks, polar component; space, volume, dimension, orientation and proportion component; polar implication; volume, dimension, orientation and proportion implication; and anomaly. The results measured on achievement over the whole sample produced a variety of orders of achievement for the four words. In the anomaly task the measure was the frequency with which the four terms were elicited. See table 19.1.

Table 19.1

Rank orders of achievement for four terms on five task sets

Task set	*high*	*long*	*wide*	*thick*
Polar component	1	2	3	4
Space, volume, etc. component	1	2	3	4
Polar implication	4	1	2	3
Volume, dimension, etc. implication	3	4	1	2
Anomaly (elicitation)	1.5	1.5	4	3

A Kendall coefficient of concordance (Siegel, 1956) calculated using the data in table 18.1 resulted in $W = 0.14$, ns. Therefore, there is no evidence to suggest that the five task sets are tapping one underlying ability.

These results do suggest, however, that recognition of the words is a unified ability since the same order emerged from the two recognition sets (the component tasks). "Concepts" are not unified in a similar way and performance is affected by the nature of the task. Elicitation of words (the anomaly task) is tied neither to word recognition nor to concepts. Obviously one should not place too much weight on results for just four words but they are presented for interest.

No statistically significant difference could be detected in the drawings of the Maori and the Pakeha samples in the imagery task when these were compared for type of object represented, type of distinction between *big* and *little*, and method of portrayal.

In general the hypothesis is supported for the implication ("concept") series with the exceptions noted above. In the polar anomaly tasks, however, the hypothesis is not supported. In the tasks for space, volume, dimension, orientation and proportion anomaly; normativity; and imagery; the hypothesis is supported. In the proportion tasks there were differences on two items but otherwise the hypothesis is supported.

In addition to comparisons of achievement and order in the two samples, comparisons were also made of patterns of choice in the polar component series. Nine different patterns were possible. On 1,1 in which both antonyms were applied to the biggest object, there was a statistically significant difference in performance ($p. < 0.01$). The Maori sample produced more of this type of pattern. However, the pattern occurred only 31 times out of 689 patterns.

In order to assess the possible effects of various background factors, measures of word recognition, concepts, and strategies (choice patterns) were correlated with the sample re-classified on the basis of background variables. The association between father's occupation and words recognised was significant at the 0.05 level but when the calculations were made on the Maori and Pakeha samples separately, only the Pakeha sample showed a significant association with father's occupation ($p. < 0.05$).

The age of the child was associated with concepts ($p. < 0.01$) and with words elicited ($p. < 0.001$). The child's place in family was associated with words recognised ($p. < 0.01$), the middle children doing best. Partial correlations indicated that socio-economic status, as measured by father's occupation, was much more strongly correlated with word recognition than was the ethnic identity of the child.

One must remember that a sample such as the present one which is based on geographical location will distort either Maori or Pakeha samples. The present study which gives equal weight to rural and to urban residence tends to introduce in the Pakeha sample bias towards higher socio-economic status.

Discussion

What these results suggest is that there are differences between Maori and Pakeha children in number of words recognised although these differences may not be great and there is much overlap in the recognition performance of the two samples. Maori children had significantly greater difficulty than the Pakeha with 2 out of the 18 words. The Pakeha sample did better on 31 word tests and the Maori sample on 14 over the whole component series.

There are no significant differences in understanding of the concepts referred to by the words of the set. The Maori sample performed better on 10 of the implication tests and the Pakeha sample on 9. Therefore, whatever vocabulary differences there are, they cannot be held to have contributed to differences in thought, or to a shortage of concepts with respect to the semantic field which was the object of the study.

The variety of words elicited, which was greater in the Pakeha sample, suggests that Pakeha children *produce* a greater range of words than do Maori children. Once more, this cannot be held to indicate greater *comprehension*, since, as we have seen, there were no statistically significant differences in the concept series. Finally, an exhaustive examination of Maori and Pakeha strategies in the entire component series showed no significant differences apart from a greater production by the Maori sample of one unsuccessful strategy in the polar component tasks. Therefore, methods of acquiring words are shared and any differences in achievement cannot be attributed to differing conceptual styles so far as these are manifested in different pattern choices. Nor can differences in language background, which certainly exist in the two samples, be held responsible for differing performance. What appears to make the difference in performance is whether or not a child knows the word.

The sample consisted of four-year-olds. Children of this age are likely to develop understanding of the concepts the target words refer to by virtue of living in the world and without any special teaching. The use of a variety of words to refer to various aspects of space, however, must depend on some opportunity to hear such words. Olson (1970) says that an individual's vocabulary does not contribute to his own thought but to the thought of others. The child's vocabulary gives others insight into his thinking. One cannot assume that a child cannot think simply because one cannot hear him say words which refer to his thoughts. Vocabulary both aids communication and creates impressions about the speaker in the minds of others.

CHAPTER 20

A REVIEW OF THE SEMANTIC FEATURE ACQUISITION HYPOTHESIS

In this chapter the various interpretations and suggestions, based on the idea of semantic components, that have been offered to account for the acquisition of meaning will be reviewed and commented on in the light of the findings which have been presented.

Innate and universal semantic components?

Bierwisch, it may be recalled, suggested that there are innate and universal semantic primes that are organised differently in different languages. He offers few guidelines as to what these features might be, beyond stating that,

> The semantic features do not represent, however, external physical properties, but rather the psychological conditions according to which human beings process their physical and social environment. Thus they are not symbols for physical properties and relations outside the human organism, but rather for the internal mechanisms by means of which such phenomena are perceived and conceptualised.
>
> (Bierwisch, 1970)

Bierwisch (1967) suggested that proportion might be one of the underlying features. This thesis reports the testing for understanding of proportion and concluded only that, although many children could indicate the main axis of common objects, there appeared to be little sensitivity to proportion in four-year-old children. It was suggested further, that proportion was developed, not *sui generis*, but from the child's understanding of *big*.

What appeared to be innate and common to both groups of children was a tendency to choose some objects rather than others. This phenomenon is often referred to as response bias but it might be more profitable to think of such actions (both intellectual and physical) as strategies (cf. Baron, 1973) and to consider that it is the coincidence of these patterns of response with language meaning which leads to the building up of word meaning. E. Clark's (1973) study of *in, on* and *under,* shows how interpretations of commands are made by young children with respect to the properties of the objects provided (in this instance whether they were hollow or flat-surfaced) irrespective of the word presented. In a similar vein, Greenfield, Nelson and Saltzman (1972) have shown that there is a developmental order of manipulative strategies that are customarily used by young children when playing with sets of nesting cups. The present study has shown in a variety of task settings how, with regard to the spatial adjectives, unconstrained choices are usually choices of the biggest item. It seems very probable that early meaning is derived from a hierarchy of preferred responses.

Therefore, if there are such things as innate components they may be something like responses or strategies. These, however, can scarcely be called semantic components in the sense in which this phrase is used in linguistic semantics. A child's action or strategy can hardly be "attached" to a word.

It can only lead to an understanding that a particular phonological form stands for, or symbolises, the action or object to which the strategy directs attention. And the final step in acquisition is probably for the child to use or comprehend a word successfully.

It is interesting to note that Cromer (1975) in a recent article finds no evidence for a universal marker for the syntactic feature of indirect object, and orientation, which was tested in more than one form in the present study, did not appear to give rise to a unified psychological ability. (Chapter 12).

What is a feature?

There seems to be confusion in much of the current discussion as to exactly what it is that is "attached" to a word.

One of the very great weaknesses of the semantic feature acquisition hypothesis is that a "feature" is never adequately defined. The features suggested by various writers seem to include factors which are perceptual (for example, verticality), cognitive (for example, proportion), simple dscriptive (four-legged), and linguistic (antonymy). But these may not all be features in the semantic sense and one would agree with Nelson's (1974b) criticism of E. Clark's (1973b) list of features that the notion of feature is in desperate need of clarification.

Values and features

There has been a plethora of terms used to describe various forms of the semantic feature acquisition hypothesis. Examples are, the "complexity hypothesis" (H. Clark, 1973a), and the "principle of lexical marking" (H. Clark, 1969). Then there is also the "correlation hypothesis" (H. Clark, 1973a) and the "modified semantic feature hypothesis" (Brewer and Stone, 1975). In general, such terms serve merely to obscure the issues. H. Clark (1973a, 57) claims that the complexity hypothesis is a generalisation of the principle of lexical marking. It is difficult to see how the complexity hypothesis, which deals with number of markers, can be a generalisation of the principle of lexical marking, which deals with value differences on a single marker. In one sense it is a failure to grasp this essential difference between value and number that vitiates much of the claim for a semantic feature hypothesis. It is quite possible, for example, that value differences may determine order for one set of words (for example, *long* v *short*), but not for others (for example, *long* v *far*). One can suggest that whatever one's interpretation of antonyms, the polar markers are psychologically different from markers of other kinds such as (±Inherent) which is supposed to discriminate *long* from *far*. In a polar series (+) and (-) indicate poles, but used with other markers (+) and (-) indicate presence or absence of the sense characteristic. Bierwisch's analysis confuses these two uses.

If one assumes that children learn a basic meaning for pairs of words and then later distinguish the negative from the positive pole (that is, discriminate value differences) then children should confuse antonyms. (Klatsky, Clark and Macken, 1973). If one assumes that a polar feature develops before other features and that positive polar components are learnt first then confusions should arise between words of similar polarity. Brewer and Stone (1975) attempted to settle this issue by using arrays very similar to the ones used in the dimension component series employed in the study reported in this thesis. Their results suggested to them that a "modified semantic feature hypothesis" best fitted their results since the children when asked to select various items in response to the terms of the spatial set tended to confuse like-pole terms rather than antonym pairs. This, according to the authors, implies that the polar features develop before other features and that the positive poles are learnt before the negative ones. A number of comments can be made on this particular study. First, there was no control for whether the words were known or unknown to the children. Second, the displays were not simple examples of (Polarity) v (Dimension) since they included elements of what Bierwisch has called space, volume, proportion and so on. Third, the failure to recognise that polarity really implies value difference meant that the positive pole was considered as a separate feature. In the study reported in this thesis it was shown that the positive pole words *big*, *deep*, *high* and *long* are indeed confused by young children but that the positive poles words *wide* and *thick* are not confused in a similar manner, which suggests that the idea of a positive polar feature as a general cognitive understanding is unlikely.

Finally, it may be suggested that words which differ from each other on only one feature (as distinct from value) will be confused more readily than those which differ in more than one feature. For example, *big* and *thick* should be confused more readily than *big* and *high* (see p.21 for feature lists) but table 9.8 (p.125) shows that *big* is easy to distinguish in relation to *thick* - much easier than in relation to either *high* or *long*.

Number of features

One idea popular with semantic feature theorists is that the number of features attached to each word determines the order of word acquisition. E. Clark (1972, 751) says that cognitive complexity is reflected in the semantic structure of language. (See also, Haviland and E. Clark, 1974). Therefore, examination of the relative semantic complexity of different words can provide a basis for making predictions about the order of acquisition. Such a view also presupposes that words acquire markers in a serial order rather than all at once, which is what McNeill calls "horizontal development". To quote from E. Clark (1974, 108) again,

> ... the child begins by identifying the meaning of a word with only one or two of its semantic components on features of meaning, rather than with the complete combination of components used by the adult.

But if a word is known in some minimal sense before it is known in all senses, why should the number of markers in its final specification be the determinant of ease of acquisition? Perhaps this theory fits the acquisition pattern for (+Pol) and (-Pol) terms if the antonym pairs are considered to have a basic meaning and the negative polar term an additional marker, but the fit becomes less pronounced if the polar markers are considered as different values of a shared marker, and disappears altogether if features in addition to a polar one are included.

A polar component?

One of the most persistent findings is that *unmarked* words are acquired before marked ones. As has already been reported, various interpretations have been put on this fact, for example, that nominal meaning precedes contrastive meaning, that (+Pol) precedes (-Pol), and that greatest extent is perceptually more salient than less extent.

Most of the work that has been done on the acquisition of semantic features has dealt with the polar components.

As for the suggestion that the antonyms are learned as pairs (see for example, E. Clark, 1972), Weiner's (1974) study of *more* and *less* shows that *less* is not a simple contrary of the very early meaning of *more*, and Kuczaj and Maratsos (1975a) found no significant difference between *front* and *back* so far as marking is concerned. Moreover, there were no data in the present study to suggest that there was a shared polar feature assisting the acquisition of the spatial adjective pairs and some evidence (chapter 11) to suggest different methods of acquiring (+Pol) and (-Pol) concepts. The (-Pol) terms, so far as they were known, seemed to share a meaning with *little* rather than with their (+Pol) antonyms and the fact that the acquisition order of the (-Pol) terms tends to follow that of the (+Pol) terms is probably the result of attending to the objects and relationships signified by the (+Pol) terms and perhaps hearing the corresponding antonym. *Near* and *far* and *big* and *little* may, however, be learnt as pairs and if so this might provide contrary evidence to what has just been stated. However, if they are learnt as pairs, why do they not contribute a pattern for the learning of other pairs?

There is, in fact, some doubt that *big* and *little* are psychologically marked. One of the signs of an unmarked word is that it occurs more frequently than its marked counterpart (Hamilton and Deese, 1971) but the Lorge-Thorndike frequency for *big* given by Hamilton and Deese is 1773 while that for *little* is 8659.

There is little doubt, however, that the derivation of the words of the Bierwisch set is, in part, from *big* and *little*. One can agree that (+Pol) words are, in general, acquired before (-Pol) ones. However, is one justified in talk about a polar component if the child knows only one of the polar components? The present work and that of Wales and Campbell (1970) show how persistently the child chooses (mid)-items when he does not know a (-Pol) word. This suggests that the contrary opposition of the antonym pairs does not precede acquisition of the second word. (Chapter 8). Therefore, while the *big* words can properly be called the positive pole *words,* one cannot argue from this that the child uses a positive pole *strategy,* only that he shows a predisposition to choose big things. As Wales and Campbell point out (1970, 380) their data do not support an interpretation that children "select extremes as opposed to non-extremes" (that is by a feature of polarity) and nor do the present data.

Over-extensions as evidence for feature acquisition

E. Clark (1973b) has suggested that the young child's over-extensions of meaning are due to a shortage of "features". However, there is evidence from diary studies that over-extensions are accompanied by over-discriminations (*hot,* for example, restricted to a single object such as stove) in the process of the acquisition of referential meaning. How can the process of over-discrimination be explained on the basis of feature acquisition? Do young children sometimes acquire too many features and then lose some of them?

