LEXICAL EXTENSION AND OVEREXTENSION BY BLIND CHILDREN

By

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to the required standard

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Abstract

This study investigated lexical extension and overextension by three blind children, ages 1;8, 2;1 and 2;5, who had vocabularies of at least 50 words but did not yet produce two-word utterances. Theories of semantic development take it for granted that vision provides the child with access to a great deal of the information necessary for the development of meaning, including much of the knowledge about size, shape, and movement of referents. Through vision, the child is able to form concepts on which word meaning is based, and extend the domain of application of words from original referents by recognizing other instances of that word. Despite this, surprisingly little research has focused on semantic development by blind children. Results of the few relevant studies indicate that blind children rarely extend or overextend their words, and attribute this inability to either (1) a lack of experience with other similar referents, or (2) an inability to form categories that underlie lexical extension and overextension.

The blind children were given objects to name during a play session. These objects were (1) new examples of an item the child already named, providing opportunity for the child to extend known words to proper, novel referents, or (2) members of a different nominal category, but differing from an item the child already named in one or two criterial features, thus providing opportunity for the child to overextend. Data on spontaneous extension and overextension was also collected through analysis of utterances produced during experimental sessions and reported in parental diaries. Results indicated that all children extended and overextended their words, both spontaneously and in experiments; visual impairment did not prevent the children from
recognizing other exemplars of a referent, or from applying words they knew to objects similar
to original referents but, on the basis of criterial features, members of other nominal categories.
Performance during two sorting tasks indicated that the children did not have impaired ability to
form categories—all three children displayed classificatory behaviour during the sorting activities.
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CHAPTER I: INTRODUCTION AND BACKGROUND

Visual information has been implicated as an important factor in semantic development. This study examines semantic development in children when visual information is unavailable to them. Specifically, it investigates lexical extension and overextension in three blind children with varying degrees of visual loss and abilities. Chapter I will present background information, including a brief description of current theories of semantic development and a review of previous research investigating semantic development in the blind. Chapter II will describe methodological procedures utilized in this investigation and Chapters III, IV and V will present results of the study. Chapter VI will discuss the results in reference to the theories of semantic development and previous investigation of semantic development in the blind described in Chapter I.

1.1 Theories of Semantic Development

Numerous theories of semantic development have been proposed to account for the child’s acquisition of a lexicon. This section will describe five such theories, each differing slightly in its account of how children acquire the meanings of words. Despite the differences, however, the chapter will argue that the theories are not incompatible with one another, but simply account for different subsets of data. All of the theories agree that when children initially acquire new words, their word meanings do not correspond to adult meanings. Children begin to use words with only a partial meaning but, over time, modify the lexical entry until it coincides with adult
usage. Each theory differs in its account of how the meaning modification proceeds, but all of these theories assume that vision plays a central role in the process. Because of this assumption, it follows that blind children should have difficulty acquiring word meaning. The review in this section will illustrate how semantic theoreticians depend heavily on visual perception to explain lexical (primarily common nominal) acquisition, and use vision-based examples to support their theories.

1.11 The semantic feature hypothesis

The semantic feature hypothesis—proposed by Clark (1973)—assumes that word meaning can be decomposed into criterial features, defined in terms of contrastive (+/-) pairs. For example, the meaning of the word crayon can be decomposed into the features [+colours, +wax, +writing utensil, +paper wrapper]. Similarly, the word before can be decomposed into [+time, +prior]. Initially, the child’s word meaning consists of only one or two of the semantic features comprising the adult meaning. With time, more features of meaning are added to the lexical entry until the child’s meaning matches the adult’s. The theory predicts a mismatch between the meaning of words for young children and the meaning of the same words for adults.

Support for the semantic feature hypothesis is provided by the phenomenon of "overextension," defined as the systematic use of a word by a child to name a broader range of referents than adult usage allows. Overextension is a phenomenon that is frequently exhibited by children under age 2 1/2 years while they are experiencing significant growth in vocabulary (Clark 1979).
Clark (1973) argues that overextension errors clearly support the semantic feature hypothesis. For example, a child who has newly acquired the word dog may use that word with only a partial meaning such as [+animal, +4-legged]. As a result, s/he may incorrectly refer to other creatures (e.g. cats, sheep, horses, pigs) as "dogs" because they too match the child's meaning of that word. Over time, the child adds more perceptual features to his/her meaning of dog until the meaning is narrowed down to correspond to the adult meaning. At this point, the child extends the word to only proper referents.

Clark proposes that the first semantic features of a word's meaning that the child acquires are derived from sensory perception--visual, tactile, gustatory and auditory information about the objects for the child is naming. Overextensions, then, are based on perceptual information about an object's movement, size, shape, texture, and/or sound. Table 1.1 illustrates overextensions based on each of these percepts.

Table 1.1 Overextensions based on sensory perceptions (adapted from Clark 1973)

<table>
<thead>
<tr>
<th>INFORMATION SOURCE</th>
<th>LEXICAL ITEM</th>
<th>OVEREXTENSION</th>
</tr>
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<tbody>
<tr>
<td>Movement</td>
<td>bird</td>
<td>any moving animal</td>
</tr>
<tr>
<td>Shape</td>
<td>ball</td>
<td>apple</td>
</tr>
<tr>
<td>Size</td>
<td>pin</td>
<td>caterpillars</td>
</tr>
<tr>
<td>Sound</td>
<td>railway</td>
<td>steaming coffee pot</td>
</tr>
<tr>
<td>Taste</td>
<td>candy</td>
<td>anything sweet</td>
</tr>
<tr>
<td>Texture</td>
<td>kiki (cat)</td>
<td>cotton</td>
</tr>
</tbody>
</table>
Clark found that the most common bases for overextension are the visually-based properties—size, shape and movement. In some cases, however, it is difficult for the analyst to determine the bases of overextension because features are often inseparable. Sound may accompany movement; size and shape are often inseparable. In these cases, the child may be basing overextensions on one or more perceptual features.

Clark's (1973) theory further proposes that the order of acquisition of features proceeds from the most general to the most specific features. In acquiring words such as before and after, for example, the child first learns the feature [+time] and may initially mix up the two words before acquiring the more specific features [+/- prior] that distinguish the two meanings (Clark 1983).

Clark’s (1973) semantic feature hypothesis has several problems. First, Clark was quite vague in her description of the nature of semantic features themselves. "What elements constitute semantic features?" (Clark 1983:817). Which features, and how many features from the often large number available, will a child chose to add to his/her lexical entry?

Second, Clark’s theory proposes that the order of acquisition of features proceeds from the most general to the most specific features. Evidence exists to the contrary. Clark (1972 [as cited in Clark 1983]) investigated the acquisition of opposites and found that children did not necessarily acquire the features in a top-down fashion.

Third, Clark’s theory predicts that the process of semantic development involves the addition of features to a particular lexical entry. This prediction does not account for underextension of words (i.e. the use of a word by a child to refer to a more limited range of referents than adult usage allows) or for overlaps in meaning. Both are phenomena that
characterize early word usage, but for semantic development to proceed in these cases, features
must be removed or reordered as well as added.

Fourth, Clark (1983) reports that investigators have found a gap between overextensions in
production and overextensions in comprehension. Overextensions in comprehension are
relatively rare compared to those made in production. Relying upon production data (as Clark
did for her theory) to determine what meaning words hold for children, "clearly underestimates
their knowledge of word meanings" (Clark 1983:819).

Fifth, Nelson & Lucariello (1985) argue that Clark incorrectly equates "perceptual
features" with "semantic features," although she explicitly states that it is important not to do this.
Semantic features are the components of word meaning but do not map directly onto perceptual
features in the real world. Semantic features are "abstractions based on common [perceptual]
dimensions" (Nelson & Lucariello 1985:73). Clark’s theory does not explain how the concrete
perceptual features are translated and stored as abstract semantic features (nor does any other
type of early semantic development).

Finally, Clark’s theory predicts that blind children will have difficulty acquiring word
meaning because they are unable to observe the visual similarities between objects. While shape
and movement do allow perception by hand or ear, the blind child’s access is highly constrained,
particularly with respect to large or distant objects.

1.12 Lexical contrast theory

Clark (1983) acknowledges the problems with the semantic feature hypothesis and, taking
into account the criticisms, proposes a revised theory called the lexical contrast theory. This
theory, very similar to Barrett's (1978) contrastive hypothesis, proposes that two basic principles guide children (and adults) in acquiring vocabulary: conventionality and contrast. The Principle of Conventionality is "the observation [by children or adults] of conventions governing language use within a speech community" (Clark 1983:830). The Principle of Contrast refers to "the requirement that new meanings contrast with those already known" (Clark, 1983:830).

Lexical acquisition, then, is motivated by the need to convey meanings that cannot be conveyed by entries already within the lexicon. Language learners are motivated to "fill the gaps" in their lexicon to convey new meanings. In order to "fill the gaps," language learners use a variety of techniques. Young children may overextend words or use general terms such as do or that to convey their meanings. Children (and adults) may coin new words or use vocabulary figuratively to convey specific meanings.

Alone, the lexical contrast theory is not a complete explanation of semantic development. It describes guiding principles that motivate the learner to acquire new vocabulary, but requires at least the following additional "ingredients" to be classified as a complete theory of semantic development: an explanation of how the child's initial word meaning is refined until it corresponds to adult usage, a discussion regarding the influence of social setting on language use and the influence of cognitive capacities upon lexical acquisition (Clark 1983). It does not solve the problem of how children initially match words and concepts; its explication and examples rely on the same visual percepts as the earlier semantic feature hypothesis.

1.13 Functional core concept model

A third theory of semantic development—the functional core concept model—is provided
by Nelson (1974). Like Clark (1973), Nelson proposes that children initially acquire only a partial word meaning and modify it with time until it corresponds to the adult model. Unlike Clark (1973), however, Nelson proposes that functional—not perceptual—information about an object is the primary basis from which word meaning is derived. When a child learns a new word, its meaning is initially associated with core functional characteristics of the referent. For example, the concept *bird* may consist of the functional core, "something that flies, sings." Optional, unnecessary, noncore characteristics associated with the context in which the child first matches the word to a concept (e.g. "pet store," "cage") and perceptual features (e.g. "wings," "black") are also part of the child's meaning--leading first to errors of underextension--but play secondary roles in the acquisition of word meaning. Perceptual information helps to identify instances of the same (or a similar) referent in new situations, but it is functional information that is the basis for word meaning.

As development proceeds, overextensions based on either functional or perceptual information may occur before the child has modified his/her word meaning to coincide with the adult meaning. With time, the child eliminates all parts of the concept that are not necessary for its definition, retaining core functional components and perceptual attributes that allow the child to recognize other instances of that word. It is important to note that this theory, like Clark's, is essentially a classical feature-based theory. Likewise, perception (primarily visual) of similar characteristics is used to explain recognition of new instances of a category.