Saltz and Soller and Sigel (1972) suggest that for concepts the true developmental picture is one of over-discrimination and subsequent relaxation rather than over-generalisation and subsequent restriction. So far as the words of the present study are concerned both processes, over-generalisation and over-discrimination, can be detected. *Deep,* for example, is restricted to water and *long* may by some children be over-generalised to *high.* But neither over- nor under- discrimination appears to be a major process in the four-year-old's acquisition of the spatial adjectives.

The word *big* is not over-extended as E. Clark (1973b) suggests. Perhaps it is over-used in spontaneous speech but that is a stylistic matter. The confusion between *tall* or *high* and *big* may constitute over-generalisation but this seems to be stretching a point. *Fat* is sometimes over-generalised to inanimate objects but there is perhaps an element of style or humour in the child's use of *fat*. He finds it funny and his use of it produces no serious misunderstanding. *Little* may also be said to be well used rather than over-generalised.

The Bierwisch model

Some comments can be made on the formal analysis of the spatial adjectives presented by Bierwisch. It is difficult to provide a satisfactory reading for *tall* using the components of the model. Tallness is obviously inherent in an object and has something to do with verticality and yet in the Bierwisch scheme (+Inherent) is supposed to block (+Vert). Perhaps this problem does not arise with the original German terms but only with the English ones. How can *fat* be marked in a way that will distinguish it from *big* and *thick*? The answer to problems of this kind seems to be that the development of word meaning has as much to do with objective contexts as it has with semantic components.

From the results of the testing in the present project it appeared that *far* and *near* are not part of the semantic field dominated by *big* and *little*. (Chapter 10, item 27). And, finally, as has already been noted, the processing order given in Bierwisch's tree structure does not tally with the acquisition order as revealed in this and other research projects. Once the oppositions are represented in concrete form they merely reveal different contexts for the realisation of word meaning. There is evidence from the present study (see comments on item 25, chapter 10) that *deep* is marked (+Water) by young children and the suggestion was also made that *long* and *high* are at first marked (+Big). (See discussion, chapter 10).

Relationship to other theories

How does a semantic feature acquisition hypothesis relate to more general theories of cognitive functioning? The use of a componential analysis as a model of word acquisition implies a special view of cognitive functioning. Here is how E. Clark (1974, 109) explains this viewpoint.

> Just as an object may have a number of perceptual attributes, which, combined, characterise that category, so a word meaning is made up of components or features of meaning which are combined to form the lexical entry for the word. These elements of meaning may be considered to be drawn from a universal set, such that languages differ from each other mainly in terms of which semantic components are used and how they are combined to form the meanings of words. This assumption of universality is dependent on another factor also. It is assumed that among the components or features of meaning used in semantic analysis one will eventually be able to identify a set of semantic primitives, the universality of which is the result of their being directly related to the cognitive and perceptual functioning of homo sapiens. Ideally, therefore, one could assume that the initial feature or features of meaning picked out by the child are necessarily the same as some of the adult's for a particular word meaning.
>
> How do adult and child communicate effectively?
>
> Since perceptual input provides a primary source of information for the child, one can argue that it is

> the perceptual attributes of an object, e.g. shape, that are most immediately available to provide a meaning for a new word. Furthermore, given that the child and adult systems of meaning have to interlock at some point of common understanding, it would seem very plausible that the child's interpretation of some perceived characteristic(s) would coincide with the adult's.
>
> (E. Clark, op. cit., 108)

There are clearly some unsatisfactory things about this explanation. Are adult and child features the same? Maratsos (1974), for example, suggests a feature "top point" which marks *high* in a child's lexicon but not presumably in an adult's. Why should the child and adult features of meaning interlock? The child's errors and over-generalisations have been readily understood by all those who have investigated them.

It seems unlikely that children do use incomplete but otherwise adult models of semantic competence any more than they use incomplete but otherwise adult models of syntax, but rather that their semantic systems, like their syntactic models (Braine, 1963; Brown and Bellugi-Klima, 1964; Brown, 1973) or their phonological systems (Waterson, 1971), and their logical models (Piaget, 1950) go through a series of successive approximations to adult structures. This diachronic process can be described synchronically, that is, by internally consistent structures applying at a particular point in development. One would expect, therefore, that the features used by a young child would differ to some extent from adult features both in number and in type. The task of the student of child language should be to crack the child's own semantic code.

What does "adult meaning" mean? Does it mean metaphorical as well as concrete senses? Or does it mean conventional accuracy in use at whatever the level? Not all words are used inaccurately by young children. Is there something special about those that are over-extended (perhaps classes of things that look very similar or are not very familiar), in contrast to those words that are generally used correctly (for example, individual names)? One has to remember that a young child has few words and he does the best he can with them.

Nelson (1974b) suggests that E. Clark's (1973b) theory of semantic feature acquisition is simply a conservative version of the behavourist's perceptual attribute concept so familiar from learning theory and that a theory of focal concepts like the natural prototypes of Rosch (1973; Heider and Olivier, 1972) is a more appropriate a model to explain word acquisition. Farnham-Diggory and Gregg (1975, 102) suggest that the Nelson and Clark views are not incompatible. Nevertheless, they each imply a different view of meaning acquisition and, especially, a different explanation for the development of concepts.

Concept formation

The learning theory view of concepts has been expressed by Carroll (1964, 178) as follows:

> One necessary condition for the formation of a concept is that the individual must have a series of experiences that are in one or more respects similar; the constellation of

> "respects" in which they are similar constitutes the "concept" that underlies them. Experiences which embody this concept are "positive instances" of it; experiences that do not embody it may be called "negative instances". A further necessary condition for the formation of a concept is that the series of experiences embodying the concept must be preceded, interspersed, or followed by other experiences that constitute negative instances of the concept.

This behaviourist model has been the basis of concept formation experiments carried out in the laboratory. One can suggest in passing that the varying uses of *concept* may bring about confusion. The concept of the concept formation paradigm is unlike the Piagetian concept of conservation. Both in turn are unlike the concepts of natural language. Natural language concepts are meanings, Piagetian concepts are operational structures and learning theory concepts are classifications. Moreover, the laboratory experiments on concept formation bear no relationship to natural word learning (Nelson 1974b, 271). However, these interpretations are frequently used interchangeably (see for example, Beilin and Kagan, 1969). And there is little doubt that the learning theory concept is often taken to be the natural language concept (Vygotsky, 1962. 52-81). That this can lead to further confusion is shown by Bar-Hillel and Eifermann's (1970) criticism of the notion of "disjunctive concepts" as used by psychologists (see for example, Bruner, Goodnow and Austin, 1956; Ciborowski, 1973).

Studies have shownthat, rather than expressing bounded classificatory concepts both the concepts of natural language and perceptual categories have internal structure (Rosch, 1973; Rips, 1975) and appear to be organised around "functional core concepts" (Nelson, 1974b; Mervis, Catlin and Rosch, 1975; Burling, 1970) or "characteristic features" (Smith, Shoben and Rips, 1974). Some animals, for example, are more animal-like than others (Henley, 1969). Also, the boundaries of natural language concepts are characteristically vague. (Andersen, 1975). There is also evidence for early variation in natural language concepts. For example, very young children can distinguish common and proper names (Katz, Baker and Macnamara, 1974) and relative terms from absolute and contrastive ones (Nelson and Benedict, 1974). There is reason to believe (Nelson, 1974b) that the central core of a concept remains unchanged but that the discriminators may alter.

There are, furthermore, variations in the internal structure of language concepts according to the particular category under consideration, the child's age (Nelson, 1974a) and frequency of use (Patrina, 1971). It is unclear what part "negative instances" play in the acquisition of language concepts. They do not seem to be exactly the same as "false" as a truth value and it may be that negative instances are of minor importance in the early acquisition of meaning. If a child's first hunch works he needs no negative instance. A near miss is as good as a bulls-eye so long as his own communication succeeds and his understanding is sufficient for him to decipher the meaning of a message from another person (cf., comments by Nelson and Bonvillian, 1973).

The componential tests used in this present project do not, in general, reveal focal concepts because they were set up to reveal the basis of discrimination between one relational concept and another. But the normativity test showed exactly this kind of focussing process and the factors that contributed to it. (Chapter 15). Stability of response to questions regarding the size of different objects showed that familiarity with the object and striking appearance both contributed to acquisition. Also, answers to items 10, 11 and 12 suggested that a focal example of *big* is *high and big*, while a focal example of *long* is *long and thin* (although the evidence for this latter is perhaps not over-convincing).

With regard to the children's drawings; some exhibited contrast in size of pictured objects but some objects were only marginally different. In the drawings it was hard to see the symbolisation of focal concepts or typical cases but in view of the lag between mental representation and the ability to communicate this by means of drawing or other practical construction (see Blackstock and King, 1973, for seriation; Laurendeau and Pinard, 1970, for projective straight lines, and Inhelder, 1965, for a general discussion) perhaps this result is not surprising.

Word associations

Finally one can consider the evidence from word association data as evidence for features (see for example, E. Clark, 1972; H. Clark, 1970b). Francis (1972, 955) studying the syntagmatic-paradigmatic shift says that

> The finding that children of seven years were able to match words and make associations on a basis of semantic class similarities was in accord with McNeill's hypothesis of association through a semantic feature system. However .... semantic class learning is only a partial explanation of the syntagmatic-paradigmatic shift.

It is probably sufficient to say that the words are first associated because they are customarily used of similar objects rather than because they are linked by a semantic feature system. (See chapter 13).

Semantic fields

The idea of a semantic field seems to have psychological as well as linguistic validity and by virtue of its structure undoubtedly helps a child in the acquisition of new words and their meanings. The most important thing about a semantic field, however, is that it is made up of words which refer to objects, relations, actions, feelings and so on, that go together in real life. The basis for the development of understanding of word meaning is varied and, to some degree, orderly experience of the world, together with verbal messages relating to this experience.

The place of words

A point that needs to be made is that a componential analysis converted into a semantic feature acquisition hypothesis posits a deep structure; a special layer of cognitive functioning. The specification of levels without allowance for interaction between these levels leads to over-simplified accounts of meaning acquisition. It precludes, for example, the inclusion of words as factors in the acquisition of meaning.

One result of ignoring the child's knowledge of words is that it is impossible to tell whether in a study like that of Brewer and Stone (1975) the supposed results are due to the influence of features or of word knowledge. The results reported in this thesis, in which word knowledge was taken into account (see chapter 8), suggest that once words begin to be acquired they act as place-markers for meaning and become additional sources of information to the child about the meanings of other words. There are in fact, two separate issues in the acquisition of word meaning; how does the child acquire meaning for his very first words, and how does a child acquire meaning once his lexicon has begun to develop?

Conclusion

Concerning componential analysis Fillmore (1971, 273) says

> There are theories of meaning, or rather techniques of describing meaning, which regard the meanings of linguistic forms as decomposable into smaller entities of one kind of another, usually called features or components. The ascription of such components to words and morphemes has often been completely ritualistic, and it is typically carried out in such a way that wherever there are problems, it is certain that the analyst is dealing with unclarities in our understanding of objects in the world or institutions in the associated culture, rather than with facts of the type that are correctly called linguistic.

One can agree that the analysis of meaning cannot take place entirely without regard to external objects, but it seems to the present writer, that the problem with componential analysis as used in a semantic feature hypothesis does not lie in difficulties of analysis or in problems of choosing one of a number of competing interpretations. The real problem is that it seems quite impossible to derive a theory of semantic processing, not to speak of semantic acquisition, solely from one level of analysis whether that analysis is syntactic, semantic or cognitive. Similar criticisms can be made of Chomsky's idea of a Language Acquisition Device. (Derwing, 1973).

The conclusion to be drawn from the present study is, therefore, that the semantic feature hypothesis in any form is an inadequate hypothesis to account for the growth of word meaning. Certainly children do work out the way in which words used in similar contexts differ among themselves, but they make good use of the clues provided by the objective world in order to do this and particularly in view of the present findings on polarity in relation to objects in series, it would seem rash to state that word marking encodes cognitive complexity. The words themselves may contribute to the complexity, a suggestion made regarding antonym pairs in chapter 8.

Parsimony in the acquisition of the lexicon means making use of a variety of forms of information, but not a vast array of information. Both Macnamara (1972) and Schlesinger (1974) stress the importance in the acquisition of meaning of a child's being able to work out the intention of a speaker. Also, there is evidence to show that a child learns first those forms of sentence which agree with his expectations (Hutson, 1975; Slobin, 1968). The discriminations having been made by the child then it may be possible for an analyst to provide a useful list of features to describe the basis of these discriminations.

SUMMARY

This review of the semantic feature hypothesis has suggested that the feature hypothesis is correct in stating that meaning can be analysed into components and that most words are not unanalysable wholes. Bierwisch's analysis proved most fruitful in giving a pattern to follow in exploring exactly what children understand and what they do not. The analysis does not, however, offer a valid model of either meaning or word acquisition so far as the words studied are concerned. It will be the task of the next chapter to develop such a model.

CHAPTER 21

AN ACQUISITION MODEL

This chapter will summarise and expand the evidence presented earlier in this thesis and a formal model will be developed in order to show how the words of the Bierwisch set are acquired. The formulae will have to account for both accurate and inaccurate use of these words by young children. They will also have to indicate the interaction of perceptual, cognitive and symbolic forms and show whatever constant factors are at work.

It may be argued that it is unrealistic to seek the beginning of the acquisition of these words in four-year-old children who have already acquired so much of the language system. (Menyuk, 1972). The fact remains, however, that children of this age are in the process of acquiring most of the adjectives of the set. Moreover, it is possible to test four-year-olds for comprehension of words whereas it is very difficult to do this with younger children. Finally, it is possible to simulate the kind of conditions that prevail during the early stages of acquisition in order to watch a child's behaviour under these conditions. This was done in the anomaly series. Although the tests do not exactly duplicate the process of acquiring the words they gave the observer an opportunity to note the manner in which children tried to give meaning to unfamiliar words.

The model which follows is a multi-level one and resembles in some respects Donaldson and McGarrigle's (in press) outline of "a hierarchy of preferred interpretations". It also expresses the hypothesis put forward by Heidenheimer for the acquisition of antonym pairs (1975, 757) "that there exists a hierarchy of processes from opposition to the functioning of selective attention". In short, it tries to show how preferred biases and strategies increase the opportunities for words to be associated with referents.

A criticism of the response bias interpretation has been made by Holland and Palermo (1975) who point out that a response bias appears in limited choice perceptual situations and hence may be artifactual. In answer to this it can be said that response biases of the kind being discussed show up consistently in research projects of varying kinds, in spontaneous comments by children as well as in situations of constrained choice. Furthermore, in the present account "preferred interpretations" will be taken to mean something more than simple perceptual responses.