Nelson's hypothesis is the result of a series of experiments investigating whether children aged 1;0-1;6 exhibit categorization skills (Nelson 1973a). Nelson's subjects successfully engaged in spontaneous sorting behaviour and their criteria for grouping objects tended to be functional
in nature, i.e. based on the child's understanding of how objects could be used. Based on the subjects' sorting behaviour, Nelson concluded that actions are the most salient property of objects to children and, therefore, form the basis of early concepts and organizational principles.

Further evidence for the functional core concept model is provided by Nelson (1973b). In this paper, Nelson reports results of a longitudinal study investigating acquisition of the first 50 words by 18 children, aged 1;0-2;0. The children's early words referred to objects that exhibited "salient properties of change" (1973b:i). Nelson concluded that actions of objects are more salient to children than are static perceptual features.

Nelson (1979) reports results from a study investigating attending behaviour in preverbal infants, aged 0;8-1;0. Subjects attended to and remembered "actions and reactions of things and dynamic properties over static perceptual qualities" (Nelson & Lucariello 1985:70). Results are interpreted to provide further support for the functional core concept model.

Finally, Ross et al. (1983) examined concept learning by children aged 1;8. These researchers found that "the child's ability to conceptualize [an] object and learn the name associated with it" increased with the number of different things the child could do with that object (p. 80). While other factors such as frequency of exposure and perceptual saliency were also important to concept formation, functional saliency appeared particularly influential. In interpreting these results--and results of Nelson (1979)--it is important to note that the basis for attending to, remembering or choosing to name objects and properties is not necessarily isomorphic with the basis for extending names. However, the functional saliency view, which focuses on the child's actions as opposed to (primarily visual) perceptual information, allows more positive predictions about a blind child's learning of concepts, categories and names.
1.14 The functional core hypothesis updated

In a recent article, Nelson & Lucariello (1985) propose a model of semantic development that elaborates the earlier functional core hypothesis. This theory was motivated by two facts: (1) previous theoretical explanations of word meaning were unable to account for all data available on early lexical development, and (2) previous theories did not adequately address the child's changing ability to mean over developmental time. The theory proposes that word meaning changes as the child's conceptual system (i.e. his/her representation of world and real knowledge) develops. Within the first year of life, the child is able to represent knowledge in terms of holistic events. This representation allows the child to begin to use language appropriately within those events, but there is not yet a direct mapping between words and discrete components of the event. As the child develops during the second year of life, cognitive processes "analyze these holistic representations into component parts" (Nelson & Lucariello 1985:77). As a result of this analysis, the child is able to map words directly onto the separate components.

Nelson & Lucariello's (1985) view predicts that word meanings change throughout conceptual development. In fact, they claim that it is not until the late preschool years that the child's lexicon is adultlike. Even this view is not comprehensive enough; it is clear that lexical entries and the semantic system can continue to change over the lifespan, particularly as they are influenced by literacy.

1.15 Prototype theories

Prototype theories of lexical acquisition provide a fifth interpretation of how children
acquire word meaning. The major difference between prototype theories and other theories discussed in this chapter is that prototype theories assume children build meaning "on the basis of central (prototypical) instances as opposed to building them up component by component" (Johnson et al., in press:21). Children learn new words in conjunction with the focal exemplar. Later, the child begins to extend that word to referents that share attributes with the original, prototypical referent. Overextensions are predicted, as the child may extend words to improper referents which share some, but not all attributes with the original referent. Other predicted errors are underextension and associative complexes (when new referents share one or more attributes with the original referent, but not with each other; Vygotsky [1962]).

1.16 Compatibility of the theories

The theories described above appear to represent different views on semantic development. They are not, however, completely incompatible with one another. First, each theory accounts for a different semantic learning problem--a different subset of data. For example, Nelson's research focused on children aged 1;0 - 1;6 and the bases on which objects were chosen for naming. Clark's (1973) semantic feature hypothesis focused on features of early words used by children, especially those that figure in overextensions, an error type that peaks between 1;6 and 2;6. The researchers were addressing different aspects and stages of semantic development.

In combination, the theories appear to provide a more complete description of semantic development. Bowerman (1978), for example, studied the overextensions made by her own two daughters from onset of the girls' first words until they were 2;1. Overextensions based on both
perceptual and functional similarity were noted. Bowerman (1978) concluded that "children need not adhere to a single classificational principle ... using only perceptual or only functional cues" (p. 283). Children are capable of recognizing different kinds of cues and "have a variety of methods of classification at their disposal" (p. 283).

Similarly, Bowerman (1978) argued that supporting a prototypical model of semantic development does not eliminate application of a featural analysis (perceptually or functionally based). It is possible that children choose a prototypical referent (as described by prototype theories) but still perform an analysis of the referent's attributes and extend the word's use on the basis of that analysis. Although prototypical "attributes" are much like "features," they are not criterial; an exemplar is neither included nor excluded from a category on the basis of presence or absence of a particular attribute.

Prototype and feature theories are fundamentally different in some aspects, particularly those involving cognitive structures, but these are not central to the points being made here. Theorists' discussions of "features" or "attributes" illustrate how vision is simply taken for granted in theory explication.

1.17 The importance of vision to theories of semantic development

While none of the theorists cited above would argue that vision is essential to development of word meaning, they do take it for granted that vision provides the child with access to a great deal of the information necessary for the development of meaning, including much of the knowledge about size, shape, and movement of referents. Through vision, the child is able to form concepts on which word meaning is based and extend the domain of application
of words from original referents by recognizing other instances of that word. Auditory and tactile information can also provide information about word meaning and, in fact, it is often difficult to determine the precise basis for overextension. For example, does a child recognize a new instances of car on the basis of visual perception of shape, or auditory perception of engine noises, or tactile perception of moving wheels? However, many examples used to support theories involve objects, seen at a distance, such as one child's use of moon to refer to round things, including postmarks (Clark 1973).

In addition, the words theorists use to explicate their theories assume that children have vision, such as when children are said to notice or recognize similarities in shape (although it does not follow that theorists would say that children must have specifically visual perception to form categories or learn names for things). The theories of lexical development predict, then, that a child without vision would have significant difficulty—certainly more than their sighted peers—acquiring word meaning.

1.2 Role of Vision in Language Development

The assumption that vision plays an important role in the development of word meaning is not at all a surprising one, since visual information has been deemed crucial for many facets of early language acquisition and general cognitive growth. Piagetian accounts of early cognitive development, for example, focus on the importance of motor exploration and visual attention to objects and events. The sensorimotor infant uses vision to attend to movements of objects, identify relationships between people and objects, and recognize how things are used. These early visual experiences form the basis of concept development (Piaget 1965).
Stern (1974, 1977) investigated early mother-child interactions. During these interactions it is common for mothers to elicit behaviour from their infants through imitation. A mother typically produces exaggerated facial expressions and vocalizations for her child to observe and imitate. The result is mother-child bonding as well as the development of basic interactive play skills and the emergence of discourse skills.

Clark & Clark’s (1977) account of how children understand and begin to use language depends upon the "here and now" principle. Essentially, Clark & Clark propose that the child learns language by immediately matching what s/he hears with what s/he sees in the environment. The child uses contextual information to figure out what the language means. Shatz (1974) provides an example of this type of language learning in her investigation of toddlers’ responses to directives. Shatz found that her subjects interpreted directives such as "can you shut the door?" by following the eye gaze and gestures that accompanied the verbal command, directing the child toward the door. Interpretation of eye gaze and gesture cues is dependent upon vision.

Adults, too, depend upon such visual cues to interpret child meanings. Gestures such as pointing and reaching, as well as eye gaze cues, frequently aid adults in interpreting what message a child attempting to convey.

Vision is not the only sense through which information about the environment can be obtained. Taste, smell, hearing and touch can also provide information. The question arises, then, whether these senses can compensate for the information typically provided by vision to facilitate language and cognitive development. Unfortunately, "neither concepts nor the words that label them...are directly discoverable" from auditory, olfactory or gustatory information (Landau & Gleitman 1985:14). The haptic system is the only remaining source of information, but research
has indicated that haptic exploration develops later than visual exploration in sighted infants, and
development of haptic exploration is delayed in blind children, in that they are not interested in
their environment in the same way that sighted children are.

Fraiberg (1977) studied gross motor development in ten congenitally blind infants from
birth to 2;0. The study indicated that blind children were delayed in self-initiated motor
behaviours when compared to norms for sighted infants. The delay was attributed to lack of
vision—the blind children were not provided with visual "incentives" to initiate movement
(Fraiberg 1977). These findings indicate that vision is important for development of cognition
and language, and confirms the prediction that blind children may have difficulty acquiring
language.

1.3 Semantic Development in Blind Children

Despite the fact that theories of semantic development take it for granted that vision
provides much of the information that forms the basis of word meaning, surprisingly little
research has focused on semantic development when visual information is unavailable to the
child. Do blind children have difficulty acquiring word meaning because they do not have access
to visual information about their world?

1.31 Verbalism

The earliest researchers investigating blind children’s semantic development focused on
verbalism—the use of terms for which firsthand (visual) experience in acquiring the meaning is
unavailable.
Cutsforth (1932) was one of the first to investigate verbalism in the blind. In his study, Cutsforth orally presented object names to 26 blind children, aged 9-20 years, and subjects provided a qualitative description of the named object. Results indicated that, despite the lack of visual information available to subjects, 54% of responses described visual attributes of the stimulus words. Some of these visually-based responses were erroneous. For example, one child described the moon as blue; another described ivory as red (Cutsforth 1932:87-88). Cutsforth concluded that, because blind children tended to use word for which they had no sensory experience, and because they tended to use such words erroneously, they were using these words in a meaningless manner. His findings significantly influenced educators of the blind, such that programs eliminated the use of words and concepts for which the blind children could not obtain direct sensory input.

Nolan (1960) replicated and extended Cutsforth’s (1932) study. Fifty-five children, aged 9-20 years, who were either totally blind or had light perception participated as subjects. Words were presented orally and subjects were required to provide a descriptor of the object named. Sixteen subjects received instructions designed to elicit "controlled association responses." These instructions biased the subjects against providing visual descriptors: "There are lots of things you can say about everything. A man is tall or short, fat or slim, kind or mean. What would you say about ___?" (p. 100). Thirty-nine subjects received instructions for "free association responses." These instructions encouraged subjects to provide any descriptor, visual or otherwise: "There are lots of things you can say about everything. Now, when I say a word I want you to say the first thing that pops into your head" (p. 101).
Nolan's results did not support Cutsforth's findings. Nolan found that his blind subjects responded with visual attributes significantly less frequently than Cutsforth's subjects. In addition, Nolan compared the responses by his subjects with responses of sighted children for four of his stimulus words (milk, moon, butter, lamp). Nolan discovered that at least for these four words, both sighted and blind children provided visually-based qualities in approximately the same proportions. Nolan concluded that "verbal unreality [was] not a significant problem" (p. 102).