We know the approximate order in which the spatial adjectives are acquired, we have noted the child's use of perceptual cues, his developing ability to use the words he knows to distinguish less familiar ones, and his tendency to confuse meanings. Therefore the course of development will be specified up to about the age of five years using evidence from the present studies, from others addressed to similar concerns and from diary studies of very young children.

<u>Terms</u>

x = perceptual salience as "signified" (the content)

y = verbal form (y^{big}, y^{high}, y^{little}, etc.) as "signifier" (the form)

l = linearity as a cognitive ability or construct

v = verticality as perceptual salience as "signified"

– = the avoidance operation, choose away from the known, expressed verbally, for example, as "not big",

+ = conjunction

→ = gives rise to

Definition

With the above terms we shall try to express the development of the semantic field we have been exploring using a syntax which summarises the cognitive and linguistic processes used by young children. Barthes (1967, 48) says that, "The mind does not proceed, in the semantic process, by conjunction but by carving out". It is this carving out which is our present concern, but carving out is accompanied, as we have already noted, by over-generalisation of some terms and over-discrimination of others. Moreover, as Museyibova (1964, 122) notes, acquiring the ability to differentiate spatial relations is a long and complicated process which suggests that there may be changes in the processing strategies available to the maturing child.

The course of development

x → notice the globally big

The young child is attracted to the perceptually salient and the formula suggests an action of noticing on the part of the perceiver. Greenfield, Nelson and Saltzman (1972) in studying strategies that very young children use in selecting from an ordered series of cups noted that children as young as 11 and 12 months use a strategy of selecting by size and position on the same side as the acting hand. E. Clark (1973a) showed how, with very young children, the usual patterns of action gave meaning to words. The children at first responded to *in, on* and *under* as if they all meant *in*. The present study of four-year-olds has given numerous examples of a tendency to "choose the big" in the absence of more advanced strategies.

The effect of perceptual salience has been commented on by a number of authors with reference to children of different ages. Braine (1974, 454-5) seeking the derivation of the child's first utterances says that,

> ..... what is probably happening in these utterances is that the child, lacking complete command of the English rules for making action phrases, is constructing such phrases simply be seizing on some salient feature of the action for which he has a word readily available.

On this view the child notices the salient and comments if he has an appropriate word. It is an explanation for the child's linguistic production although not necessarily for his comprehension of what he hears. Nelson (1973, 31) had earlier suggested, on the basis of her study of the acquisition of the first words, that young children begin by naming objects exhibiting salient properties of change and that these properties are those brought about either by the child's own interaction with objects or by transformations apparent to the child.

In the research reported in this thesis it was shown how comprehension of new words is guided by perceptual salience. When left without contextual or environmental clues, as in the anomaly tests, the biggest item tended to be chosen as referent for unknown words. Also, when asked which of a pair of pictured objects differing in proportion was "best", four-year-olds tended to choose the biggest regardless of its appropriateness.

In a study of a different kind Gardner (1974) showed that pre-school children were able to use words metaphorically and Gardner suggests (op. cit., 85) that in his investigation this resulted from the child recognising a common "expansive" property of entities such as loud noises and bright colours. A similar result emerged from the studies by Ervin and Foster (1960) and Nummedal and Murray (1966), already referred to, in which words associated on Osgood's semantic differential factors of Evaluation (for example, *good* and *pretty*) and Potency (for example, *heavy* and *strong*) were found to be used synonymously (and were therefore confused) by children as old as those in the sixth grade.

What kind of perceptual displays constitute salience to the young child? Rosch (1973) reporting a series of experiments with three- and four-year-old American children and with the Dani of New Guinea says that the good forms of Gestalt psychology and those colours with basic colour names in different languages,

> .... more readily attract attention than less salient stimuli and are more easily remembered than less salient stimuli. When category names are learned, they tend to become attached

> first to salient stimuli (only later generalising to other instances) and by this means "natural prototypes" become foci of organisation for categories.
>
> (Rosch 1973, 113-114)

Rosch also points out that not all semantic categories have such an obvious perceptual basis as those for colour and shape, and that many categories may be culturally relative.

Brown (1958, 208) speaks of "natural prepotency" and Titchener (reported in Bruner,1966, 25) of change in the visual field, movement, brightness and so on as attention catchers.

When children were asked to discuss size differences in perceptual displays, Farnham-Diggory and Bermon (1968) found that children talked about the greater difference first. Gollin, Moody and Schadler (1974, 103) in an experimental study of children's ability to choose "next-to" items in a series of rods and in which the various displays differed in overall size of items found that arrays consisting of the smallest set were significantly more difficult than those consisting of the larger sets.

Klatsky, Clark, and Macken (1973) reported that young children found it significantly easier to learn the meanings of nonsense syllables if they had as referents, greater extent along any one of several dimensions than if they referred to relatively less extent.

The evidence from the studies just reviewed is to the effect that perceptual salience has been noted as generating,

(a) unconstrained choice strategies in very young children,

(b) linguistic production of first words,

(c) comprehension of the denotative meaning of unfamiliar words,

(d) connotative meaning and metaphoric use of words,

(e) the establishment of at least some semantic categories by means of "natural prototypes".

Perceptual salience has also been found to be related to the order in which objects are mentioned, ease of cognitive processing, ease of learning and effective remembering.

The stress here on perceptual dominance cannot be taken to mean that this is necessarily the genesis of meaning for all words or even for these particular words. There were instancesin the present study in which children, becoming tired and restless during the testing refused to look at the block displays and hoping, no doubt, to terminate what had become wearisome, put out a hand and grabbed. What tended to be grabbed was the largest object. Therefore, the action base for early learning as described by Piaget may quite easily precede the perceptual strategy suggested here, or it may accompany it. Visual perception may simply note things already made salient by the child's own actions. Schlesinger (1974, 142) comments that our cognitive structures are very much more complex and variegated than the messages, which Schlesinger calls I-markers or Intention and Input Markers, which function in language. In this review and discussion of the relationship between perceptual salience and language one can see how a perceptual strategy serves to focus attention on one aspect of a situation and we shall now discuss evidence relative to the salient being associated with a sign. The formula is as follows:

$$x + y^{big} \rightarrow big$$

We know from every study, including the present one, that has concerned itself with the spatial adjectives that *big* emerges before words like *long, high* and *wide.* Is *big,* however, acquired before *little?* When do *big* and *little* enter the child's vocabulary?

Nelson's (1973) study of the first 50 words of 18 children between the ages of one and two years yielded data which showed that attribute words are rarely found in such early lexicons and that neither *big* nor *little* occurs in any of the vocabularies. Adjectives, in general, are comparatively late in acquisition (see for example, Dewey's comments, 1971) and are represented infrequently in vocabulary lists drawn up on the basis of the early diary studies. One has to remember that the evidence is from what a child produces and since adjectives must be combined with at least one other word either explicit or implicit perhaps they cannot be expected to appear before the advent of the two-word sentence at about the age of two years. Velten (1971, 84) comments on the emergence of a stage of classification by size (among other orderings) which appeared in the speech of a child of 22 months. "That big red chair", and, "That little greentable", both appeared at 23 months. Associated with classifications by size there is a great increase in vocabulary at the beginning of two-word sentences. Others have noted this increase in vocabulary and it is one of the reasons that lexicon studies are often abandoned at about this point because it becomes too difficult to keep track of each new entry. This phenomenon does raise the question, however, of whether the cognitive ability to process and produce two-word sentences also permits the expression of many words, such as adjectives, previously only comprehended.

In a study devoted to vocabulary concerned with aspects of space Ames and Learned (1948) found that the first "space" words were the one dimensional words *up, down, on, off* at 18-21 months, and *in* and *out* at 2 years but that comprehension of these words is at first in connection with particular objects, for example "in the box" before *in*. In the Ames and Learned study *big* was first recorded at 21 months and *littlest* at 42 months. It is important to note that Ames and Learned (op. cit., 77) distinguished a sequence of different levels of attainment in mastery of any one space word. First, came the ability to respond to a space word, then to use it spontaneously and thirdly to use it in answer to questions. (This order appears in the present results too). The Ames and Learned study suggests that *big* is acquired before *little*. Other studies, including the Velten one cited above, suggest otherwise. Brown and Bellugi-Klima (1964) reported "big boot" and "doggie big" among the two word sentences of Adam. The corpora of the children studied by Bloom (1970) show that

Kathryn produced *big* more often than *little* at 21 months, that Eric produced *little* at 22 months and that neither word was heard from Gia at 19 months. Yuen Ren Chao (1971) reports a Chinese speaking child as producing *big* and *small* at 28 months. A Japanese child studied by McNeill (1973) produced *little* but not *big* at 24 months and Ruth Weir (1962) reported a sequence from the speech production of her little boy which indicated that he was using *big* and *little* in a paradigmatic relationship at two and a half years. At 20 months the son of a colleague produced a similar pattern in "big one teddy", "little one teddy". (R. Benton, personal communication). By 19 months Bloom's (1973) daughter Allison had used *big* and *small* at least five times and Bloom records that *big* was the first of the pair to be used with consistency. Kotyrlo (1964) says that *big* and *small* figure in the active vocabulary of three-year-old Russian children just as *big* and *wee* do for Scottish children at three and a half years (Donaldson and Wales, 1970). Therefore some of the corpora contain *big* without *little*, two contain *little* without *big*. *Big* may precede *little* in the manner predicted by H. Clark for the acquisition of the polar terms but there is no evidence in the diary studies to indicate this. It is interesting to note in this context that the study by Klatsky, Clark and Macken (1973) showed no positive - negative assymetry for *big* and *small* although it did show this for the other antonym pairs. One has to remember that words other than *big*, *little* and *small* may serve the same purpose. Children frequently use *Daddy* as a synonym for *big* as some of the four-year-olds in the present study did, even though they understood *big* perfectly well. *Fat* was another popular word with the New Zealand children. Whatever the actual terms used the concepts of "big" and "little" appear to be comprehended around about, or a little earlier than, two years and may be comprehended earlier.

The evidence for the developmental order of *big* and *little* is equivocal. What seems certain is that *little* does not precede *big*. However, *little* may appear at the same time or very shortly after *big*. On the basis of deductive rather than inductive evidence the suggested derivation of *little* is as follows,

$$[-\mathit{big}]+y^{\text{little}} \rightarrow \mathit{little}$$

One of the major achievements of the sensori-motor period is the understanding that objects have permanence. This implies that if there is an A there must also be non-As. Edwards (1973, 417) reports a study by Le Compte and Gratch in which children of eighteen months were tested for object permanence by a technique in which the experimenters substituted another object for the original one. The children showed by their puzzlement and continued searching that they had a concept of a particular object and one must conclude that the substituted object was therefore in the category of objects that we have referred to as non-A. Therefore the sign *big* which at first signifies global size and refers to objects which are big in relation to other objects also implies that there are objects which are not big.

The operation of the logical principle of identity $A \neq$ non-A results in the child's action (when presented with a new sign) of avoidance of the objects for which an appropriate sign is known. Museyibova (1964, 124) provides a description of avoidance behaviour in a child trying to discover the meaning of a new word.

> Thus, Larisa G. (six years and eight months), when asked to place the doll opposite the Teddy Bear said as follows: "There", said Larisa, putting the doll side by side with the Teddy Bear, facing toward her, "that's side by side, there - that's one behind the other, the doll first and the Teddy Bear last, behind. But what will opposite be? Maybe as if they had quarrelled and turned their backs on each other? Or maybe like that? Face to face?" and she puts the toys opposite each other.

Vincent-Smith, Bricker and Bricker (1974, 192) describe a similar phenomenon in a word learning experiment.

> During phase 1, both groups of children demonstrated the ability to employ a known distracter to determine their choice of an unknown object the first time it appeared. For example, when presented a trial with "doll" and "megaphone" as the two objects and told to take the megaphone, the children were able to do so - not because they knew the label "megaphone", but because they knew the name of the other object was "doll".

Walta (1971, 19) in a study of seriation gives evidence of the use of negation when he says that "many children when experiencing difficulty on the production task used the negation (for example, *not taller*) to describe the element". In the present project children frequently explained the choice of a (mid)- or a little object rather than the correct object by saying that the correct object was big, and presumably therefore could not be linked with an unknown word. This kind of strategy should lead to the identification of one object for *big* and an indefinite number of objects for *little*. This is exactly the kind of behaviour reported by Greenfield, Nelson and Saltzman (1972, 301).

> The 11, 12, and 16-month-old children operate as though size were a binary concept rather than a continuum possessing infinite gradation. It seems as though the cup is treated as "biggest" while all the others belong to the category "little".

It seems most likely that although the signs *big* and *little* come into the vocabulary at about the same time they are not truly antonymous since the extension of *little* to not-*big* items ensures a wider extension than would be the case if *little* were marked (-Pol). Even in the present sample of children there were some who showed a tendency to point spontaneously to more than one item and say that each was "little" whereas it was difficult to persuade children to choose more than one item for *big* when the display did not offer another identical item. Nelson and Bonvillian (1973, 445) report that 18-month-old children learning concept names in most cases applied over-generalisations to objects which they had not yet named appropriately.

Therefore the early use of *big* and *little* does not mean that the child already has a polar strategy such that he will apply the words only to the extremes of scales, and the first use of *big* and *little* appears to apply to the whole scale but to different portions of it. Thus the set to notice big things is joined by an ability to comprehend a word to refer to the state of bigness. The child learns *big* and a word or words to refer to what is not big. The order suggested in this thesis gives confirmation to Heidenheimer's (1975, 758) hypothesis, "that the *not* categorisation constitutes an intermediate developmental stage that leads to the comprehension of the opposite. The specific application of the operation of opposition to contrastive lexical units is viewed as the final development". Nevertheless by the time a child is four his first choice of *little* in any collection of objects ordered by size is generally the littlest object. This suggests the following formula:

$$[-\,big - x] \quad + y^{\text{little}} \rightarrow little$$

The formula assumes an array of more than two objects and the conquering of the salience of overall size. The derivation of *little* therefore is by filiation from "avoid the big" and is probably "avoid the *big*" and then "avoid the 'big'". That is, the word serves to place mark the largest item, perceptual strategy serves to place mark the larger object of the leftovers.

It can be noted that there is no one word for the intermediate items. Children in the research samples used *middle* or *middle size* or *little-big (big-little* was not recorded). The acquisition of a phrase such as *middle size* is an additional possible reason for avoidance of the middle item in assigning *little*. Museyibova (1964) reports that children from three years of age grasp *the middle* and *between* but only for horizontal arrays and not for vertical ones. A more plausible hypothesis is that the spontaneous measuring process (Piaget, Inhelder and Szeminska, 1960, 27) that is such a feature of the activities of three- and four-year-olds may very well lead to interest in the extremes of scales.