Harley (1963) investigated the relationships of "verbalism among blind children to age, intelligence, experience and personal adjustment" (p. 11). Forty blind children, aged 6;1 to 14;3 were randomly selected as subjects from two residential schools for the blind in the United States. All subjects had been blind from birth and had no more than light perception in both eyes. Harley did not control for etiology of blindness or for handicaps in addition to blindness.

Intelligence quotients for subjects were obtained from school records, as qualified psychometrists had administered an intelligence test to each subject within two to three years prior to Harley's investigation. "Experience" and "verbalism" scores were obtained by having the subjects define 39 words and later identify objects representing the 39 words. "Personal adjustment" scores were obtained through the administration of the Tuddenham Reputation Test, which asks subjects to name the person (or people) described by the experimenter.

Harley's results indicated that older, more intelligent or more experienced children exhibited verbalism significantly less frequently than younger, less intelligent or less experienced subjects. Harley concluded that, while blind children did use words meaninglessly, the frequency of verbalism was highly affected by the child's age, IQ and world experiences.
Dokecki (1966) renewed the interest in verbalism and provided a logical argument based on word usage by normal sighted individuals that raises further doubt as to whether blind children do use words "meaninglessly." Dokecki (1966) argued that sighted people use many words that do not reflect sensory experiences, yet concepts of these words are seldom viewed as "meaningless." Meaning for these words is acquired from linguistic experience itself. "While meaning does indeed depend on context, the sensory context is not the only possible one ... language itself is also important in the creation of meaning" (Dokecki 1966:526-527).

DeMott (1972) provided further evidence that "meaning" of visually-based concepts was not significantly different for blind or visually impaired people. DeMott (1972) presented 30 objects to a total of 143 subjects who were totally blind (N=41), severely visually impaired (N=41), or fully sighted (N=61), between the ages of 6 and 20 years. Subjects were required to define the objects and, later, to identify each object upon presentation of the same series of items. DeMott found that, while visually impaired and blind subjects used visual terms, they did not use words meaninglessly; meaning for words they could not experience with their senses was acquired "from within the language" (DeMott 1972:8).

More recently, Anderson & Olson (1981) revived the interest in verbalism among congenitally blind by investigating "blind children's understanding of common objects and the words used to describe those objects" (p. 165). Ten congenitally, totally blind and ten sighted children with normal IQs, between the ages of 3;0 - 9;0, participated in the study. Each child was interviewed and asked to define objects. Ten objects were "more tangible" (i.e. those that could be completely encompassed by the hand) and ten objects were "less tangible" (i.e. those that could not be held completely in one hand). The researchers assumed that the descriptors
used to define each item would reflect the subjects’ "mental representation" or meaning of the object. Results revealed that, while blind subjects tended to make fewer references to colour and perceptual descriptors, the difference between blind and sighted pairs at each age interval was not statistically significant. These results indicated that word meaning was equivalent in blind and sighted children.

1.32 Rate of semantic development

In addition to verbalism, researchers have investigated the rate of early vocabulary development by blind children. Maxfield & Fjeld (1942 [cited in Warren 1984]) used the Vineland Social Maturity Scale to compare the ages at which blind and sighted children learn words. The researchers determined that their blind subjects scored slightly better than sighted subjects on one item on this scale that relates to early vocabulary development ("uses names of familiar objects"). On the basis of this single item, the researchers concluded that blind children begin using words at the same age or even sooner than sighted children.

Wilson & Halverson (1947 [cited in Warren 1984]) investigated the attainment of 10 and 20 word vocabulary levels by blind and sighted children and found that both groups reached the levels at approximately the same time.

Burlingham (1961 [cited in Warren 1984]) studied lexical acquisition in blind infants aged 1;4 - 1;6. At this age, some normal sighted children are demonstrating a significant growth in vocabulary, but Burlingham found that his blind subjects were very slow in acquiring words at this age. In fact, his subjects often showed signs of regression. Burlingham (1961, 1965 [cited in Warren 1984]) posited that blind children did not acquire vocabulary as quickly as sighted
peers because the auditory and tactile experiences upon which blind children relied were not as efficient in facilitating lexical development as visual feedback is to sighted children.

Landau (1982) investigated various aspects of language learning in three blind children, and found that onset of first words was late for two of the subjects, but still fell within the normal range relative to sighted peers. Landau (1982) attributed the late onset to the fact that these children were premature; onset of first words was also late for sighted premature controls. The third child, who was not premature, began to produce words well within the normal time range.

The majority of the studies reviewed above indicate that blind children do not appear to differ grossly from sighted children in rate of early word acquisition. Lexical milestones are attained within the normal time period, perhaps at the lower end of that range. A question that arises is, do blind children use these words in a way that is qualitatively different from sighted children? Researchers have attempted to begin answering this question by investigating lexical extension and overextension.

1.33 Lexical extension and overextension

Bigelow (1987) studied early lexical development in three blind children from the onset of first words until a 50 word vocabulary had been acquired. Relying on parental diaries, Bigelow found that her subjects tended not to extend words to refer to functionally or perceptually similar items. In fact, her subjects showed evidence of significantly constrained word meaning. One subject, for example, used the word bunny to refer to only a specific toy rabbit (p. 54). A second subject used the word mitt to refer only to his brother’s baseball glove.
(cited in Mulford 1988:311). No instances of overextension were noted. Bigelow (1987) concluded that failure to extend word meaning by her subjects reflected a lack of experience with other similar items. Bigelow believed that if the children were presented with other forms of objects for which they knew the name, they would successfully extend their word to the new referent. In evaluating Bigelow’s study, it is important to note that even sighted children do not often overextend words during the first 50-word vocabulary period. Overextension is most frequent between ages 1;6 and 2;6, after the 50-word milestone (Clark 1973).

Dunlea (1982) and Andersen et al. (1984) report data on the acquisition of early words in six children with varying degrees of visual acuity. One subject was totally blind, one had minimal light perception, two had some usable vision (i.e. shadow or shape perception), and two were fully sighted. Through the use of monthly observations, parent diaries, parent interviews and individualized experiments, these authors found that the blind subjects were capable of extending and overextending words, but with significantly less frequency than the sighted children. The blind subjects in these studies overgeneralized only 8 to 13% of their first 100 words, while sighted subjects overgeneralized 41% of their early words. In addition, the blind subjects were unusually restricted in their ability to properly extend word meaning beyond the original context in which a word was acquired. Only 50% of blind subjects’ first 100 words were extended, while sighted subjects successfully extended 95% of their early words (Dunlea 1982).

In order to investigate possible reasons why the blind children did not extend or overextend words as frequently as her sighted subjects, Dunlea (1982) conducted individualized experiments with each blind child. She presented subjects with novel items to name, thereby
providing the opportunity for the children to extend or overextend words they knew. Unfortunately, the children refused both to name the novel objects and to locate certain items upon request. Dunlea could not conclude whether this refusal indicated a lack of cooperativeness, or the tendency simply not to extend or overextend.

Dunlea (1982) also noted that the children did not display any spontaneous sorting behaviour. This fact was significant because both word extension and overextension require the child to use the basic classification strategies that are exhibited during sorting behaviours (Rescorla 1981). Dunlea (1982) concluded that the lack of spontaneous sorting behaviour and failure of individual experiments to elicit the behaviour suggested underlying constraints on category formation. The absence of visual information, then, "has a detrimental effect on category formation, a cognitive difference that leads to a language difference, since categorization schemata are thought to underlie lexical extension" (Andersen et al. 1984:655).

Landau (1982) studied early lexical acquisition in three blind children and provided some very limited evidence for overextension by blind children. When her subject Kelly was given a pumpkin, Kelly replied "oh, a ball" (Landau & Gleitman 1985:32). Landau & Gleitman (1985) interpret this to indicate that blind children do overgeneralize words, but one should expect fewer generalizations from blind children than sighted simply because the blind child is prevented from observing visual similarities between objects. In addition, many overextensions may "escape the notice of sighted observers, or be interpreted as bizarre, just because the sighted observer's salient organization of properties is different from that of the blind" (Landau & Gleitman 1985:32).

Urwin (1984) reported a longitudinal study investigating language development in three
blind children. Urwin noted that, during the early stages of lexical acquisition, her subjects did not overextend as frequently as sighted children do. In later stages of lexical development, however the children did extend early acquired words into new contexts. Urwin's study did not focus on this topic, and she was not explicit about what she meant by "early" and "late," nor did she provide examples of overextensions.

Finally, Johnson (in progress) has noted from her work with identical twins, one of whom is blind, that her blind subject does generalize and overgeneralize words in spontaneous speech and in experiments. Because he has a sighted twin, his linguistic environment is more like that of a sighted child. This is a significant point because research has indicated that speech of parents addressing a blind child differs from that of parents addressing a sighted child. Kekelis & Andersen (1984) analyzed the language input to six children with varying degrees of visual loss over a six month period. These were the same children studied by Dunlea (1982)—two were fully sighted, two had usable vision, one had light perception and one was totally blind. The researchers found that speech to the blind children tended to consist largely of labels or requests for labels. Speech to the sighted children contained much more detailed descriptions of the environment and its stimuli. Johnson (in progress) suggests that perhaps the lack of extension and overextension observed in other blind children reflects restricted linguistic environments.

Results of the studies reported above are inconclusive. Is semantic development hindered by lack of vision in blind children? Do blind children extend the names they know beyond a limited domain and do they overgeneralize words as they are learning language? If blind children are constrained in their extension and overextension of words, is it due to (1) the child's lack of opportunity to notice and name other instances of the same category, or (2) a detrimental
effect of the visual impairment on the formation of categories that underlie word meanings? Further research is warranted. Results would have important consequences for (1) theories of lexical acquisition, all of which centrally assume vision as the primary basis for word-concept mapping and, (2) counselling of families with blind children and of educators working with blind children.

1.4 Research Questions

This study was designed to investigate two aspects of lexical acquisition by blind children: extension and overextension. Specifically, the following questions were addressed:

1. Do blind children extend names of objects to objects within the same nominal category?

2. Do blind children overextend names of objects to objects that are similar but not in the same nominal category?

3. If blind children do extend and overextend names, on what bases do they do so?

4. How are categorization abilities related to the child’s abilities to extend and overextend words?

5. How does linguistic environment appear to be related to semantic development by the blind child?
This chapter will describe the procedures used to investigate lexical extension and overextension by one congenitally blind child—Stephen. Three children participated in the study, but only Stephen fulfilled all criteria for subject selection and was, therefore, studied more thoroughly than the other two subjects. Data from the additional two subjects—Margaret and Danny—is presented in chapters IV and V; changes made to the method for these subjects is described in those chapters. The rationales for including Margaret and Danny in the study are also included in chapters IV and V. For reasons of confidentiality, the children are referred to by pseudonyms.

2.1 Subject Selection Criteria

The following criteria for subject selection were established for this investigation:

1. totally blind or minimal light perception only
2. congenitally blind or blind before age 6 months
3. no other known physical, cognitive, or emotional handicaps
4. monolingual home environment
5. single-word to two-word combinatory stage of language acquisition

The criteria were developed on the basis of the following rationale:

2.11 Totally blind or minimal light perception only

As discussed in Chapter I, visual input plays a significant role in language development. In order to study semantic development in the absence of vision, ideal subjects would be children
who were totally blind. Children legally classified as blind but with functional visual abilities were not considered suitable since it is possible that even colour or shape perception may provide the child with visual information about the environment that may facilitate semantic development. Minimal light perception only was also included as part of the criteria because the actual incidence of total blindness is extremely rare (Jan, Freeman & Scott 1977). Limiting subject selection to totally blind only would have made location of a suitable subject for this study extremely difficult. Light perception allows the child only to react to very strong lighting and is unlikely to provide any information about the environment that could facilitate language development.

2.12 Congenitally blind or blind prior to age 6 months

This criterion was selected to eliminate subjects who may have had the benefit of visual input at the onset of language acquisition. The criterion allowed for the inclusion of subjects blinded during the first 6 months (prematurity, infections) because congenital blindness is actually fairly rare (Jan, Freeman & Scott 1977).

2.13 No other known physical, neurological or emotional handicaps

The purpose of this study was to investigate the effects of lack of vision on semantic development. As a result, children with physical, neurological, or emotional handicaps in addition to blindness were excluded so that results could be attributed directly to the visual impairment and not to other factors.
2.14 Monolingual home environment

Bilingualism—or multilingualism—was considered to be a potential complicating factor for semantic development. The task of learning more than one language simultaneously is more complex, and the developmental timetable may be extended (McLaughlin 1984). Because the purpose of the study was to investigate early word meaning, only children who were monolingual English speakers were considered appropriate for this study.

2.15 Single-word to two-word combinatory stage

The primary purpose of this study was to determine whether blind children extend and overextend words during early semantic development. In normal, sighted children, the phenomenon of overextension is most evident during the single-word stage of language acquisition—particularly at the time when the child experiences a significant growth in vocabulary (Clark 1979). As the child begins to combine words, and once his vocabulary is quite large, overextension tends to be less visible and the child begins to extend word use to proper referents only. It was assumed that, if blind children did extend and overextend their words, they would do so at the same point in language development as sighted children do. Because of this assumption, blind subjects with at least a 50-word vocabulary who were speaking mainly in single words were selected as subjects. Blind children who were speaking mainly in word combinations—beyond the period when overextension is most prominent—were excluded from the study.
2.2 Locating Subjects

Potential subjects for this study were located through the Visually Impaired Programme at British Columbia's Children's Hospital. Blind children living throughout the entire province of B.C. are registered with this programme and receive regular team assessments throughout childhood. Each child receives a complete evaluation including the following:

1. psychological evaluation
2. neurological examination
3. speech-language assessment
4. auditory testing
5. physiotherapy assessment
6. occupational therapy evaluation

Hospital records of these evaluations were used as a basis for determining whether a child was a potential subject or not.

The families of four potential subjects were contacted to participate in this study. All families expressed interest in participating. One of the four children fulfilled all criteria for selection and was the focus of this study. Two additional children were also included in the study although they did not meet all criteria for subject selection. The rationale for including these children is included in Chapters IV and V with their results. A fourth child was not at all suitable for the study and was not visited at all.

2.3 Subject Profile--Stephen

At the time of this investigation, Stephen was a 20-month-old (1;8) child, the firstborn of middle class parents. Stephen was totally blind from Leber's Congenital Amaurosis, a genetic disorder which affects the retina.
Stephen’s mother reported that birth and pregnancy histories were essentially unremarkable. There were no complications during pregnancy. Birth weight was 8 lbs. 7 oz. The only indication of a visual problem was the presence of nystagmus at birth. Leber’s Syndrome was diagnosed when Stephen was 6 months old.

Stephen’s family are extremely loving and supportive of him. Stephen’s mother is a registered nurse, but has remained at home for the majority of the time since the birth of her son. Stephen’s father is a real estate appraiser. Stephen has one younger brother, Patrick, who was 2 months of age at the beginning of this research. He too has Leber’s Amaurosis and is totally blind.

Since the diagnosis of Leber’s Syndrome, Stephen’s family has received regular visits from CNIB workers, an Infant Development worker and a Visually Impaired Team worker. These workers provide family support and counselling and monitor Stephen’s development. Stephen was evaluated by the Visually Impaired Program at the Children’s Hospital three months before this investigation began. Audiological testing indicated normal hearing bilaterally. Neurological, psychological, and physiotherapy evaluations indicated that Stephen’s development was well within normal limits.

Most of Stephen’s time is spent at home with his mother and new baby brother. He spends one morning each week with a babysitter. He has very little opportunity to interact with sighted peers.

Stephen is an extremely amiable child. He is socially responsive and inviting, with a sense of humour that makes him a joy to be with. At the time of the observation he enjoyed playing with real rather than toy objects, preferring to "talk" on the family phone or to play with
his father's tools than to play with typical toys.

2.4 Procedures

Stephen was visited in his home on six occasions over a two-month period. Each session lasted approximately 1 1/2 - 2 hours and was audio and video taped in its entirety using the following high quality recording equipment:

1. Marantz PMD430 audiorecorder
3. Panasonic WV-3240 videorecorder

Below is a description of procedures for data collection during each visit.

2.41 Productive vocabulary

To obtain an estimate of words that Stephen used productively, parents completed The MacArthur Communicative Development Inventory - Infants (1989). This inventory consists of a set of checklists and interview questions designed to assess aspects of early language development, including a word list that helps parents determine which words are productive in the child’s vocabulary. A list of Stephen’s productive nouns was required for designing experiments conducted with Stephen to elicit extension and overextension of nominals.

Two versions of this inventory exist--an Infant version designed for Children 0;8 - 1;4 and a Toddler version designed for children 1;4 - 2;6. Although Stephen’s age (1;8) warranted completion of the Toddler version, the Infant version was administered. This decision was based on three reasons. First, the vocabulary checklist in the Infant version is much shorter than in the Toddler version and can be completed much more quickly by parents. Second, the purpose of
administering the Communicative Inventory was to obtain an estimate of nouns that were productive in Stephen's vocabulary so that individualized experiments designed to elicit extension and overextension of these words could be designed. Many of the additional words included in the Toddler version are function words (e.g. articles, conjunctions, auxiliary verbs) and do not provide any additional information required for this study. Third, results of earlier work (Landau & Gleitman 1985) led us to predict that blind children's vocabularies would be near the lower boundary of the normal range for a given age. Thus, the shorter vocabulary checklist from the Infant version of the inventory was administered.

The MacArthur Communicative Development Inventory (1989) resulted from many years work by Elizabeth Bates and colleagues to develop a valid parent report instrument that could be used to assess various aspects of language development (see Snyder et al. 1981; Bretherton et al. 1983; Bates et al. 1988).

There tends to be dispute regarding the use of parent report for the study of language development. Lack of training and parental pride can produce a significant bias, resulting in an overestimation of child language abilities. However, it can be argued that parent report is a viable measurement instrument. First, parents have far more experience than other observers with their child and are qualified to produce a more comprehensive estimate of child language abilities. Second, other tools for obtaining an estimate of productive vocabulary are unavailable. Relevant to this study, vocabulary tests normed on blind children do not exist. Language sampling techniques are not suitable for obtaining a complete list of words used by a child.

Several studies have investigated the validity of the Communicative Index and have found it to be a sound estimate of child language abilities. Reznick (1982 [cited in Reznick &
Goldsmith 1989]) administered an earlier version of the Communicative Index to parents when their children were age 0;8, 1;2 and 1;8. Reznick "found a reasonable pattern of similarity between parents' assessment of child language and the child’s behaviour in a word comprehension procedure administered in the laboratory" (Reznick & Goldsmith 1989:92).

Bates et al. (1988) reported data from a longitudinal study of 27 children, aged 0;10 - 2;4, obtained through the use of an earlier version of the Communicative Inventory and language sampling. Information obtained from each source of data correlated at r=0.83.

Dale et al. (1989) reported norming information and validity co-efficients for an earlier version of the communicative inventory. These researchers combined information from three large samples of children whose parents had completed the communicative inventory when their children were aged 1;8. Significant correlations were found between estimates of language abilities obtained via the parent report instrument and estimates made by the Bayley Scales of Mental Development. Results also correlated significantly with PPVT scores at a later age (2;4).

Because of the results of the studies described above, The MacArthur Communicative Development Inventory was judged to be a valid tool for efficiently obtaining an accurate estimate of productive vocabulary in the children who participated in this study.

2.42 Naming experiment

An object-naming experiment was designed to provide Stephen with an opportunity to extend and overextend words that were part of his productive vocabulary. Five words were
chosen from Stephen’s productive, common nominal vocabulary. The words were: ball, telephone, book, keys, and spoons. The words were chosen according to two criteria. First, the nature of the perceptual features on which the child’s meaning may be based was considered. An attempt was made to select words representing a variety of features upon which meaning may potentially be based. For example, the meaning of ball may be based solely on shape, while the word telephone may be based on shape, function, and/or action. Second, words were chosen according to the number of words used by the child within the same nominal category. The purpose of this experiment was to investigate lexical extension and overextension. Lexical overextension is more likely to occur within nominal categories that are poorly represented in the child’s lexicon. Thus, words from poorly represented nominal categories were chosen over words from richly represented categories. Finally, the word ball was chosen as a target for Stephen as well as the other two subjects in this study to allow for comparability of data. This word also appears to be a common word overextended by sighted children.

For each of these words, six to eight other novel objects were selected and presented to Stephen during play to name. Three or four of these objects were different forms of the item which he already named, but differed in one or more noncriterial features. These items provided opportunity for Stephen to extend his words to proper, novel referents. The remaining objects were members of a different nominal category but differed from the original referent in one or two criterial features. These objects provided Stephen with opportunities to overextend his words. Table 2.1 provides examples of objects presented to Stephen to name for two words

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1The original design called for ten words, but pilot experimentation with Margaret showed that the required number of object presentations made the task too long for children this age.
selected from his productive vocabulary.

Table 2.1 Examples of objects presented to Stephen

<table>
<thead>
<tr>
<th>ORIGINAL REFERENT</th>
<th>ASSUMED MEANING BASES</th>
<th>NOVEL ITEMS PRESENTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ball</td>
<td>shape</td>
<td>large ball</td>
</tr>
<tr>
<td></td>
<td></td>
<td>golf ball</td>
</tr>
<tr>
<td></td>
<td></td>
<td>small ball</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapefruit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plastic egg</td>
</tr>
<tr>
<td>2. phone</td>
<td>function, shape</td>
<td>toy phone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>new phone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dial chip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>arch block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>receiver rattle</td>
</tr>
</tbody>
</table>

All objects presented were new to Stephen and were items for which he did not yet use the name. The original referent was also presented to Stephen during the play session to ensure that he did in fact name it accurately. Several other familiar items were also presented to him randomly during the session as distracters and to ensure that he remained on task.