The next formula shows the feature of polarity developing as a system based on the meaning of the words *big* and *little.*

big + *little* $\rightarrow$ polarity $^{\text{(big-little)}}$

The construction of polarity by means of one word pair does not inform searches for the meaning of new terms. The polarity feature comes in with each word separately and is confirmed by the superlative morpheme *-est.*

Although pre-operational children may have both values of a particular attribute such as *high* and *low* they do not attach these specifically to one dimension, and *big* and *little,* both marked (*n* Space), cover all situations of polarity. Thus the words of the set have a syncategorematic function and in pairs supply a meaning (extremes of scales) not present in the single words and not derived from the child's own actions. (Cf., Blank's, 1974, treatment of *why* and *because*). The series of word pairs have a parallel in the truncated series of the non-seriating child and the use of polarity as an overall strategy may have to wait for the achievement of seriation. However, a series based on two words is sufficient to produce a polar pair. It is only at this stage that the words can properly be said to be marked (±Pol).

$$\mathit{big} + \mathit{little} \rightarrow \text{polarity}^{\text{(big-little)}} \rightarrow \mathit{big}\ (+\text{Pol}),\ \ \mathit{little}\ (-\text{Pol})$$

When a child has acquired the signs *big* and *little* they become a means of communication with others. These particular signs are widely substitutable and hence the child's own use of them will generally be correct and non-anomalous. Hence the truth value of a child's *big* and *little* statements is likely to be true rather than false and his communications regarding the ideas they express will be successful. If the truth value of a child's statement was most often false, acquiring words would be a very tedious process. It seems that in the development of word use there is an avoidance of falsity. Nelson and Bonvillian (1973, 448) say in their report of very young children that the child may adopt a "correct" hypothesis from the start and then add that "this error-free route has borne minimal attention in previous work on early word meaning, but it could be the most common".

By four the child generally has a synonym for *big* and this synonym in New Zealand is most likely to be *fat* although it may also be something like *huge* or *enormous*. (Lovell, 1961, however, reports a study by Holmes in which not more than 60% of a group of five-year-olds could demonstrate that they understood the difference between *little* and *huge*). It would seem that such words can be derived from the sign *big*. The formula is as follows:

$$\mathit{big} + \text{y}^{\text{fat}} \rightarrow \mathit{fat}$$

The derivation is from an existing sign (a fusion of form and concept) rather than from comparison of the range of reference application of *big* and *fat* respectively, or from similar linguistic environments for *big* and *fat*. Certainly *fat* is substitutable for *big* in many sentence frames and certainly the referents of *big* and *fat* show considerable overlap, but it would seem that children see the signs as similar, as, for example, where a child speaking of one object says, "It's fat *and* big". Adults generally use *fat* and *big* of differing objects and in stylistic variation. Children use focal examples of categories (Rosch, 1973, Nelson, 1974b) rather than the bounded classes of logic and learning theory. With *big* and *fat* the child expresses synonymous focal concepts. Keifer (1965) argues for the primacy of similarity in the analysis of semantic relations in natural language.

The synonym relationship can be expressed as follows:

fat(+Big)

The association of *big, fat* and *little* in a set marks the initiation of a semantic field referring to the attributes of objects in a spatial field. As Nelson (1973) has shown, even beginning speakers establish semantic fields.

The spatial adjectives start, therefore, with *big* and *little* which come to be related to each other antonymously, and *fat* which is a diversification of the base word *big*. *Small* probably develops in a similar manner from *little*. The stress here on the linguistic relationship of synonymy is not meant to suggest its innateness. There is, as Sinclair (1971) points out, a solid basis of cognitive development well before the child says his first word. Synonymy, for example, has a parallel in different actions which achieve the same results although one does have the uncomfortable feeling that much of the isomorphism postulated of behaviour at different stages and between, for example, syntax and actions may arise on the basis of adult modes of analysis.

With *big, fat, little* and *small* the child has an antonym pair, one or two synonyms, and a primitive form of polarity.

The spatial semantic field can be activated by questions (raised by the child himself or by an interlocutor) related to three-dimensional objects, distance relations and so on. It may also be activated by words which are themselves part of the field (E. Clark, 1972). In the case of four- and five-year-olds the words most commonly activated are *big* and *little*.

The next stage, which probably begins about a year after the acquisition of the *big-little* pair, sees the meaning of the other (+Pol) terms of the set gradually comprehended. The reason for the priority of the terms referring to the greatest extension must surely be the result of the pre-school child's predilection for the most salient objects. And, as E. Clark (1973a, 163) suggests it may appear that the child "has (+Pol) as well as (+Amount) because of the strategy of choosing the greater amount".

The correct use of words like *high* and *long* depends on the child using them in situations for which he previously used *big*. These words are not true synonyms of *big* but may be such to the young child. We shall refer to such a use of two words as "double assignment". If the child is prepared to make a double assignment he is more likely to choose the perceptually salient *big* rather than the less salient *little*. Thus the *big* words *high, long, deep,* tend to be acquired before their antonyms. One can see that if the child learns how words are like each other and he has a bias to respond to the big, the (+Pol) words will be learnt first. This is perhaps allied to the process of matching described by Campbell, Donaldson and Young (1976, 98) in which later choices in a sequence are constrained by the initial one. *Big* can be considered an "initial choice".

Salience appears to change in the course of a child's development. There seems to be, for example, a change from global to vertical salience (Maratsos, 1973, 1974; Lumsden and Poteat, 1968) although it has been suggested earlier in this thesis that it may be linearity rather than verticality which is noticed. Moreover, the overall role of perceptual attributes in attracting the child's attention changes with age. (Saltz, Soller and Sigel, 1972; Saltz, Dunin-Markiewiez and Rourke, 1975).

The words of the *big* set are first identified by the child as (+*Big*). Thus, to a child, an object may be *high and big*. Next an object may be *high* and *big* and, some time after the advent of a sense of linearity and spontaneous measurement, *high* or *big*. From the beginning of the *high and big* stage, children seem to be prepared to make double assignments, on the one object, of words familiar to them. Asch and Nerlove (1960, 50) report, in a study of a child's grasp of double function terms, a pre-school child as saying, "Daddy and Mommy are *deep* because they look big".

In order to deal with *tall* (or with *high* in its use as equivalent to *tall*) the child must have developed a sense of linearity which in the following statement is referred to by the symbol "l". Gardner et al. (1975) report in a study of metaphors that "numerous pre-schoolers selected the ending 'tall as string' perhaps because tallness was equated with length". In the following formula "big" is redefined as "big and linear".

$$[x + l] + y^{\text{big. high. long}} \rightarrow \textit{big} + \textit{high (tall)} + \textit{long}$$

One can realise how this procedure can lead to confusion in distinguishing the three terms, *big*, *high* and *long*. However, not all children experience confusion and an alternative statement might read,

$$[\textit{big} + l] + y^{\text{high}}, y^{\text{long}} \rightarrow \textit{high, long}$$

When a child begins to use *high*, *long*, and *deep*, he has two or more terms for what he previously referred to as *big*. *Big*, however, is not restricted in its use as might be the case if it had previously been over-generalised. It continues to remain applicable to all instances covered by *high* and *long*, although the new words offer greater choice and are of more use for communication in situations in which the referents are not directly perceived by the receiver of the message. It is the new acquisitions, *high* and *long*, for which a reference domain has to be carved out.

Orientation is not entirely missing from the semantic discriminations of four-year-olds but it is not used systematically to discriminate *long* from *high*. Various studies have charted the development of a sense of linearity and spontaneous measurement in pre-school children (Piaget, Inhelder and Szeminska, 1960, 27). Laurendeau and Pinard (1970, 127) show that the ability to construct a projective straight line on a rectangular base develops rather rapidly between 3;6 and 5;0. Palermo (1973, 221) says that there is evidence from studies of *more* and *less* that linear arrays are easier to judge than global and continuous quantities. Zaporozhets (1965, 87) in a study of eye movements when children of four and five were looking at figures says that "judging by direction the movements seemed to be oriented to the size and length of the figures. There were many long movements that were aimed probably, at measuring the objects. The observers did not see movements tracing the outline of the figures". In the development of drawing, too, children first draw global figures and later linear ones. (Golomb, 1974).

The emergence of a feeling for fit and extension of this to measurement of linear dimensions and, finally, this measurement applied to the vertical dimension, prepares the way for the correct use of *high*. During the testing, children frequently held the objects upright and next to each other to compare them. They noted tiny discrepancies in size which meant that, during the pilot study, the experimenter was frequently required to return home to shave thin slices from the end of blocks and rods so that the exacting eye of the four-year-old would be satisfied that objects which were meant to match, in fact, did so. Palermo (1973) reports minute comparisons of water levels by five- to seven-year-olds. The experimenter in the present study had difficulty in restraining children from changing the orientation of the long horizontal objects in order to show how they matched the high objects. A number of children indicated their thinking quite clearly by running a finger up one of the high blocks and saying, "That's long". From time to time children tried either to stand all the blocks up or to put them all horizontal in the item testing the opposition between *high* and *long* (item 22). Evidence for linearity was also given in the results from three of the anomaly tasks in this project (items 74, 75, 76). *High* appears to be learned a little before *long* but *long* in the sense of a measure of length appears to precede *high* in the sense of a measure of height.

The acquisition of *high* follows from the salience of verticality (v) which in turn is a filiation from linearity.

$$[[x + 1] + v] + y^{\text{high}} \rightarrow \textit{high}$$

The formula for noticing middle-sized objects can be expressed as follows:

$[-big + x] \rightarrow$ (mid)-objects

This repeats an earlier formula but because no word is presented the formula results in an identification of the (mid)-objects. The formula assumes that the child avoids the well-known *big* and chooses the bigger of the leftovers. It is likely, too, that the child avoids the well-known *little* or that he turns his attention to the "next-to" item. However, in everyday circumstances there can be little opportunity to choose an extremal item and then an intermediate one, a process that appears to assist in locating the item (Gollin, Moody and Schadler, 1974) and the formula given is plausible in the light of the behaviour of the children in this study.

It can be suggested then that *long* is derived as follows remembering that *wide* is not yet acquired and hence is unlikely to confuse discriminations of the horizontal dimensions.

$$[[x + 1 - v] + y^{\text{long}} \rightarrow long$$

The first of the (-Pol) terms to be acquired (apart from *little*) is probably *low* and the derivation may be as follows:

$$[[- big - x] + v] + y^{\text{low}} \rightarrow low$$

Perhaps a more plausible reading would be

$$[[little + 1] + v] + y^{\text{low}} \rightarrow low$$

but in view of the rivetting effect of big items on a four-year old, the first reading must also be considered. The antonym relationship applied to a linear dimension is derived thus *high* + *low* → polarity$^{\text{(high-low)}}$ → *high* (+Pol), *low* (-Pol)

We have now provided a formula for words which a majority of the four-year-olds in the sample could identify in the tests.

Two of the (+Pol) adjectives do not appear above; *far* and *deep*. The data suggested that *far* is not derived from *big*. *Far* as we noted in testing the opposition between *far* and *big* is free from the gravitational effects of *big* and *little*. *Deep* seems to branch out from *big* by referring to *big* in a special context.

big (+Water) + y$^{\text{deep}}$ → *deep*

It seems very likely that other words are "marked" in a similar manner by association with particular contexts or objects. There are therefore two additional forms of "marking" available to the young child - signs as in the example given earlier of *high* (+*Big*) and a context marking.

Of the (+Pol) terms *wide* and *thick* were still largely unfamiliar to the children in the sample. It can be suggested that the derivation of *wide* is

[[- x - v] - *little*] + y$^{\text{wide}}$ → *wide*

It has been suggested earlier that the difficulty with *wide* may be that it is hard for a child to work out its relationship to *big* and *little*. It is *little* in relation to *big*, *high* and *long* but *big* in relation to *narrow*. Thus, whereas *high* can be thought of as a variety of *big*, *wide* is neither synonym nor antonym. Moreover, there are only limited occasions in the objective world where *big* of an object coincides with *wide*. This seems a more parsimonious explanation for the difficulty with *wide* than one that sees its emergence as part of the understanding of a co-ordinate axis system. A young child is not particularly sensitive to orientation but is very sensitive to size and the explanatory formula tries to account for this.

Finally, one can suggest the following derivation for *thick* and *thin*. It can be recalled that children confused these words and it was suggested that this was due partly to a similarity of sound.

$$[[-1-\mathit{big}]-\mathit{little}]+y^{\text{thin. thick}} \rightarrow \mathit{thick\ and\ thin}$$

The formulae will now be arranged in stages. It must be stressed that these are not meant to show how a child processes a word in order to derive its meaning but, how, in the course of development, he acquires this meaning.

Stage I: <u>Synonymy and Antonymy</u>

$x \rightarrow$ "notice the big"

$x + y^{\text{big}} \rightarrow \mathit{big}$

$[-\mathit{big}] + y^{\text{little}} \rightarrow \mathit{little}$ — Global size

$[-\mathit{big} - x] + y^{\text{little}} \rightarrow \mathit{little}$

$\mathit{big} + \mathit{little} \rightarrow \text{polarity}^{(\text{big-little})} \rightarrow \mathit{big}\ (+\text{Pol}),\ \mathit{little}\ (-\text{Pol})$

$\mathit{big} + y^{\text{fat}} \rightarrow \mathit{fat} \rightarrow \mathit{fat}\ (+\mathit{Big})$

Stage II: Homology*

$[x + 1] + y^{\text{big. high. tall. long}} \rightarrow$ *big* + *high* + *tall* + *long*

or

$[\textit{big} + 1] + y^{\text{high}}, y^{\text{long}} \rightarrow$ *high, long*

$[[x + 1] + v] + y^{\text{high}} \rightarrow$ *high*

$[-\textit{big} + x] \rightarrow$ (mid)-objects — Linearity

$[[x + 1] - v] + y^{\text{long}} \rightarrow$ *long*

$[[-\textit{big} - x]+v] + y^{\text{low}} \rightarrow$ low, or

$[[\textit{little} + 1] + v] + y^{\text{low}} \rightarrow$ *low*

high + *low* $\rightarrow$ polarity $^{\text{(high-low)}} \rightarrow$ *high* (+Pol), *low* (-Pol)

big (+Water) + $y^{\text{deep}} \rightarrow$ *deep*

Stage III: Secondary Dimensions

$[[-x - v] - \textit{little}] + y^{\text{wide}} \rightarrow$ *wide* — Words

$[[-1 - \textit{big}] - \textit{little}] + y^{\text{thin. thick}} \rightarrow$ *thick and thin*

Discussion

One can note in the above model

(a) the recurrence of the operation of perceptual and cognitive factors

(b) the use of established signs to elucidate new ones,

(c) the centrality of *big* and to a lesser extent *little*,

(d) the generation of "confused" in addition to clearly defined signifieds (suggesting the vagueness of boundaries),

(e) the building up of cognitive polar systems with the assistance of syncategorematic linguistic elements,

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* "A fundamental similarity due to community of descent". The Random House Dictionary, College Edition, 1968.