All items that successfully elicited lexical extension or overextension were described in terms of characteristics. These characteristics were then compared to characteristics of the familiar objects in order to determine the potential bases for extension and overextension. It should be noted that (1) this analysis derives from a feature-based theory of semantic development, and (2) no attempt was made to balance the experimental items in terms of feature types.
2.43 Spontaneous extension and overextension

Spontaneous extension and overextension data was obtained from transcripts of the experimental sessions spent with Stephen, and from diary data recorded by Stephen's parents during the experimental period. Overextension frequency in this thesis was summarized in terms of lexical types, for comparability with other studies (e.g. Andersen et al. 1984), although token information was also provided in the tables. Token information was also interesting in that it indicated the communicative work being done by the child's vocabulary.

2.431 Transcript data

Sessions 1-4 and 6 were transcribed by the experimenter and instances of spontaneous overextensions identified. A word was considered to be overextended if it was used to refer to a broader range of referents than adult usage allows.

2.432 Diary data

Stephen's parents were given a diary and asked to record all spontaneous instances of overextension of words by Stephen noted during the experimental period. Instructions for recording this information were written on the first page of the diary and stated: "Please record all instances when Stephen uses a word in a way that an adult does not. Please describe the situation in which the word was used." Examples of hypothetical overextensions were included for three different nouns.

To determine if Stephen spontaneously extended words he used, his parents were asked to track Stephen's use of four words (ball, bottle, pig, spoons) over a two week period. These
words were part of Stephen’s productive vocabulary as determined by *The MacArthur Communicative Development Inventory* (1989) and were chosen on the basis of the following rationale:

**pig**: This word was a word newly acquired by Stephen and was spontaneously overextended by him during the first experimental session. This word was tracked to learn what referents Stephen would extend or overextend a newly acquired word to.

**ball, spoons**: These words were chosen as two of the target words for the naming experiment which elicited lexical extension and overextension. Stephen’s parents were asked to track his spontaneous use of the words because spontaneous data on the same words would allow direct comparison between spontaneous and elicited results.

**bottle**: This word was chosen because both Stephen and his new baby brother used bottles, providing ample opportunity for him to use the word daily.

### 2.44 Sorting experiments

Two sorting tasks were given to Stephen to determine whether he displayed classificatory behaviour. These tasks were included because some previous research on extension and overextension of words by blind children has been interpreted to indicate that blind children do not exhibit spontaneous or elicited sorting behaviour, indicating underlying constraints on category formation (Dunlea 1982). Since lexical extension and overextension require classificatory strategies (Rescorla 1981), previous research has been interpreted to show that the lack of extension and overextension by blind children was a direct consequence of poor classification skills (Dunlea 1982; Andersen et al. 1984). Two sorting tasks were included in this
study to further explore the relationships between classification skills and lexical extension and overextension, and between vision and category formation.

Sugarman (1983) has investigated classification skills in children aged 1-3 years. "Classification" is defined as the equivalent treatment of "two or more discrete events" and evidence for such behaviour "can be found in humans virtually from birth" (Sugarman 1983:4). Classificatory behaviour changes, however, with age.

This point is particularly important when interpreting classificatory behaviour of young children. Sugarman (1983) noted that children display their classification skills in different ways depending on their age. When given an array of four blocks and four balls, for example, a 1-year-old may display classification by picking out two balls and setting them together and leaving all the other items untouched. A 1-year-old may also display classification by picking up two of the blocks and banging them together. A 2-year-old, on the other hand, may group all the blocks into one pile and all the balls into another. He may also group the objects on the basis of more than one dimension, e.g. shape and colour.

Sugarman (1983) charted the development of classification skills across 1-3-year-old children. She found that there were four general phases of classification corresponding to increasing age. Sugarman's (1983) classification phases were used in this study to determine whether behaviour displayed by Stephen during sorting tasks was classificatory or not. Below is a description of each phase:

Preiterative: The preiterative phase of classification is typically displayed by children 1;0-1;6. These children tend to select a single item from an array and bring it in contact with other similar items within that array. For example, a preiterative child may select one block from an
array of blocks and balls and touch one or two other blocks with it. Typically, the preiterative child works with only a small number of objects presented and with only one class of objects. The child selects his/her class of objects on the basis of perceptual saliency or because it is novel to him/her.

Simple Iteration: The simple iteration phase of classification is typically displayed by children aged 1;6 - 2;0. Like the preiterative children, these children tend to work with a small number of objects presented in an array and also tend to select objects from only one class. The difference between simple iterative and preiterative behaviour is that simple iterative children will move two or more objects to a chosen location, rather than selecting only one item and moving it from item to item within the array. Two-class constructions (i.e. manipulation of both classes of objects also emerges during this stage.

Successive Iteration: The successive iteration phase of classification is typically displayed by children aged 2;0 - 2;6. These children tend to select a larger number of objects within the array and two-class constructions become common. When classifying two different classes of objects, however, these children tend to select one group of things that are the same, followed by selection of a second group of similar items.

Coordinated Iteration: The coordinated iteration phase of classification is typically displayed by children aged 2;6 - 3;0. These children use most items within the array and tend to shift between classes of objects, sorting two or more classes simultaneously.

2.441 Sorting food

Stephen was given a bowl containing grapes and raisins and allowed to eat the food items
with little involvement from the experimenter. Behaviour was observed for evidence of classification skills as described in 2.44.

2.442 Sorting blocks and balls

Stephen was given a shoebox with a hole cut in the centre of the lid and was encouraged to drop blocks into the hole one at a time. Once he reliably performed this behaviour on his own, the experimenter removed the blocks from inside the box and placed them back into a bag near the child. Several soft texturized balls were mixed into the bag of blocks without Stephen knowing. He was encouraged simply to continue dropping blocks into the box. Stephen’s behaviour was observed for evidence of classification skills as described in 2.44.

2.45 Mother-child interaction

During Visit #5, Stephen and his mother were videotaped during a free play session. The purpose of this session was to observe the mother’s interaction with Stephen and to analyze her language input to him. Previous research has indicated that linguistic input to blind children is not as rich as input to sighted children and this may be reflected in impaired semantic development, including the abilities to extend and overextend word (see Kekelis & Andersen, 1984; Johnson, in progress).

Several novel objects were also given to Stephen’s mother to introduce to Stephen during the session in order to observe how she approached teaching new word meanings to her son. She was encouraged to chose from these items the ones she felt Stephen would be interested in learning about. She was allowed to chose as many or as few of the objects as she wished,
depending on Stephen's co-operativeness and her own judgment. The experimenter chose potential objects according to the nature of the perceptual features represented by each item. Table 2.2 illustrates each item and its most salient perceptual features.

Table 2.2 Novel objects provided for mother to teach new word meanings

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>SALIENT CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. jar of cinnamon</td>
<td>taste, smell</td>
</tr>
<tr>
<td>2. bottle of perfume</td>
<td>smell, shape</td>
</tr>
<tr>
<td>3. pencils—1 sharp, 1 new</td>
<td>shape</td>
</tr>
<tr>
<td>4. varying textures of paper</td>
<td>texture</td>
</tr>
<tr>
<td>5. crayons</td>
<td>function, shape</td>
</tr>
<tr>
<td>6. stickers—scented and nonscented</td>
<td>texture, smell, function</td>
</tr>
<tr>
<td>7. extension plug</td>
<td>function</td>
</tr>
<tr>
<td>8. book with musical keyboard</td>
<td>sound, function</td>
</tr>
<tr>
<td>9. fridge magnets—made of felt</td>
<td>texture, function</td>
</tr>
<tr>
<td>10. large paper clip</td>
<td>function, shape</td>
</tr>
<tr>
<td>11. ice cube tray</td>
<td>function, shape</td>
</tr>
<tr>
<td>12. balloon</td>
<td>function, shape</td>
</tr>
<tr>
<td>13. stethoscope</td>
<td>function, shape</td>
</tr>
<tr>
<td>14. novel toy—apple with a small</td>
<td>shape, sound</td>
</tr>
<tr>
<td>small ball that winds around it</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER III: RESULTS--STEPHEN

3.1 Productive Vocabulary

Stephen's total productive vocabulary was estimated through administration of the Infant version of the MacArthur Communicative Development Inventory (1989). Total productive vocabulary was 481 words.

Dale et al. (1989:244) provided norming information for an earlier version of the Communicative Inventory, based on estimated productive vocabularies for three groups of children, at 1;8. Table 3.1 presents Dale et al.'s norms and, for comparison, Stephen's productive vocabulary size.

Table 3.1 Norming data for Communicative Index and Stephen's results
(adapted from Dale et al. 1989)

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>MEAN PRODUCTIVE VOCABULARY</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Term Infants (N=161)</td>
<td>168.5</td>
<td>127.6</td>
</tr>
<tr>
<td>Preterm Infants (N=21)</td>
<td>125.9</td>
<td>85.7</td>
</tr>
<tr>
<td>Precocious Infants (N=44)</td>
<td>427.3</td>
<td>97.9</td>
</tr>
<tr>
<td>Stephen</td>
<td>481.0</td>
<td></td>
</tr>
</tbody>
</table>
Stephen’s results compare most closely to the precocious sample. The precocious sample consisted of 44 children, all of whom showed "remarkable language facility" for their ages, such as "evidence for three-word sentences" (Dale et al. 1989:243). In addition, the precocious sample consisted predominantly of caucasian, first born children with parents of "moderately high education ... and income" (p. 243). Stephen was comparable to this group. He was caucasian and the first born son of educated, middle-class parents. In the assessment three months prior to this study, he was described as "bright," and language and cognitive development were estimated at average to above average levels for his age. Stephen’s mother reported that he produced numerous two-word utterances (e.g. close it; shoe on; take it; wind it), indicating that his language skills were advanced for his age, assuming that these were productive word combinations, rather than rote-learned phrases. Compared to the precocious sample, Stephen’s productive vocabulary (481 words) was slightly higher than the group mean (427.3 words), but within 1 standard deviation.

Fenson et al. (1990) have provided preliminary norms for The Macarthur Communicative Development Inventories (1989). Norms for productive vocabulary estimated by the Infant checklist are provided for children aged 0;8 - 1;4. Norms for productive vocabularies estimated through administration of the Toddler checklist are available for children aged 1;4 - 2;6. In order to compare Stephen’s productive vocabulary to that of his age peers, his estimated vocabulary results were transferred from the Infant to the Toddler checklist form. This manipulation was a valid one because Stephen’s parents were meticulous in completing the vocabulary checklist and spent considerable time recording additional words their son produced that were not included in the Infant version. Many of these additional words were included in the Toddler checklist.
form, so we concluded that transferring results would in no way affect the overall estimate of vocabulary size. By transferring results in this way, comparison of Stephen’s productive vocabulary to that of sighted age peers was possible.

Mean productive vocabulary for sighted children at 1;8 was estimated by Fenson et al. (1990) at approximately 175 words. Stephen’s productive vocabulary (481 words) was significantly larger than his sighted peer group average, larger than 90% of the norming sample.

Stephen’s language developed rapidly over the experimental period. At the beginning of the investigation, the majority of his utterances were single words, but at the end of the study, the majority of utterances were two-word combinations. For example, a total of 105 utterances were produced by Stephen during the first experimental session—100 single words and 5 phrases (which may have been learned as single units). A total of 145 utterances were produced in the sixth session (1 1/2 months later)—41 single words and 104 phrases. At the end of the investigation, he was also producing some three- four- and five-word combinations (e.g. Go see Patrick; Kim wind it please; Kim listen to it; they go in your mouth).

3.2 Naming Experiment

Thirty-seven objects were presented to Stephen to name during this experiment. Thirty-two of the objects were novel items and provided Stephen with the opportunity to extend and/or overextend words he already used productively. Five objects were familiar to him and provided a means for ensuring that those words were indeed productive.

A total of 48 responses were obtained from Stephen during this experiment. Thirty-seven responses corresponded to each of the 37 objects presented to Stephen to name. Eleven
additional responses were obtained in the following manners: five objects were presented a
second time to Stephen by sound alone; four objects were presented to Stephen a second time
for rechecking; two objects were labelled with two different names by Stephen as he explored
them.

3.21 Naming familiar objects

Five opportunities were provided for Stephen to name familiar objects. After exploring
each object manually, he correctly named all five objects, indicating that target words were
productive. The objects given to Stephen to name (and chosen as target words for extension and
overextension portions of this experiment) were: Stephen’s own telephone, his favourite ball, a
set of measuring spoons which he played with frequently, a familiar book, and his mother’s car
keys.

3.22 Extension

Twenty opportunities were provided for Stephen to extend words. Novel objects from the
same nominal category as target words were given to Stephen to explore (manually and/or
 auditorily) and to name. Responses were scored according to the following criteria:

Extension: A response was considered an extension if, after exploration, the novel
object was correctly named.

Overextension: A response was considered an overextension if, after exploration, the
novel object was incorrectly named.

Failure to Extend: A response was considered a failure to extend if, after exploration of an
object within the same nominal category as the target word, the subject failed to provide a name for it.
Failure to Overextend: A response was considered a failure to overextend if, after exploration of an object outside the nominal category of the target word, the subject failed to provide a name for it.

Noncompliant: Instances in which the subject refused to explore and name an object were coded as noncompliant.

Unintelligible: Instances were scored unintelligible if the subject explored an object and clearly attempted to name it, but produced an utterance unintelligible to the experimenter.

Of the 20 opportunities to extend words, Stephen extended eleven times, overextended two times, failed to extend seven times and was never noncompliant. Table 3.2 summarizes these results.

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>TOTAL NUMBER</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension</td>
<td>11</td>
<td>55.00</td>
</tr>
<tr>
<td>Overextension</td>
<td>2</td>
<td>10.00</td>
</tr>
<tr>
<td>Failure to Extend</td>
<td>7</td>
<td>35.00</td>
</tr>
<tr>
<td>Uncooperative</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 3.3 contains a list of objects given to Stephen to elicit extension, expected responses based on Stephen's current vocabulary, his responses verbatim, and coding of responses according to the scoring criteria above.
Table 3.3 Objects presented to elicit extension and Stephen’s responses

<table>
<thead>
<tr>
<th>OBJECT PRESENTED</th>
<th>EXPECTED RESPONSE</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. novel set of keys keys</td>
<td>keys</td>
<td>keys</td>
<td>extension</td>
</tr>
<tr>
<td>2. single plastic key key(s)</td>
<td>did not name</td>
<td>failure to extend</td>
<td></td>
</tr>
<tr>
<td>3. plastic keys to sound keys</td>
<td>keys</td>
<td>spoons</td>
<td>overextension</td>
</tr>
<tr>
<td></td>
<td>keys</td>
<td>spoons</td>
<td>overextension</td>
</tr>
<tr>
<td>4. single metal key key(s)</td>
<td>key</td>
<td>extension</td>
<td></td>
</tr>
<tr>
<td>5. own measuring spoons to sound spoons</td>
<td>spoons</td>
<td>spoons</td>
<td>extension</td>
</tr>
<tr>
<td>6. plastic measuring spoons to sound spoons</td>
<td>did not name</td>
<td>failure to extend</td>
<td></td>
</tr>
<tr>
<td></td>
<td>spoons</td>
<td>spoons</td>
<td>extension</td>
</tr>
<tr>
<td>7. wooden spoon</td>
<td>spoon</td>
<td>did not name</td>
<td>failure to extend</td>
</tr>
<tr>
<td>8. single spoon</td>
<td>spoon</td>
<td>did not name</td>
<td>failure to extend</td>
</tr>
<tr>
<td></td>
<td>did not name</td>
<td>failure to extend</td>
<td></td>
</tr>
<tr>
<td>9. several spoons spoons</td>
<td>spoons</td>
<td>spoons</td>
<td>extension</td>
</tr>
<tr>
<td>10. large plastic ball ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>11. golf ball</td>
<td>ball</td>
<td>did not name</td>
<td>failure to extend</td>
</tr>
<tr>
<td></td>
<td>did not name</td>
<td>failure to extend</td>
<td></td>
</tr>
<tr>
<td>12. medium plastic ball ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>15. new telephone phone</td>
<td>phone</td>
<td>phone</td>
<td>extension</td>
</tr>
<tr>
<td>16. toy telephone phone</td>
<td>phone</td>
<td>phone</td>
<td>extension</td>
</tr>
</tbody>
</table>
3.221 Bases for extension

To determine the featural bases on which Stephen extended words, a comparison was made between characteristics of the familiar and novel items to which extension applied. Table 3.4 illustrates the bases on which extension occurred. Refer to Appendix A for a list of features for all objects used in the naming experiment.

Table 3.4 Possible perceptual bases for lexical extension—Stephen

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL EXTENSION</th>
<th>BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. new set of keys</td>
<td>keys (to sound only)</td>
<td>sound</td>
</tr>
<tr>
<td>2. single metal key</td>
<td>key</td>
<td>shape, texture</td>
</tr>
<tr>
<td>3. plastic measuring spoons</td>
<td>spoons (to touch)</td>
<td>shape, quantity</td>
</tr>
<tr>
<td>4. several spoons</td>
<td>spoons</td>
<td>shape, quantity, sound</td>
</tr>
<tr>
<td>5. large ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>6. medium ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>7. new book</td>
<td>book</td>
<td>shape, texture, action</td>
</tr>
<tr>
<td>8. coil notebook</td>
<td>book</td>
<td>shape</td>
</tr>
<tr>
<td>9. novel phone</td>
<td>phone</td>
<td>shape</td>
</tr>
<tr>
<td>10. toy phone</td>
<td>phone</td>
<td>shape</td>
</tr>
</tbody>
</table>
Stephen made extensions on the basis of a variety of characteristics including shape, texture, sound and/or quantity. Shape and texture were the most frequent bases for extension, although this is in part due to the choice of objects presented to him to name. Objects did not represent all potential feature-bases equally; in fact, no opportunities were provided for Stephen to extend on the basis of taste or smell. Because of this, we can only describe the bases that Stephen did use and cannot make claims about the relative importance of one basis over another in his development of word meaning.

3.23 Overextension

A total of 23 opportunities were provided for Stephen to overextend words. Novel objects, similar to familiar objects but from different nominal categories, were given to Stephen to explore (manually and/or auditorily) and to name. Responses were scored as overextensions, extensions, failure to overextend, noncompliant or unintelligible as defined in 3.22. Table 3.5 contains a list of objects given to Stephen to elicit overextension, the expected responses based on Stephen’s current vocabulary, his responses verbatim, and codings of responses according to the criteria stated above.
Table 3.5 Objects presented to elicit overextension and Stephen’s responses.

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>EXPECTED RESPONSE</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. plum</td>
<td>ball</td>
<td>apple</td>
<td>overextension</td>
</tr>
<tr>
<td>2. grapefruit</td>
<td>ball</td>
<td>food</td>
<td>overextension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>orange</td>
<td>overextension</td>
</tr>
<tr>
<td>3. plastic egg which</td>
<td>ball</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>opens into 2 halves</td>
<td></td>
<td>santa*</td>
<td>overextension</td>
</tr>
<tr>
<td>4. magazine</td>
<td>book</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
<tr>
<td>5. t.v. guide</td>
<td>book</td>
<td>baby**</td>
<td>overextension</td>
</tr>
<tr>
<td>6. hard folder</td>
<td>book</td>
<td>book</td>
<td>overextension</td>
</tr>
<tr>
<td>7. soft folder</td>
<td>book</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
<tr>
<td>8. dial chip</td>
<td>phone</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td>9. phone receiver</td>
<td>phone</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td></td>
<td></td>
<td>phone</td>
<td>overextension</td>
</tr>
<tr>
<td>10. arch shaped</td>
<td>phone</td>
<td>phone</td>
<td>overextension</td>
</tr>
<tr>
<td>11. diaper pin</td>
<td>key</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td>12. bubble blower</td>
<td>key</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td>13. paper clips on a ring</td>
<td>keys</td>
<td>keys</td>
<td>overextension</td>
</tr>
<tr>
<td>to sound</td>
<td></td>
<td>keys</td>
<td>overextension</td>
</tr>
<tr>
<td>to touch</td>
<td></td>
<td>spoons</td>
<td>overextension</td>
</tr>
<tr>
<td>14. knitting bobbins on ring</td>
<td>keys</td>
<td>spoons</td>
<td>overextension</td>
</tr>
<tr>
<td>to sound</td>
<td></td>
<td>spoons</td>
<td>overextension</td>
</tr>
<tr>
<td>to touch</td>
<td></td>
<td>spoons</td>
<td>overextension</td>
</tr>
</tbody>
</table>
Table 3.5 continued

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15. ladle</td>
<td>spoon(s)</td>
<td>ball***</td>
<td>overextension</td>
</tr>
<tr>
<td></td>
<td>did not name</td>
<td>failure to overextend</td>
<td></td>
</tr>
<tr>
<td>16. serrated spoon</td>
<td>spoon(s)</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td>17. ice cream scoop</td>
<td>spoon</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
</tbody>
</table>

*Stephen had a set of nesting santas that were egg-shaped with a crease in the middle where the santa opened to reveal the one inside of it. The plastic egg was identical in shape and texture to these santas.

**Stephen’s favourite book was titled *The Baby*. This response was interpreted to refer to that specific book.

***Stephen was touching the scoop portion of the ladle when he named this item. He had been playing with a ball several minutes before exploring the ladle and this may have influenced his response. The ladle was presented a second time during a different session, but Stephen did not name the ladle at all.