(f) the effect of knowledge of objects on order of acquisition,

(g) the network effect of a semantic field,

(h) the complex interaction of language and thought.

CHAPTER 22

CONCLUSIONS

In this final chapter the main findings will be presented regarding the performance of the Maori sample on the series of tasks used in this study and their educational implications will also be discussed.

(1) No "Whorfian" effect was observed in the Maori performance. This does not disprove the possibility of such effects in other samples or with other words. It can be recalled that none of the children was an active speaker of Maori.

Educational implications: So far as the adjectives of the Bierwisch set are concerned and probably for many other common words with concrete reference, Maori children acquire the same meanings as do Pakeha children. Nevertheless, there are almost certainly meaning differences in word use by Maori and by Pakeha and research could be directed towards determining which words in the English language do have Maori cultural interpretations and which do not.

(2) The children in the Maori sample appear to use exactly the same strategies in the acquisition of word meaning as do the children in the Pakeha sample and there was, in the results from the study, no sign of either "deficit"

or "difference" in ways of thinking between the two groups.

Educational implications: Any methods of teaching successful with young Pakeha children should be appropriate to Maori children also.

(3) There was a difference between the productive vocabularies of the two samples of children so far as the words of the study are concerned. The Maori sample as a whole produced as many words but a reduced range of words. The difference in recognition of the words of the set, however, was only slight, and comprehension differences were non-significant. It must be remembered that many of the childrenin the Maori sample may have known Maori words unknown to the Pakeha sample.

Educational implications: One of the most important findings from this study is that there were varying differences between the samples according to whether the test was one of comprehension, recognition or production. This, therefore, indicates that teachers should be wary of judging a child's cognitive ability on the basis of either production of words or their recognition and that teachers should be especially wary of doing so if the child is Maori. To argue that a Maori child does not "think" properly or does not have "concepts" because he does not have words would not apply to the children in this study and it is unscientific to state that children have no language simply because they fail to respond when asked to. (See Labov, 1970a, for a discussion of the "no language" view of children from minority groups).

To argue, on the other hand, that because children comprehend adequately then no attention need be paid to their productive vocabularies is hardly sound. The acquisition of words may make little direct difference to the child's own thought but it will make a difference to his powers of communication and to the impression he makes on others.

The words examined in this research project were only a tiny fraction of all words known by a four-year-old and they are words of one particular kind. One cannot generalise from these words to words generally learnt through reading, or to words generally learnt in connection with subjects taught in school, nor necessarily to nouns rather than adjectives. What one can say, however, is that some differences in the *use* of adjectives referring to space have been detected and that these differences may be due to a number of causes such as shyness, and cultural patterns connected with behaviour appropriate in the presence of adults, as well as to actual knowledge of the words. The testing also revealed how important a secure and familiar environment is to a child if he is to do his best in a testing situation. It also showed that in many instances three testing sessions were necessary before a child would speak freely.

(4) The overwhelming importance of information in the process of word learning has been documented throughout this thesis. The children in the Maori sample did as well as the children in the Pakeha sample when there was adequate information and, relatively speaking, they depended more on information and contextual clues because they could depend somewhat less on word knowledge.

Educational implications: There are many implications that arise from these findings. The first is obvious. All teaching situations need to have meaning. Abstract materials like blocks, for example, are probably less effective than real life models in supporting learning of size. In other words, the belief that number concepts are "abstracted" by the child as a result of playing with blocks may not be a sound one. Another implication is that language "tests" must take into account the young child's need to process information from the environment in order to be fully competent in language. For it is the immediate situation and the things that he knows that a young child talks about (cf. Harris, 1974, on very similar findings with adults). Feldman (1971) found that sentence recall, especially in children as young as five is greatly improved by having the objects referred to presented simultaneously, and Bloom (1974) reported a young child who, when asked to repeat sentences in a repetition task, was unable to repeat sentences he himself had previously produced spontaneously. The younger the child the more his ability to produce sentences depends upon the immediate context and his own behaviour and activity.

In the tests used in the present study the children's interest disappeared when they were pressed to identify thick objects and wide objects (especially when these were presented together) because the children did not know the words. The situation lacked sufficient information for their interest to be aroused. A similar thing occurred when the children were asked to look at pictures of cupboards. Cupboards, presumably, have little personal meaning for a child. Water, men, babies, cars, houses and dogs - even lumps of foam rubber brought forth a willing response.

(5) Words are associated in semantic fields.

Educational implications: Advantage should be taken of the fact that learning one word assists the learning of related words in any attempts to increase a young child's vocabulary.

The structured materials of many of the commercial pre-school programmes for the disadvantaged with their particular emphasis on "language" (Dale, 1972, 280-293, reviews some language training programmes for pre-schools; see also Bereiter and Engelmann, 1966; Bereiter et al., 1966; Blank and Solomon, 1968; Blank, 1970) seem to violate most of the principles revealed in the recent research on a young child's language and thought reviewed in this thesis. For example, young children told that, "This is a _______.

This is not a _______", are not likely to develop sharper concepts because this is a "boundary" exercise and, as we have seen, the normal way for a child to develop concepts is to start with a focal instance and to develop variations in relation to this. In one sense *big* is a focal instance of the concept of size, and *high* and *long* are variations. As has been suggested earlier, there is no need to refer to something as being *not big*. For one thing the idea of non-A appears at a very early stage, and for another, *not big* has no focus of its own. Also, there is almost certainly a lack of match between the child's own intuitive understanding of class exclusion and object denial, and his understanding of these ideas when they are expressed by another person.

SHOULD WORDS BE TAUGHT TO YOUNG CHILDREN?

The child has a predisposition to learn words and, apparently, an early expectation that words have referents. In this study some children picked up the words they were unfamiliar with like *thin*, kept them in mind, and obviously tried to find referents for them. One little boy, playing Roger Brown's (1958) "Original Word Game", when, after a series of questions about *thick*, and faced with another display, pointed to one of the blocks and said, "It might be thick".

At least two studies have been concerned with examining the process of word acquisition in experimental settings and both produced interesting findings. Nelson and Bonvillian (1973) using a sample of eighteen-month-old children showed that children learnt to use many of the experimental words correctly (they were real words like *sifter* and *caboose*), that this learning was based upon relatively limited data, and that progress was more rapid for words which the children heard their mothers use. Displays included more than one example of an object in any one category and children often "formed an hypothesis about the conceptual meaning of a word before directly or indirectly imitating adult labelling of particular objects", (op. cit., 445).

A second study of word acquisition by Vincent-Smith, Bricker and Bricker (1974) indicated that new words can be acquired by children between the ages of 20 and 30 months in as few as five trials. Therefore children do not appear to find difficulty in acquiring content words. Other kinds of words, for example, *wide* may present rather more difficulty. It is as well to remember H. Clark's (1973b) warning about the "language-as-fixed-effect" fallacy.

In general, showing young children interesting things and talking to them about them should be sufficient to ensure the learning of vocabulary. A young child learns words not through conscious teaching, but through his interest in particular objects, through his customary actions, through a word's similarity to and difference from other related words, through the use of words in the messages he receives, and through his own successful use of words.

Should one stop concentrating on Maori children when trying to offer educational assistance and instead, look for disadvantaged Maori and Pakeha children? There were some children in this project, both in the Maori and the Pakeha samples, who knew very few words and it seemed to the experimenter that they would have benefited greatly from some special attention. Of course, all children should be helped if they need it and there should be no suggestion that only Maori children have problems. But at the level of policy it is likely to be more fruitful to put resources into areas where there are Maori children. A further argument against seeking "disadvantaged" or "deprived" children is that these usually turn out to be largely Maori. (Mitchell, 1968). Maori people think of themselves as Maori people not as members of the working class, and certainly not as "deprived" or "disadvantaged". To attempt to bring "disadvantaged" Pakehas into the same network will negate such assistance unless Maoris themselves draw in the Pakehas. For outside bodies to try to do so practically guarantees the failure of any scheme.

MOTHERS AND TEACHERS

Both mothers and teachers of the children in the study reported in this thesis tended to think that if a child spoke little or indistinctly or in short sentences that he had poor language development. In other words they judged the child's production without reference to his comprehension; and language, to them, meant speech. Authors are not immune from the same belief (see for example, Schiach, 1972), and the whole issue is confused by the use of "language" by school teachers, to refer to a particular section of the curriculum. In the course of dealing in a testing situation, and in unstructured situations, with over 80 children, the investigator found that it was common to find four-year-olds who said very little and who, when they did speak, were monosyllabic. However, these children appeared to be perfectly normal in their development and might offer lengthy, albeit rare, bursts of speech when excited or angry. There seems to be a need for educators to understand what it is that a young child comprehends rather than to worry about whether or not he talks a lot.

Some mothers reported that they had tried to teach their children some of the words of the set (after finding that the children did not understand them) but without success. It seemed that they took the hardest words like *thin* and *wide,* when possibly *long* and *deep* were the correct match for the child's stage of development.

Mothers said that they enjoyed watching the testing and that it gave them ideas for things to give the children to play with and a greater understanding of their own child's abilities. They were particularly impressed with performance on the implication tasks and frequently said of the child something like, "Well, I didn't know he was smart but I see he is". It must be emphasised that the mothers did not suggest that their child was clever relative to others but merely that he possessed powers of reasoning that they did not previously suspect. Mothers and children told fathers about the work and some of them came to watch the child while he was being tested.

TESTING

Cazden (1972) warns that the usual vocabulary tests fail to tap many aspects of word meaning since they test only for a relationship between a word and a picture. The complexity of word meaning has been demonstrated in this thesis and, although the tests explored only the most elementary and basic meanings of the selected words, in relation to a limited set of objects in space (abstract metaphorical meanings and polysemy were ignored), differences in performance were found according to both situational and verbal contexts. Thus "meaningful" displays were easier for the child to match with a word than were "meaningless" ones. In other words the amount of non-linguistic information offered to the child was important. Successful comprehension of a particular word also depended upon the word or words with which it was contrasted in the tests. In the anomaly test for polar components, again, the word elicited depended partly on the object pictured, partly on the word used as stimulus and to some degree on the words already presented. In the tasks for normativity successful language use depended upon the nature of the object referred to, the nature of the vocabulary items, the truth value of the statement and the nature of the syntax required in the response.

Certainly so far as the young child is concerned testing for any one aspect of language in isolation from the others is a doubtful enterprise.

Lenneberg (1973, 6) says that

> In order to understand the nature of language, it is first of all necessary to rid outselves of the notion that its most important components are simply labels or "names". Language is relational in every aspect and at every turn.

Informal assessment

There is a need, however, for informal assessment of a child's interpretation of the meaning of words. Unless a teacher has some idea of what a child knows he or she cannot hope to give him the kind of individual attention he may need.

The equipment prepared for this investigation was deliberately kept simple and was of a kind that can be made athome, for the research worker had in mind its possible usefulness for teachers and mothers. But even without specially constructed materials it is possible to find objects varying in size, dimension and position and by talking to a child and listening to what he says, observe his understanding. If something more structured is wanted the very simple model of a town prepared for the present study was a great favourite with the children[1] and it is the kind of play object that can be talked about by child and adult and be used both for informal assessment and for informing the child. Abstract materials work well as materials for imaginative play but they are usually boring to discuss. There seems no sense to a little child in questions about the height and width of featureless blocks (even if this was done in the present study). Real life materials, miniature towns, houses, people, cars and animals are suitable for discussion purposes.

Many children were stimulated by the testing programme

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1. The experimenter took photographs of many of the children in the sample and asked each child to choose the toy he liked best so that he could have his picture taken while he was playing with it. The most popular items were the Landrover, the doll and the teacup, and the town.

and continued, at home, to talk about *big* and *little* and the other words and to tell older brothers and sisters about them.

FURTHER RESEARCH

One can sympathise with Shields and Steiner (1973) who complain about a lack of norms for language structure in young children and agree with Shields (1974, 181) that there is a dearth of descriptive studies which deal with the variety of language forms used by the child and their function for the child. One can add that there is also a dearth of studies either descriptive or experimental dealing with how the three- to five-year-old child uses and comprehends words in different situations. As already discussed, studies of the lexicon have concentrated on only one or two, or at most, a small set of words. The resurgence of interest in studying the acquisition of first words, however, may lead to greater interest in lexical and semantic acquisition amongst older children.

There should be a further search for possible differences between Maori and Pakeha word meanings. For example, other semantic fields could be explored in a manner similar to that of the present study, or, the structure of various language concepts could be examined by determining the core of the concept, the peripheral instances and the nature of the concept boundaries.

It is not certain from the present results, whether the

(-Pol) words are derived in some way from *big*, or "big", or *little*, or from a combination of these sources. The acquisition of the remainder of the words of the Bierwisch set, particularly the (-Pol) terms could well be studied.

Geraldine McDonald

ASPECTS OF THE LANGUAGE AND THOUGHT OF FOUR-YEAR-OLD MAORI CHILDREN: A STUDY BASED ON BIERWISCH'S COMPONENTIAL ANALYSIS OF A SET OF ADJECTIVES

APPENDICES AND REFERENCES

Submitted for the degree of Doctor of Philosophy in
Education at the Victoria University of Wellington
1976

APPENDICES

APPENDIX A

INTERVIEW SCHEDULE

INTERVIEW SCHEDULE

Name:

Date:

		Age category
1.	Birth date of child	1 2 3 4
2.	Sex of child	M F
3.	How long has he/she been at pre-school?	Up to 6 months 6 months and up to 1 year 1 year and up to 18 months 18+ months
4.	Does he/she hear any language at home apart from English? (Establish in what circumstances the child hears a second language; how often he hears it; whether he participates in conversation; whether mother speaks any other language.)	English Maori Dutch Other

			M	P	M/P
5.	Do you consider yourself Maori, Pakeha or what?	Mother	[ ]	[ ]	[ ]
6.	What about your husband?	Father	[ ]	[ ]	[ ]
7.	What about [name of child]?	Child	[ ]	[ ]	[ ]

8. How much education were you able to have?

9. How much education was your husband able to have?

10. What is your husband's job?

11. What did you do before you were married?

12. Are you between 20 and 29, 30 and 39, 40 or over? 20-29 30-39 40 and over

13. How many children have you?

14. What is [child's name] place in family?

APPENDIX B

SCORE SHEETS

COMPONENT SERIES

Name:

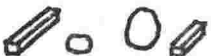
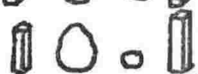
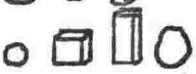
Date:

Polar Component

Show me the ......