Of the 23 opportunities provided to overextend words, Stephen overextended 14 times, failed to overextend seven times, and was noncompliant two times. Table 3.6 summarizes these results.
Table 3.6 Opportunities to overextend and Stephen's responses

<table>
<thead>
<tr>
<th>RESPONSES</th>
<th>TOTAL NUMBER</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overextensions</td>
<td>14</td>
<td>60.87</td>
</tr>
<tr>
<td>Failure to Overextend</td>
<td>7</td>
<td>30.43</td>
</tr>
<tr>
<td>Noncompliant</td>
<td>2</td>
<td>8.70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23</td>
<td>100.00</td>
</tr>
</tbody>
</table>

When the two instances of overextension from the extension task are added in, the number of opportunities rises to 25, with 16 (64%) overextensions.

3.231 Basis for overextension

In order to determine the basis on which Stephen overextended his words, a comparison was made between characteristics of the familiar and novel items to which overextension applied. Table 3.4 illustrates the basis on which overextension occurred. Appendix A contains a list of features for all familiar and novel objects presented to Stephen to name from which Table 4.7 was compiled.

Stephen made overextensions on the basis of several different features including shape, texture, size, sound, taste and smell. Shape, texture and sound appeared to be most frequent with respect to this set of items. This was partially due to the choice of objects--no attempt was made to balance the experimental items in terms of feature types.
Table 3.7 Possible perceptual bases for lexical overextension

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL OVEREXTENSION</th>
<th>BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. paperclips</td>
<td>keys (to sound only)</td>
<td>sound</td>
</tr>
<tr>
<td>2. paperclips</td>
<td>spoons (to touch)</td>
<td>quantity, sound</td>
</tr>
<tr>
<td>3. bobbins</td>
<td>spoons (to sound only)</td>
<td>sound</td>
</tr>
<tr>
<td>4. bobbins</td>
<td>spoons (to touch)</td>
<td>sound, quantity</td>
</tr>
<tr>
<td>5. ladle</td>
<td>ball (while touching scoop part)</td>
<td>shape</td>
</tr>
<tr>
<td>6. plum</td>
<td>apple</td>
<td>shape, taste and/or smell</td>
</tr>
<tr>
<td>7. grapefruit</td>
<td>food</td>
<td>taste and/or smell</td>
</tr>
<tr>
<td>8. grapefruit</td>
<td>orange</td>
<td>shape, texture, taste and/or smell</td>
</tr>
<tr>
<td>9. egg</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>10. egg</td>
<td>santa</td>
<td>shape, texture</td>
</tr>
<tr>
<td>11. t.v. guide</td>
<td>baby</td>
<td>size, shape, or action</td>
</tr>
<tr>
<td>12. hard folder</td>
<td>book</td>
<td>shape, texture, or action</td>
</tr>
<tr>
<td>13. rattle</td>
<td>phone</td>
<td>shape</td>
</tr>
<tr>
<td>14. arch block</td>
<td>phone</td>
<td>shape</td>
</tr>
</tbody>
</table>
3.3 Spontaneous Extension

To determine if Stephen spontaneously extended words he used, his parents were asked to track Stephen's use of four words (ball, bottle, pig, spoons) over a two-week period. Data indicated that Stephen did spontaneously extend his words to new referents. Table 3.8 illustrates Stephen's original and extended use of the words ball and spoons. Extension data is not available for the word bottle. Diary entries were made for the word, but Stephen used it only in reference to the original referent and did not display extension. Extension data is not available for the word pig. A diary entry was made for the word, but was an example of a spontaneous overextension and is reported in 3.42.

Table 3.8 Spontaneous extension data--Stephen

<table>
<thead>
<tr>
<th>WORD</th>
<th>ORIGINAL REFERENT</th>
<th>EXTENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ball</td>
<td>Stephen's small plastic ball that rattles</td>
<td>Stephen exclaimed beach ball as he as he played with it in the bathtub While his mother was working in the kitchen, Stephen found his musical ball and brought it to her and asked to play ball.</td>
</tr>
<tr>
<td>spoons</td>
<td>set of steel measuring spoons</td>
<td>After Stephen tried to open and reach into the cutlery drawer, his mother gave him a big and a little spoon for him to touch. Stephen pretended to eat with the spoons and said umm, spoons.</td>
</tr>
</tbody>
</table>
3.4 Spontaneous Overextension

Data on spontaneous overextension was obtained from two sources: transcripts of experimental sessions and diary data provided by Stephen’s parents. Results from each source of data are described separately below.

3.41 Spontaneous overextension--transcript data

Sessions 1-4 and 6 were transcribed by the experimenter and instances of spontaneous overextension were identified. Spontaneous overextension was defined as any instance when a word was used to refer to a broader range of referents than adult usage allows. These instances were, of course, in addition to any overextensions elicited during the naming experiment sessions which were the contexts in which this data was collected.

A language sample of 972 child utterances provided the basis for the spontaneous overextension analysis. A total of 23 spontaneous overextensions occurred during this sample - - thirteen overextensions of single nouns, nine overextensions of verb phrases (e.g. plug it in) and one overextension of a single verb. The 23 spontaneous overextensions represent seventeen word types -- ten nouns, six verb phrases, and one single verb. Table 3.9 illustrates the amount of spontaneous overextension obtained from the database.
Table 3.9 Spontaneous overextension--Stephen

<table>
<thead>
<tr>
<th></th>
<th>TOTAL NUMBER</th>
<th>TOTAL TYPES</th>
<th># OVERG</th>
<th>TYPES OVERG</th>
<th>% OVERGEN BY TYPE</th>
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</thead>
<tbody>
<tr>
<td>Single Verbs</td>
<td>121</td>
<td>33</td>
<td>1</td>
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<tr>
<td>Verb Phrases</td>
<td>186</td>
<td>79</td>
<td>9</td>
<td>6</td>
<td>7.59</td>
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<tr>
<td>Single Nouns</td>
<td>273</td>
<td>62</td>
<td>13</td>
<td>10</td>
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<tr>
<td>Noun Phrases</td>
<td>36</td>
<td>16</td>
<td>0</td>
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<td>20</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Adverbs</td>
<td>46</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Other Phrases</td>
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<td>4</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
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<td>2</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
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<td>8</td>
<td>4</td>
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<td>0.00</td>
</tr>
<tr>
<td>Routines</td>
<td>73</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Pronouns</td>
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<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Auxiliary</td>
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<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>77</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>792</td>
<td>23</td>
<td>17</td>
<td>--</td>
<td>7.20</td>
</tr>
</tbody>
</table>

Each utterance in the database was also coded as either spontaneous (produced spontaneously by the child) or imitative (a repetition of a word within one of the preceding three adult or child utterances). Table 3.10 illustrates the number of spontaneous versus imitated utterances within the language sample.

Overextensions were all spontaneously produced words by the child. Thus, all spontaneous overextensions can be compared to the spontaneous word productions to determine overall frequency of spontaneous overextension. This data is summarized in Table 3.11.
Table 3.10 Spontaneous versus imitated utterances

<table>
<thead>
<tr>
<th></th>
<th>TOTAL TYPES</th>
<th>SPONT TYPES</th>
<th>%</th>
<th>IMITATED TYPES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Verbs</td>
<td>33</td>
<td>21</td>
<td>63.6</td>
<td>12</td>
<td>36.4</td>
</tr>
<tr>
<td>Verb Phrases</td>
<td>79</td>
<td>54</td>
<td>68.4</td>
<td>25</td>
<td>31.6</td>
</tr>
<tr>
<td>Single Nouns</td>
<td>62</td>
<td>52</td>
<td>83.9</td>
<td>10</td>
<td>16.1</td>
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<tr>
<td>Noun Phrases</td>
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<td>11</td>
<td>68.8</td>
<td>5</td>
<td>31.2</td>
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<tr>
<td>Adjectives</td>
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<tr>
<td>Adverbs</td>
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<td>50.0</td>
<td>4</td>
<td>100.0</td>
</tr>
<tr>
<td>Yes/No</td>
<td>2</td>
<td>2</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other Phrases</td>
<td>4</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>100.0</td>
</tr>
<tr>
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<td>50.0</td>
<td>1</td>
<td>50.0</td>
</tr>
<tr>
<td>Prepositions</td>
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<td>3</td>
<td>75.0</td>
<td>1</td>
<td>25.0</td>
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<tr>
<td>Modal</td>
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<td>1</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Routines</td>
<td>18</td>
<td>12</td>
<td>66.7</td>
<td>6</td>
<td>33.3</td>
</tr>
<tr>
<td>Pronouns</td>
<td>2</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>77</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 3.11 Overall frequency of spontaneous overextension

<table>
<thead>
<tr>
<th></th>
<th>TOTAL TYPES</th>
<th>SPONTANEOUS TYPES</th>
<th>SPONTANEOUS OVEREXT.</th>
<th>% OVEREXT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>62</td>
<td>52</td>
<td>10</td>
<td>19.23</td>
</tr>
<tr>
<td>Single Verbs</td>
<td>33</td>
<td>21</td>
<td>1</td>
<td>4.76</td>
</tr>
<tr>
<td>Verb Phrases</td>
<td>79</td>
<td>54</td>
<td>6</td>
<td>11.11</td>
</tr>
</tbody>
</table>
3.42 Diary data

Stephen’s parents were asked to record all instances of overextension they noticed over a 1 1/2 month period. A total of 24 overextensions (23 types) were noted by parents. Table 3.12 summarizes the spontaneous overextensions by type. Appendix A contains a list of the spontaneous overextensions recorded by Stephen’s parents.

Table 3.12 Spontaneous overextensions by type

<table>
<thead>
<tr>
<th>Overextensions of Single Nouns</th>
<th>12</th>
<th>12</th>
<th>50.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overextensions of Single Verbs</td>
<td>1</td>
<td>1</td>
<td>4.17</td>
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<tr>
<td>Overextensions of Noun Phrases</td>
<td>3</td>
<td>3</td>
<td>12.50</td>
</tr>
<tr>
<td>Overextensions of Verb Phases</td>
<td>9</td>
<td>8</td>
<td>33.33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25</td>
<td>24</td>
<td>100.00</td>
</tr>
</tbody>
</table>

3.5 SORTING EXPERIMENTS

Two sorting tasks were given to Stephen to determine whether he displayed classificatory behaviour. Stephen’s behaviour during each of these tasks is described below.

3.51 Sorting food

Stephen was given a bowl containing grapes and raisins and encouraged simply to eat his
treat. Stephen's behaviour proceeded in the following manner:

1. Stephen put both hands into the bowl, touching both raisins and grapes simultaneously.

2. Stephen selected a grape and ate it.

3. Stephen selected a grape and ate it.

4. Stephen selected a grape and ate it.

5. Stephen selected a grape and ate it.

6. Stephen selected a grape, held it for a moment and placed it back in the bowl. His mouth was still full of food.

7. Stephen selected a grape and ate it.

8. Stephen selected a grape and ate it.

9. Stephen selected a grape and ate it.

10. Stephen selected a grape and ate it.

11. Stephen selected a grape and ate it.

12. Stephen selected a grape and ate it.

13. Stephen selected a grape and ate it.

14. Stephen selected a grape and ate it.

15. Stephen selected a raisin, held it for a moment and dropped it back into the bowl without tasting it.

16. Stephen selected a grape and ate it.

17. Stephen selected a grape and held it in one hand while he was chewing.

18. Stephen selected a grape and held it in his other hand while he was chewing.

19. Stephen put a grape from one hand into his mouth, but he dropped it.

20. Stephen put the remaining grape back into the bowl.
21. Stephen picked up the dropped grape and held it.

22. Stephen gave the grape to the experimenter, indicating that he was no longer interested in eating.

23. Stephen gave another grape to the experimenter.

24. Stephen selected raisins from the bowl, one-at-a-time, for a total of 4 raisins and gave them to the experimenter without tasting them.