1. *Big/little* corks (*big-little, big-little, big-little*) 
2. *Long/short* sticks (*short-long*) 
3. *Wide/narrow* strips (*narrow-wide*) 
4. *High/low* blocks (*low-high*) 
5. *Deep/shallow* water (*shallow/deep*) 
6. *Far/near* dolls (*far away-near*) 
7. *Thick/thin* sticks (*thick-thin*) 
8. *Tall/short* men (*tall-short*) 
9. *Fat/thin* men (*fat-thin*) 

Space Component

10. *Long* v *big* (*long-big*) 
11. *High* v *big* (*high-big*) 
12. *Wide* v *big* (*wide-wide-big*) 
13. *Far* v *big* (*far away-far away-big*) 
14. *Deep* v *big* (*deep-deep-big*) 
15. *High* v *thick* (*high-high-thick-thick*) 
16. *Long* v *thick* (*long-long-thick-thick*) 
17. *Wide* v *thick* (*wide-wide-thick-thick*) 

Volume Component

18. *Deep* v *thick* (*deep-deep-thick-thick*) 

Space Component

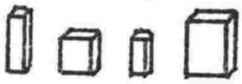
19. *Deep* v *thick* (*deep-deep-thick-thick*) 
20. *Far* v *thick* (*far away-far away-thick-thick*) 

Dimension Component

21. *Long* v *wide* (*long-long-wide-wide*)

22. *High* v *long* (*high-high-long*)

23. *Wide* v *high* (*wide-wide-high-high*)

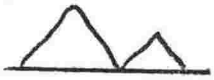


Orientation Component

24. Three sisters ... which is the *tallest* one?

Why?

25. *High* v *deep*, why? (*high-deep*)

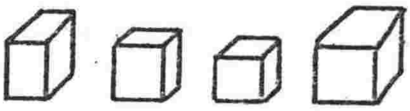


26. *Far away* from the lady

27. *Far* v *long* (*far-far-long-long*)

Proportion Component

28. *Deep* v *wide* (*deep-deep-wide-wide*)



29. *Deep* v *long*, why? (*deep-long*)

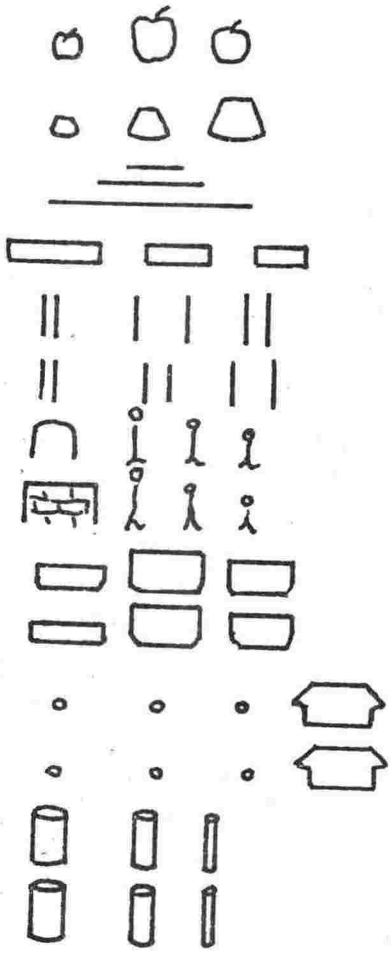
IMPLICATION SERIES

Name:

Date:

Polar Implication

30. "Big" v "little"
31. "Little" v "big"
32. "Long" v "short"
33. "Short" v "long"
34. "Wide" v "narrow"
35. "Narrow" v "wide"
36. "Low" v "high"
37. "High" v "low"
38. "Shallow" v "deep"
39. "Deep" v "shallow"
40. "Near" v "far"
41. "Far" v "near"
42. "Thick" v "thin"
43. "Thin" v "thick"

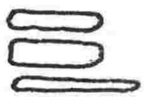


Normativity Implication

44. This boy's mother ... will this shirt do?
45. This girl's mother ... will this dress do?

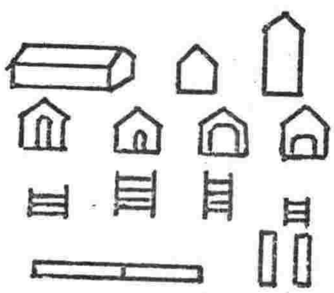
Volume Implication

46. "Thick" v "big"



Dimension Implication

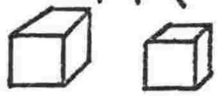
47. "High" v "long"
48. "Wide" v "high"
49. "High" v "wide"
50. "Long" v "high"



Orientation Implication

51. Give the doll a cup of tea 

52. Give me the piece of wood 

53. Which cupboard holds the most blocks? 

Proportion Implication

54. Best stone to roll along the ground. Why? 

55. Best wheel for a car. Why? 

ANOMALY

Name:

Date:

Polar Anomaly	Response

56. low elephant
57. tall house
58. fat chair
59. narrow fly
60. big pear
61. short chair
62. far man
63. thick apple
64. shallow wheel

Normativity Anomaly

65. Three shoes

    Can you see a shoe which is big enough?

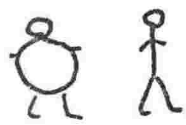
66. Three shirts

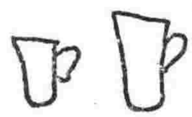
    Can you see a shirt which is too big?

Space Anomaly

67. Can you see a deep bowl? 

Volume Anomaly

68. Can you see a wide person? 

69. Can you see a fat jug? 

70. Can you see a fat cake? 

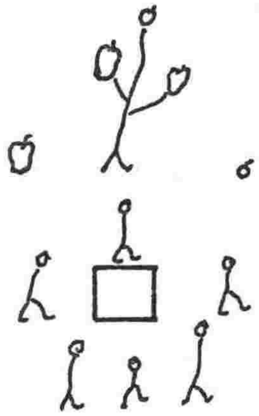
Orientation Anomaly

71. Can you see a tall apple?

Can you see another one?

72. Can you see a tall man?

73. Can you see a high boy?



Proportion Anomaly

74. Can you see something long?

Show me how it is long.

75. Can you see something long?

Show me how it is long.

76. Can you see something long?

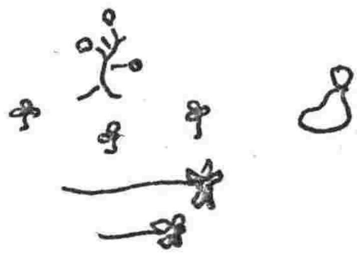
Show me how it is long.

Dimension Anomaly

77. Can you see a tall apple?

78. Can you see a long flower?

79. Can you see a far flower?



FEATURE SERIES

Name:

Date:

Normativity Feature

80. Is a ______ big?

81. Is a ______ small?

	80. Yes	80. No	81. Yes	81. No
cow	[ ]	[ ]	[ ]	[ ]
cat	[ ]	[ ]	[ ]	[ ]
mouse	[ ]	[ ]	[ ]	[ ]
you	[ ]	[ ]	[ ]	[ ]
house	[ ]	[ ]	[ ]	[ ]
dog	[ ]	[ ]	[ ]	[ ]
stick	[ ]	[ ]	[ ]	[ ]

Proportion Feature

82. Which is the best door? Why? 

83. Which is the best fishing rod? Why? 

84. Which is the best car? Why? 

85. Which is the best table? Why? 

86. Which is the best pencil? Why? 

87. Which is the best spoon? Why? 

Show me with your hands

		Vertical	Horizontal
88.	How big is an apple?	[ ]	[ ]
	How big is a motor car?	[ ]	[ ]
	How big is a tree?	[ ]	[ ]
	How big are you?	[ ]	[ ]
	How big is a stick?	[ ]	[ ]
89.	How big is a little apple?	[ ]	[ ]
	How big is a little motor car?	[ ]	[ ]
	How big is a little tree?	[ ]	[ ]
	How big are you?	[ ]	[ ]
	How big is a little stick?	[ ]	[ ]

APPENDIX C

SPECIFICATIONS FOR THE TEST ITEMS AND ILLUSTRATIONS OF ITEMS

COMPONENT SERIES

POLAR COMPONENT

Many of the objects in the component series were made from wood. Where the material is not specified it is wood.

Item 1: 3 corks; diameter 3cm, height 3cm; diameter 1.9cm, height, 2.3cm; diameter 1.1cm, height, 1.9cm.

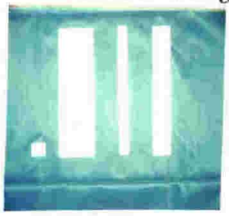
Item 2: 3 sticks dyed lemon, diameter 0.6cm; length, 10.2cm, 7.6cm, 5.0cm.

Number cards 2.5cm x 2.5cm

Item 1
big-little
Item 2
short-long

Item 3: 3 cardboard strips coloured yellow; 24.5cm x 6.5cm; 24.5cm x 3.1cm; 24.5cm x 1.5cm.

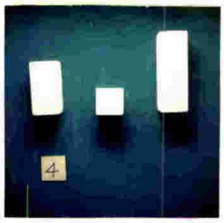
Number card 2.5cm x 2.5cm



Item 3
narrow-wide

Item 4: 3 blocks of unstained wood; 7.5cm x 2.5cm x 2.5cm; 5.0cm x 2.5cm x 2.5cm; 2.4cm x 2.5cm x 2.5cm.

Number card 2.5cm x 2.5cm



Item 4
low-high

Item 5: 3 plastic containers; diameter 9.7cm, height 6.0cm. Filled with water to the following heights: 5.0cm; 3.0cm; 1.0cm.

Number card 2.5cm x 2.5cm

Item 5
shallow-deep

Item 6: 3 plastic dolls coloured pink; height when sitting 4.5cm.

Number card 2.5cm x 2.5cm

Item 6
far-near

Item 7: 3 rods dyed red; length 10.3cm, diameter 1.2cm, length 10.3cm, diameter 1.0cm, length 10.3cm, diameter 0.6cm.

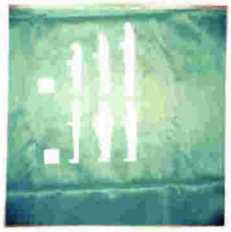
Number card 2.5cm x 2.5cm

Item 7
thick-thin

Item 8: 3 cardboard cutouts of men all the same girth; height 14.0cm, 11.8cm, 9.5cm.

Item 9: 3 cardboard cutouts of men all the same height; height 11.8cm, girth 3.0cm, 1.8cm, 1.2cm.

Number card 2.5cm x 2.5cm

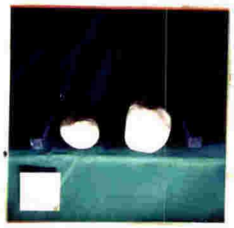


Item 8
tall-short
Item 9
fat-thin

SPACE COMPONENT

Item 10: 2 squared rods dyed blue; 9.5cm x 1.2cm x 1.2cm; 5.0cm x 1.2cm x 1.2cm; 2 plastic wood 'lumps'; height 5.5cm, width 5.0cm, depth 4.0cm; height 4.5cm, width 3.7cm, depth 3.5cm.

Number card 3.75cm x 3.75cm



Item 10
long v *big*

Item 11: 2 squared rods dyed orange; 9.5cm x 1.2cm x 1.2cm; 5.0cm x 1.2cm x 1.2cm; 2 plastic wood 'lumps'; height 5.5cm, width 5.0cm, depth 4.0cm; height 4.5cm, width 3.7cm, depth 3.5cm.

Number card 3.75cm x 3.75cm

Item 11
high v *big*

Item 12: 2 wooden slabs dyed green; 11cm x 2.5cm x 1.2cm; 5cm x 4cm x 1.2cm; 2 plastic wood 'lumps'; height 5.5cm, width 5.0cm, depth 4.0cm; height 4.5cm, width 3.7cm, depth 3.5cm.

Number card 3.75cm x 3.75cm

Item 12
wide v *big*

Item 13: 4 spheres (approximate) made from plastic clay and dyed red; 2 x diameter 4.0cm approximately, 2 x diameter 1.3cm approximately.

Number card 3.75cm x 3.75cm

Item 13
far v *big*

Item 14: A drawing of 4 fish bowls; 1.8cm x 4.2cm, 1.2cm x 4.2cm, 1.2cm x 1.5cm, 1.8cm x 1.5cm. The heights of the containers bear the same relationships to each other as does the depth of the water. The depth of the container, fore and aft, matched the height.
Number card 3.75cm x 3.75cm

Item 14
deep v *big*

Item 15: 4 cylinders dyed yellow; height 7.3cm, diameter 4.3cm; height 7.3cm, diameter 2.5cm, height 5.0cm, diameter 4.3cm; height 5.0cm, diameter 2.5cm.

Number card 3.75cm x 3.75cm

Item 15
high v *thick*

Item 16: 4 rods dyed green; length 11.2cm, diameter 1.8cm; length 11.2cm, diameter 1.2cm; length 6.1cm, diameter 1.8cm; length 6.1cm, diameter 1.2cm.

Number card 3.75cm x 3.75cm

Item 16
long v *thick*

Item 17: 4 blocks dyed purple, 7.7cm x 4.5cm x 2.7cm; 7.7cm x 4.5cm x 1.3cm; 7.7cm x 2.6cm x 2.7cm; 7.7cm x 2.5cm x 1.3cm.

Number card 3.75cm x 3.75cm

Item 17
wide v *thick*

Item 19: A Chinese tea bowl and matching saucer, 2 oblongs of foam rubber. Bowl, depth 6.0cm diameter 7.2cm, saucer, depth 2.5cm, diameter 6.5cm. Foam rubber, 11.0cm x 7.0cm x 5.5cm; 11.0cm x 7.0cm x 2.5cm.

Number card 3.75cm x 3.75cm

Item 19
deep v *thick*

Item 20: 4 cylinders dyed lavender, 2 cylinders, height 7.3cm, diameter 4.3cm; 2 cylinders, height 7.3cm, diameter 2.5cm.

Number card 3.75cm x 3.75cm

Item 20
far v *thick*

VOLUME COMPONENT

Item 18: 4 cylinders dyed red, height 7.3cm, diameter 4.3cm; height 7.3cm, diameter 2.5cm; height 5.0cm, diameter 4.3cm; height 5.0cm, diameter 2.5cm.

Number card 3.75cm x 3.75cm

Item 18
thick v *big*

DIMENSION COMPONENT

Item 21: 2 blocks and 2 squared rods dyed green,
10cm x 4cm x 1.3cm; 4.8cm x 4cm x 1.3cm;
10cm x 1.3cm x 1.3cm; 4.8cm x 1.3cm x 1.3cm.

Number card 3.75cm x 3.75cm

Item 21
long v *wide*

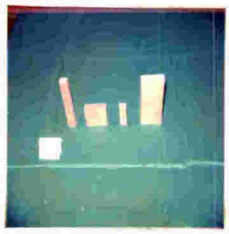
Item 22: 2 blocks and 2 squared rods dyed blue,
11cm x 4cm x 1.3cm; 11cm x 4cm x 1.3cm,
11cm x 1.3cm x 1.3cm; 4.8cm x 1.3cm x 1.3cm.

Number card 3.75cm x 3.75cm

Item 22
high v *long*

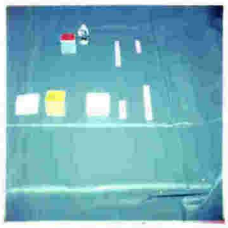
Item 23: 2 blocks and 2 squared rods dyed orange,
11cm x 4cm x 1.3cm; 11cm x 1.3cm x 1.3cm;
4.8cm x 4cm x 1.3cm; 4.8cm x 1.3cm x 1.3cm.

Number card 3.75cm x 3.75cm



Item 23
wide v *high*

ORIENTATION COMPONENT



Item 24 *tallest*
Item 25 *high* *deep*

Number card 3.75cm x 3.75cm

Item 26 *far away*
Item 27 *far* *long*

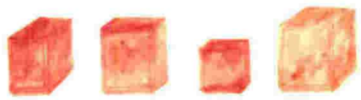
Number card 3.75cm x 3.75cm

PROPORTION COMPONENT

<u>Item 28</u>:

deep v *wide*

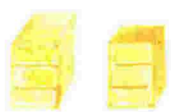
Picture 26cm x 13cm



<u>Item 29</u>:

deep v *long*

Picture 16cm x 13cm



IMPLICATION SERIES

POLAR IMPLICATION

Riki's Story

Item 30:

"big" v "little"

Which apple did Riki eat?

Number card 2.5cm x 2.5cm

Item 31:

"little" v "big"

How did Riki stop the orange juice coming out?

Number card 2.5cm x 2.5cm

Item 32:

"long" v "short"

Which ribbon did Riki tie round
the parcel?

Number card   3.5cm x 3.5cm

Item 33:

"short" v "long"

Which book did Riki put in
his bag?

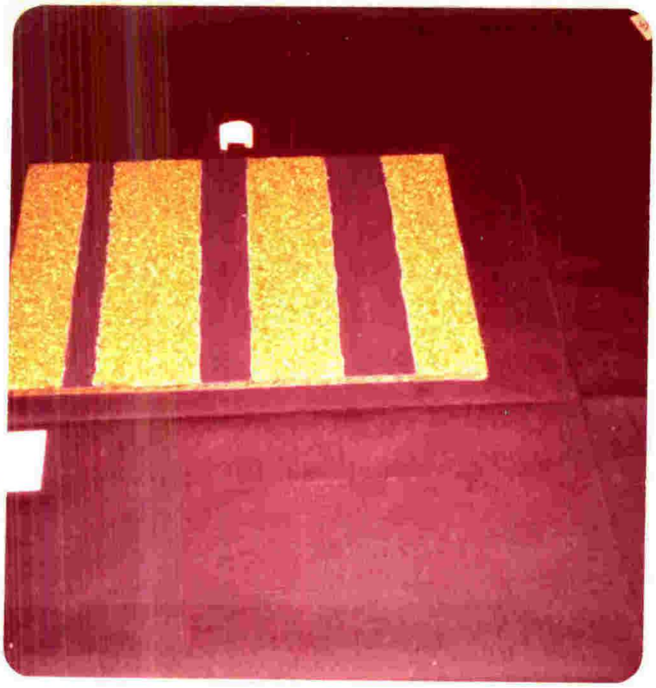
Number card   2.5cm x 2.5cm

Item 34:

"wide" v "narrow"

Which is the best road for the Landrover?

Number card   2.5cm x 2.5cm



Item 35:

"narrow" v "wide"

Which river does the bridge go over?

Number card   2.5cm x 2.5cm

Item 36:

"low" v "high"

Which person can walk through the gateway?

Number card 2.5cm x 2.5cm

Item 37:

"high" v "low"

Which person can see over the top of the wall?

Number card 2.5cm x 2.5cm

Item 38:

"shallow" v "deep"

Which is the best pool for the baby to sit in?

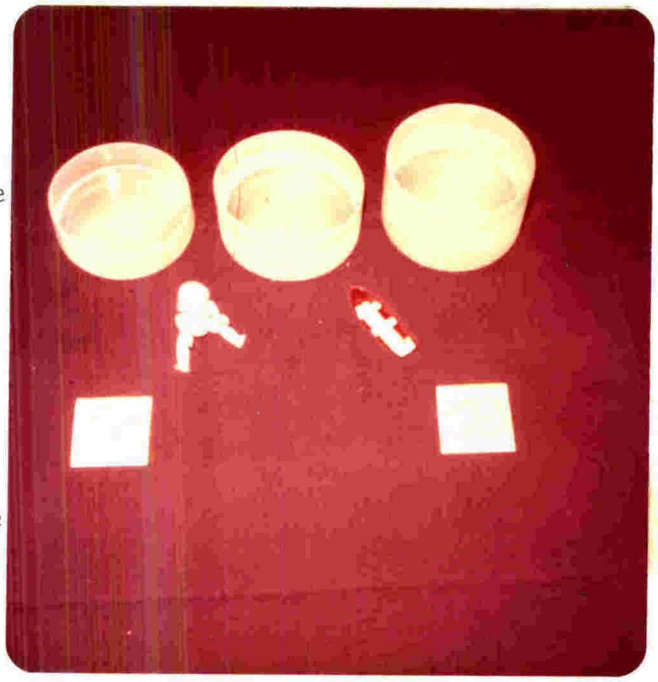
Number card 2.5cm x 2.5cm

Item 39:

"deep" v "shallow"

Which is the best pool for the boat to go in?

Number cards 2.5 cm x 2.5cm



Item 40:

"near" v "far"

Which sheep will get to the farmer first?

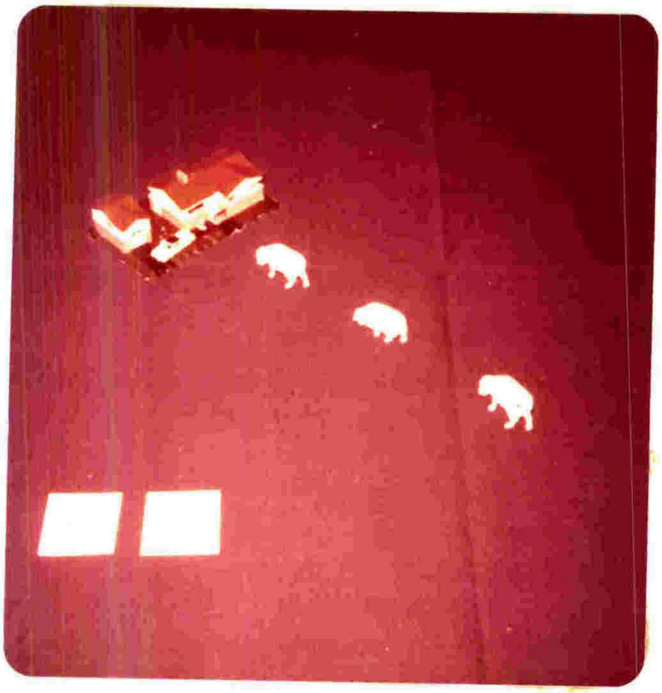
Number card 2.5cm x 2.5cm

Item 41:

"far" v "near"

Which sheep will get to the farmer last?

Number card 2.5cm x 2.5cm



Item 42:

"thick" v "thin"

Which is the best piece of wood to take home to make a big fire?

Number card 2.5cm x 2.5cm

Item 43:

"thin" v "thick"

Which is the best one for for breaking into little bits?

Number card 2.5cm x 2.5cm

NORMATIVITY IMPLICATION

Item 44:

Will this shirt do?

Number card   3.75cm x 3.75cm

Item 45:

Will this dress do?

Number card   3.75cm x 3.75cm

VOLUME IMPLICATION

The Tired Man

Item 46:

"thick" v "big"

Which mattress does the man want to sleep on?

Number card   2.5cm x 2.5cm

DIMENSION IMPLICATION

Making a Town

Item 47: "high" v "long" Which is the best house for the man?

Item 48: "wide" v "high" Which is the best house for the dog?

Item 49: "high" v "wide" Which ladder is the best one to get the boy's ball?

Item 50: "long" v "high" Show me how the people made the fence.

Number cards 2.5cm x 2.5cm

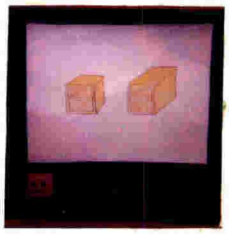
ORIENTATION IMPLICATION

Item 51: Give the doll a cup of tea

Number card 2.5cm x 2.5cm

Item 52: Give me the piece of wood

Number card 2.5cm x 2.5cm



Item 53: Which cupboard holds the most blocks?

Picture 18cm x 13cm

PROPORTION IMPLICATION

Item 54: Which is the best stone to roll along the ground?

Number card 3.75cm x 3.75cm

Item 55: Which is the best wheel for a car?

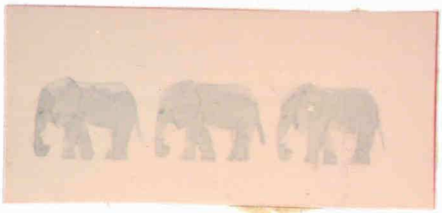
Number card 3.75cm x 3.75cm

ANOMALY SERIES

POLAR ANOMALY

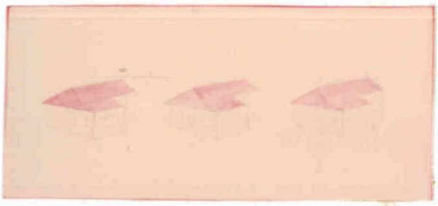
Item 56: low elephant

Picture 26cm x 13cm



Item 57: tall house

Picture 26cm x 13cm



Item 58: fat chair

Picture 26cm x 13cm

Item 59: narrow fly

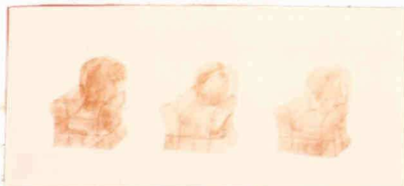
Picture 26cm x 13cm

Item 60: big pear

Picture 26cm x 13cm

Item 61: short chair

Picture 26cm x 13cm



Item 62: far man

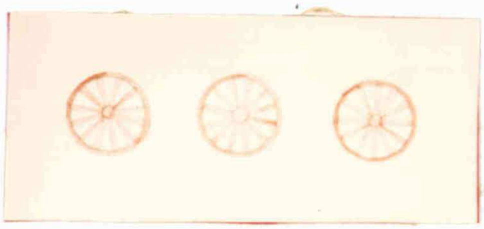
Picture 26cm x 13cm

Item 63: thick apple

Picture 26cm x 13cm

Item 64: shallow wheel

Picture 26cm x 13cm



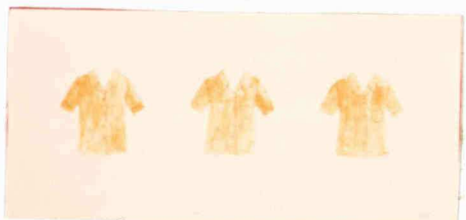
NORMATIVITY ANOMALY

Item 65: big enough

Picture 26cm x 13cm

Item 66: too big

Picture 26cm x 13cm



SPACE ANOMALY

Item 67: deep bowl

Picture 16cm x 12cm

VOLUME ANOMALY

Item 68: wide person

Picture 13cm x 13cm

Item 69: fat jug

Picture 16cm x 12cm

Item 70: fat cake

Picture 16cm x 12cm

ORIENTATION ANOMALY

Item 71: tall apple

Picture 26cm x 13cm

Item 72: tall man

Picture 26cm x 13cm

Item 73: high boy

Picture 26cm x 13cm

PROPORTION ANOMALY

Item 74: *long*
Number card = 2.5cm x 2.5cm

Item 75: *long*
Number card = 2.5cm x 2.5cm

Item 76: *long*
Number card = 2.5cm x 2.5cm

DIMENSION ANOMALY

Item 77: tall apple

Picture 13cm x 13cm

Item 78: long flower

Picture 13cm x 13cm

Item 79: far flower

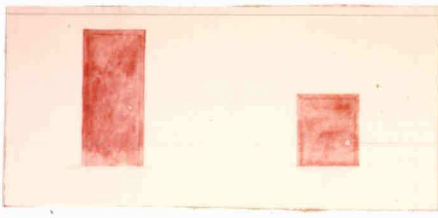
Picture 13cm x 13cm

FEATURE SERIES

PROPORTION FEATURE

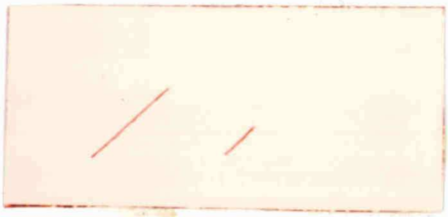
Item 82: best door

Picture 26cm x 13cm



Item 83: best fishing rod

Picture 26cm x 13cm



Item 84: best car

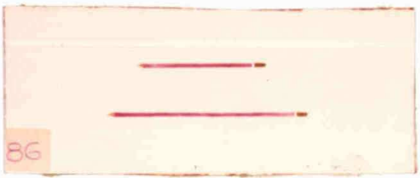
Picture 26cm x 13cm

Item 85: best table

Picture 26cm x 13cm

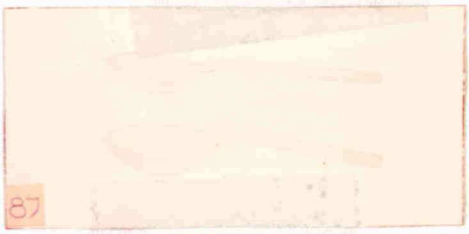
Item 85: best pencil

Picture 26cm x 13cm



Item 86: best spoon

Picture 26cm x 13cm

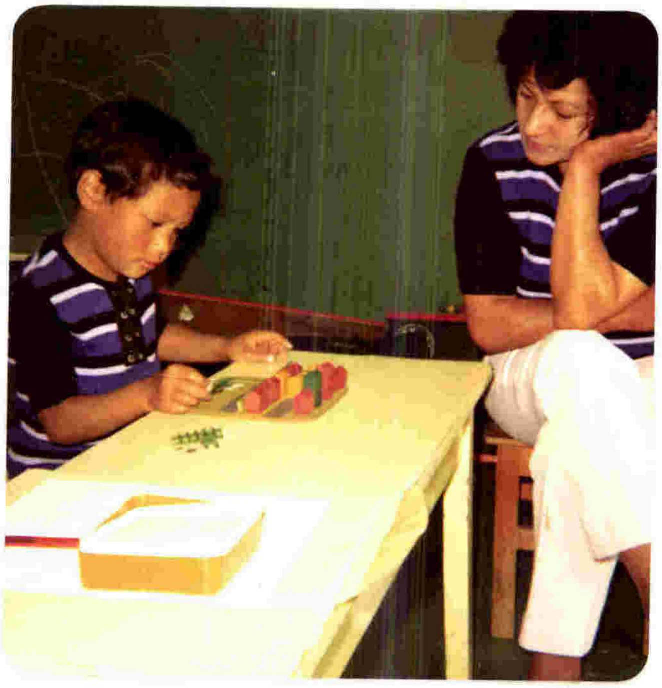


CHILDREN WORKING WITH SOME OF THE TEST ITEMS

Item 49:

Item 19:

Item 49:



Item 46:

APPENDIX D

CROSS TABULATIONS OF BACKGROUND AND PERFORMANCE VARIABLES

Cross tabulations of background and performance variables

Code	Recognised words
1	14-18 words
2	12, 13 words
3	10, 11 words
4	6-9 words

Code	Concepts
1	13, 14 concepts
2	11, 12 concepts
3	9, 10 concepts
4	6-8 concepts

Code	Elicited words
1	One
2	Two
3	Three
4	Four
5	Five
6	None
7	Omitted

Community type x performance variables

Code:	Community
1	Kin-based
2	Migrant

Community	Recognised words 1	2	3	4	
1	5	14	13	8	40
2	7	9	14	10	40
	12	23	27	18	80

$\chi^2 = 0.94$, 3 df, ns

Community	Concepts 1 + 2	3 + 4	
1	26	14	40
2	27	13	40
	53	27	80

$\chi^2 = 0.06$, 1 df, ns

Community	Elicited words 1+6+7	2+3+4+5	
1	30	10	40
2	33	7	40
	63	17	80

$\chi^2 = 0.74$, 1 df, ns

Age of child x performance variables

Code: Age of child

1 Youngest quarter of age group
2 Second quarter of age group
3 Third quarter of age group
4 Fourth quarter of age group

Age	Words 1 + 2	3 + 4	
1	6	14	20
2	10	10	20
3	9	11	20
4	10	10	20
	35	45	80

$\chi^2 = 2.04$, 3 df, ns

Age	Concepts 1 + 2	3 + 4	
1	9	11	20
2	10	10	20
3	17	3	20
4	17	3	20
	53	27	80

$\chi^2 = 12.62$, 3 df, $p.<.01$

Age	Elicited words 1+6+7	2+3+4+5	
1	10	10	20
2	16	4	20
3	5	15	20
4	6	14	20
	37	43	80

$\chi^2 = 15.03$, 3 df, $p.<.001$

Sex of child x performance variables

Code: Sex

1 Male
2 Female

Sex	Recognised words 1	2	3	4	
1	7	8	14	9	38
2	5	15	13	9	42
	12	23	27	18	80

$\chi^2 = 2.8$, 3 df, ns

Sex	Concepts 1 + 2	3 + 4	
1	25	13	38
2	28	14	42
	53	27	80

χ^2 = 0.016, 1 df, ns

Sex	Elicited words 1+6+7	2+3+4+5	
1	16	22	38
2	21	21	42
	37	43	80

χ^2 = 0.46, 1 df, ns

Length of time child has been at pre-school x performance variables

Code: Time at pre-school

1 Up to 6 months
2 6 months to 1 year
3 1 year to 18 months
4 18+ months

Time at pre-school	Recognised words 1 + 2	3 + 4	
1	5	13	18
2	9	10	19
3	4	7	11
4	17	15	32
	35	45	80

χ^2 = 3.3, 3 df, ns

Time at pre-school	Concepts 1 + 2	3 + 4	
1	8	10	18
2	12	7	19
3	9	2	11
4	24	8	32
	53	27	80

χ^2 = 6.19, 3 df, ns

Time at pre-school	Elicited words 1+6+7	2+3+4+5	
1	10	8	18
2	10	9	19
3	3	8	11
4	14	18	32
	37	43	80

χ^2 = 2.41, 3 df, ns

Language heard in the home x performance variables

Code: Language

1 English only
2 Maori spoken within the home on some occasions
3 Quite a lot of Maori heard in the home
4 Some other language heard in the home

Language	Recognised words 1 + 2	3 + 4	
1	21	25	46
2 + 4	8	12	20
3	6	8	14
	35	45	80

χ^2 = 0.01, 2 df, ns

Language	Concepts 1 + 2	3 + 4	
1	30	16	46
2 + 4	14	6	20
3	9	5	14
	53	27	80

χ^2 = 0.4, 2 df, ns

Language	Elicited words 1+6+7	2+3+4+5	
1	34	12	46
2 + 4	8	12	20
3	9	5	14
	51	29	80

χ^2 = 6.82, 2 df, $p.<.05$

Father's identity x performance variables

Code: Father's identity

1 Maori or other Polynesian
2 Maori and Pakeha
3 Pakeha
4 Pakeha (some Maori)

Father's identity	Recognised words 1 + 2	3 + 4	
1 + 2	10	20	30
3 + 4	25	24	49
	35	44	79

χ^2 = 2.4, 1 df, ns

Father's identity	Concepts 1 + 2	3 + 4	
1 + 2	20	11	31
3 + 4	33	15	48
	53	26	79

$\chi^2 = 0.14$, 1 df, ns

Father's identity	Elicited words 1+6+7	2+3+4+5	
1 + 2	16	15	31
3 + 4	20	28	48
	36	43	79

$\chi^2 = 0.8$, 1 df, ns

Mother's identity x performance variables

Code: Mother's identity

1 Maori or other Polynesian
2 Maori and Pakeha
3 Pakeha
4 Pakeha (some Maori)

Mother's identity	Words 1 + 2	3 + 4	
1 + 2	14	24	38
3 + 4	21	21	42
	35	45	80

$\chi^2 = .14$, 1 df, ns

Mother's identity	Concepts 1 + 2	3 + 4	
1 + 2	24	14	38
3 + 4	29	13	42
	53	27	80

$\chi^2 = 0.31$, 1 df, ns

Mother's identity	Elicited words 1+6+7	2+3+4+5	
1 + 2	19	19	38
3 + 4	18	24	42
	37	43	80

$\chi^2 = 0.39$, 1 df, ns

Descent x performance variables

Code: Descent

1 Maori or other Polynesian
2 Pakeha
3 Maori and Pakeha
4 Pakeha (some Maori)

Descent	Recognised words 1 + 2	3 + 4	
1 + 3 + 4	20	29	49
2	16	15	31
	36	44	80

$\chi^2 = 0.8$, 1 df, ns

Descent	Concepts 1 + 2	3 + 4	
1 + 3 + 4	30	19	49
2	23	8	31
	53	27	80

$\chi^2 = 1.5$, 1 df, ns

Descent	Elicited words 1+6+7	2+3+4+5	
1 + 3 + 4	24	25	49
2	13	18	31
	37	43	80

$\chi^2 = 0.33$, 1 df, ns

Mother's education x performance variables

Code: Mother's education

1 Primary only
2 Secondary, no qualifications
3 S.C. or U.E. or other qualification
4 Tertiary
5 Not known

Mother's education	Recognised words 1 + 2	Recognised words 3 + 4	
1 + 5	3	5	8
2	20	31	51
3 + 4	12	9	21
	35	45	80

χ^2 = 2.1, 1 df, ns (2 top categories combined)

Mother's education	Concepts 1 + 2	Concepts 3 + 4	
1 + 5	6	2	8
2	32	19	51
3 + 4	15	6	21
	53	27	80

χ^2 = 0.83, 2 df, ns

Mother's education	Elicited words 1+6+7	Elicited words 2+3+4+5	
1 + 5	5	3	8
2	23	28	51
3 + 4	9	12	21
	37	43	80

Father's education x performance variables

Code: Father's education

1 Primary only
2 Secondary, no qualifications
3 S.C. or U.E. or other qualification
4 Tertiary
5 Not known

Father's education	Recognised words 1 + 2	3 + 4	
1 + 5	6	13	19
2	20	26	46
3 + 4	10	5	15
	36	44	80

χ^2 = 4.3, 2 df, ns

Father's education	Concepts 1 + 2	3 + 4	
1 + 5	11	8	19
2	29	17	46
3 + 4	13	2	15
	53	27	80

χ^2 = 3.72, 2 df, ns

Father's education	Elicited words 1+6+7	2+3+4+5	
1 + 5	12	7	19
2	19	27	46
3 + 4	6	9	15
	37	43	80

χ^2 = 2.8, 2 df, ns

Father's occupation x performance variables

Code: Father's occupation

1 Level 1 on Elley-Irving socio-economic index
2 Level 2 on Elley-Irving socio-economic index
3 Level 3 on Elley-Irving socio-economic index
4 Level 4 on Elley-Irving socio-economic index
5 Level 5 on Elley-Irving socio-economic index
6 Level 6 on Elley-Irving socio-economic index
7 n.a. and not known

Father's occupation	Recognised words 1 + 2	3 + 4	
1 + 2 + 3	15	8	23
4 + 5	14	25	39
6 + 7	6	12	18
	35	45	80

$\chi^2 = 6.14$, 2 df, $p. < .05$

Father's occupation	Concepts 1 + 2	3 + 4	
1 + 2 + 3	18	5	23
4 + 5	22	17	39
6 + 7	13	5	18
	53	27	80

$\chi^2 = 2.9$, 2 df, ns

Father's occupation	Elicited words 1+6+7	2+3+4+5	
1 + 2 + 3	9	14	23
4 + 5	18	21	39
6 + 7	10	8	18
	37	43	80

$\chi^2 = 1.07$, 2 df, ns

Occupation of fathers of Maori children x words

Words	Occupations 1+2+3+4	5+6+7	
1 + 2	5	9	14
3 + 4	5	21	26
	10	30	40

χ^2 = 1.2, 1 df, ns

Occupation of fathers of Pakeha children x words

Words	1+2+3	4+5+6+7	
1 + 2	13	8	21
3 + 4	5	14	19
	18	22	40

χ^2 = 4.23, 1 df, p.<.05

Mother's former occupation x performance variables

Code: Mother's occupation

1 Level 3 on Vellekoop scale
2 Level 4 on Vellekoop scale
3 Level 5 on Vellekoop scale
4 Level 6 on Vellekoop scale
5 Level 7 on Vellekoop scale
6 No work or not known

Mother's occupation	Recognised words 1 + 2	3 + 4	
1 + 2	7	9	16
3 + 4	22	24	46
5 + 6	4	14	18
	35	45	80

χ^2 = 4.58, 2 df, ns

Mother's occupation	Concepts 1 + 2	3 + 4	
1 + 2	11	5	16
3 + 4	33	13	46
5 + 6	9	9	18
	53	27	80

χ^2 = 2.62, 2 df, ns

Mother's occupation	Elicited words 1+6+7	2+3+4+5	
1 + 2	7	9	16
3 + 4	19	27	46
5 + 6	11	7	18
	37	43	80

χ^2 = 1.45, 2 df, ns

Mother's age x performance variables

Code: Mother's age

1 20 - 29 years
2 30 - 39 years
3 40+ years

Mother's age	Recognised words 1 + 2	3 + 4	
1	12	22	30
2	20	15	35
3	3	8	11
	35	45	80

χ^2 = 5.29, 2 df, ns

Mother's age	Concepts 1 + 2	3 + 4	
1	23	11	34
2	23	12	35
3	7	4	11
	53	27	80

χ^2 = 0.12, 2 df, ns

Mother's age	Elicited words 1+6+7	2+3+4+5	
1	18	16	34
2	15	20	35
3	4	7	11
	37	43	80

χ^2 = 2.37, 2 df, ns

<u>Number of children in family x performance variables</u>

Code: <u>Number of Children</u>

1 One
2 Two
3 Three
4 More than three

Number of children	Recognised words 1 + 2	3 + 4	
1 + 2	11	16	27
3	8	12	20
4	16	17	33
	35	45	80

χ^2 = 0.4, 2 df, ns

Number of children	Concepts 1 + 2	3 + 4	
1 + 2	18	10	28
3	13	6	19
4	21	12	33
	52	28	80

χ^2 = 0.17, 2 df, ns

Number of children	Elicited words 1+6+7	2+3+4+5	
1 + 2	13	14	27
3	7	13	20
4	17	16	33
	33	43	80

χ^2 = 1.34, 2 df, ns

Child's place in family x performance variables

Code: Place in family

1 Oldest
2 Middle position
3 Youngest
4 Only child

Place in family	Recognised words 1 + 2	3 + 4	
1 + 4	8	21	29
2	11	6	17
3	16	18	34
	35	45	80

χ^2 = 6.39, 2 df, <.05

Place in family	Concepts 1 + 2	3 + 4	
1 + 4	17	12	29
2	14	3	17
3	22	12	34
	53	27	80

χ^2 = 2.73, 2 df, ns

Place in family	Elicited words 1+6+7	2+3+4+5	
1 + 4	15	14	29
2	9	8	17
3	13	21	34
	37	43	80

$\chi^2 = 1.55$, 2 df, ns

APPENDIX E

PRE-SCHOOL CENTRES WHICH HELPED WITH THE STUDY

PRE-SCHOOL CENTRES WHICH HELPED WITH THE STUDY

Miramar Central Kindergarten

Trentham Kindergarten

Doris Nicholson Kindergarten

Otaki Convent Family Pre-School

Arakura Playcentre

Glendale Playcentre

Randwick Playcentre

Otaki Playcentre

Masterton East Playcentre

Tinui Playcentre

Kaiti Playcentre

Elgin Playcentre

Mangapapa Playcentre

Manutuke Playcentre

Patutahi Playcentre

Te Karaka Playcentre

Tokomaru Bay Playcentre

Te Puia Playcentre

Ruatoria Playcentre

Tiki Tiki Playcentre

Rangitukia Playcentre

Te Araroa Playcentre

Ohau Playcentre

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