For the majority of this task, Stephen’s hands (and feet) remained in the bowl of food and he fingered both the grapes and raisins prior to making his selections. This behaviour was equivalent to visual scanning by a sighted child and provided evidence that Stephen’s selections were not random—he intentionally searched for one class of items over another.

The behaviour displayed by Stephen during this task was similar to classificatory behaviour described by Sugarman (1983) as successive iteration. He selected one group of things that were the same and then went on to select a second group of things that were the same. Interestingly, he used items from the two classes in different ways—he tended to eat the grapes, but gave each of the raisins to the experimenter without tasting any. This change in behaviour may be accounted for in two ways. First, Stephen began to select the raisins after eating 14 grapes. He may not have eaten any raisins simply because he was full, but continued to classify the objects by changing the action. Second, Stephen’s mother reported that, although he did like raisins, he preferred the taste of grapes. He may have chosen to eat only his preferred food item. This explanation is the most viable of the two, given that he did select one raisin in the middle of his grape eating, but did not eat it—he put it back in the bowl. Regardless of explanation, this task provided clear evidence of Stephen’s ability to categorize.
3.52 Sorting blocks and balls

Stephen was presented with a bag containing wooden blocks and soft texturized balls and was encouraged to drop the items into a shoebox. Throughout the task, his hands were in contact with the total array of blocks and balls; thus, use of the word selected in describing this task implies Stephen’s active choice. His behaviour proceeded as follows:

Trial 1:

1. Stephen selected a ball and gave it to the experimenter.
2. Stephen selected a ball and gave it to the experimenter.
3. Stephen selected a ball and gave it to the experimenter.
4. Stephen selected a ball and gave it to the experimenter.
5. Stephen selected a block and put it in the shoebox.
6. Stephen selected a block and put it in the shoebox.
7. Stephen selected a block and put it in the shoebox.
8. Stephen selected a block and put it in the shoebox.

Trial 2:

1. Stephen selected a ball and put it in the shoebox.
2. Stephen selected a block and put it in the shoebox.
3. Stephen selected a ball and put it in the shoebox.
4. Stephen selected a block and put it in the shoebox.
5. Stephen selected a block and put it in the shoebox.
6. Stephen selected a block and put it in the shoebox.
7. Stephen selected a block and put it in the shoebox.
8. Stephen selected a block and put it in the shoebox.
9. Stephen selected a block and put it in the shoebox.
10. Stephen selected a ball and tried to put it in the shoebox as the experimenter emptied the items from the box back into his bag.
11. Stephen put the ball he selected above into the shoebox.
12. Stephen selected a ball and held it in one hand.
13. Stephen selected a ball and held it in his other hand.
14. Stephen dropped both balls into the box.
15. Stephen reached into the shoebox and took a ball out.
16. Stephen selected a block and put it in the shoebox.

As in the food sorting tasks, Stephen’s behaviour during Trial #1 of this task was similar to the classificatory behaviour described by Sugarman (1983) as successive iteration. He selected one group of objects that were the same and went on to chose a second group of similar objects. Interesting is that Stephen utilized each class of objects in a different way--he insisted on giving all the balls to the experimenter, but dropped all the blocks into the shoebox. This may have occurred because, prior to this task, Stephen was trained to drop blocks into the shoebox. When given an array of blocks and balls in the task, he continued to drop the blocks into the box as he was trained, but chose another action for the balls. Clearly, this is classificatory behaviour.
In trial #2, Stephen’s behaviour was also classificatory, but slightly different than in trial #1. In trial #2, Stephen tended to shift between classes of objects, sorting blocks and balls. His behaviour during this trial is harder to interpret than behaviour during the first trial. It is possible that his classificatory behaviour indicated the emergence of coordinated iteration—shifting between classes of objects, sorting two or more classes simultaneously. However, since the end result for both classes was identical (i.e. both blocks and balls were put into the shoebox), it is difficult to determine if he was sorting both classes at the same time. Had Stephen continued to give the balls to the experimenter and put the blocks into the box, he clearly would have been demonstrating coordinated iteration. It should be noted that the nature of the training and task may be biased in favour of a successive iteration response; in other words, it may underestimate Stephen’s level of classification ability. This may support the coordinated iteration interpretation of trial #2 results. In any case, this task--like the food sorting task--clearly demonstrates Stephen’s ability to categorize.

3.6 Mother-child interaction

Stephen and his mother were videotaped during a play session for approximately one hour. The purpose of this session was to obtain a sample of the language used by Stephen’s mother while interacting with him and to observe how she approached teaching new word meanings to her son. Previous research investigating linguistic input to blind children by their parents (Kekelis & Andersen 1984) has indicated that these parents tend to name objects for their children and request labels from them, but they tend not to provide detailed descriptions of items.
Stephen's mother's language was not like the language of mothers studied by Kekelis & Andersen (1984). Stephen's mother did not simply label new (and familiar) objects, but she described them. Figures 3.1 and 3.2 illustrate Stephen's mother's description of new objects to him.

**Figure 3.1 Stephen's mother's description of a ladle to him**

A ladle was given to Stephen to name during the naming experiment. He explored it with his hands, but failed to name the item. He took the ladle to his mother and began to teach him what the object was.

M: What's that you have?

(S does not respond)

M: What is it?

(S does not respond)

M: It's a ladle and do you know what? Mommy uses the very same utensil to get your soup out of the big container in the fridge. It's like a big scoop.

**Figure 3.2 Stephen's mother's description of a stethoscope to him**

M: S, what is mommy touching you with on your knee?

(S does not respond)

M: Feel this. You'll find that it's very interesting. It has long tubes.

S: phone (as he reaches to touch the stethoscope)

M: You think it's a phone do you, well it's kind of similar. Do you know what this is S? Do you remember when we go to see Dr. C? It's a stethoscope. And do you remember what she listens to?

S: Dr. C.
M: Dr. C.

S: XX

M: What does Dr. C. listen to with this instrument? Does she listen to your heart? Remember your heart is inside your chest. She listens to your tummy. She listens to your tummy growling to see whether you’ve had breakfast or not.

S: stethoscope


(S puts the ear portion into his mouth)

M: Do you know what you have in your mouth?

S: Dr. C put in your mouth.

M: Oh she doesn’t put that in her mouth. These are ear pieces. These little ear things here--there’s two of them.

S: Dr. C.

M: Dr. C. She listens to your heartbeat with the stethoscope.

As Figures 3.1 and 3.2 illustrate, Stephen’s mother’s descriptions of objects included information about shape, function, etc., as well as the object’s name.

Stephen’s mother also provided comparisons for him--comparisons between new and familiar objects (illustrated in Figure 3.1) and comparisons between past and present experiences Stephen had with the objects. Examples of this latter type of comparison are provided in Figures 3.2 and 3.3.

Figure 3.3 Stephen’s mother relating present and past events

Stephen was touching his brother’s face and felt a soother inside Patrick’s mouth.

S: Here Patrick. (as he touches the soother)
M: Yah, Patrick has his soother in his mouth. What do you call it?

S: Sooker.
   Patrick take it.

M: What's that? (she did not understand his utterance)

S: Here Patrick.

M: Here Patrick

S: Patrick.

M: Yesterday when Patrick was crying so much, you said mommy soother, didn't you. And I said, "oh that's a good idea." And boy, Patrick just calmed right down. Yes.

The information provided by Stephen's mother's descriptions were functionally equivalent to the information normally obtained through vision. The eyes are used to compare objects and to shift focus in space. The linguistic comparisons provided by Stephen's mother about objects and between past and future experiences, functioned as the "eyes" in these situations.

Language provided by Stephen's mother also fulfilled another role of vision in language development—it provided the incentive for exploring the environment that is usually provided for sighted children by their vision. Stephen's mother frequently encouraged him to explore his environment by making him aware that there were interesting things to discover and explore within it. For example, when she brought out new toys for Stephen to play with, she told him that she had placed new items nearby and if he searched, he would find them. This type of language input encouraged Stephen to explore his environment independently.

Stephen's mother was given several novel items to introduce to her son during the session in order to observe how she approached teaching new words and concepts to him. She was encouraged to choose items she felt would interest Stephen and to talk to him about those items.
Her choice of objects was interesting. She tended to choose real (rather than toy) objects and chose only those items which Stephen could experience easily without vision. She chose the bottle of perfume which he could smell, the jar of cinnamon he could smell and taste, and the plug and ice cube tray which he could do things with. Stephen’s mother also chose to blow up a balloon for Stephen—an event that is difficult to experience without vision. In presenting the balloon, however, Stephen’s mother incorporated auditory and tactile experiences to make the event more meaningful for her son. She held Stephen’s hand around the balloon to feel the size enlarging as it was filled with air. She took exaggerated breaths of air so that Stephen could hear her breathing as she blew up the balloon. Finally, when the balloon was full, and she let the air out again, she held the opening together in a way that made the balloon squeak as the air escaped. This way, Stephen could hear the air escaping as he felt the balloon growing smaller.

While only one mother’s linguistic input to her blind child was studied in this investigation, it is probable that linguistic input does have a significant influence on language development in blind children. Previous research (Kekelis & Andersen 1984) has found that blind children’s word meanings are constrained and that linguistic input by the mothers of these same children is not stimulating. Stephen’s word meanings were not constrained, his language development was advanced for his age, and his mother provided rich and stimulating language input. Linguistic input does appear to affect semantic development (and language development in general) in blind children.

3.7 Summary

Stephen was a 20-month-old child, totally blind from Leber’s Congenital Amaurosis. An
evaluation three months prior to this investigation indicated that speech, language, and motor
development was well within the normal range. In addition, neurological examination was
normal and audiological testing indicated normal hearing bilaterally.

Stephen's total productive vocabulary was 481 words. This vocabulary size was
significantly larger than that of sighted peers; in fact, it was larger than that of 90% of sighted
children aged 1;8.

In the naming experiment, Stephen was given novel objects to name to elicit lexical
extension and overextension. Some of these objects were from the same nominal category as
objects familiar to Stephen and provided the opportunity for him to extend his words. Stephen
extended words to 55% of the objects presented to him. Other objects were similar to items
which Stephen was familiar with, but were from different nominal categories. These items
provided the opportunity for Stephen to overextend his words. He overextended words to 60.87%
of the objects presented to him. These figures underestimate Stephen's ability to generalize
because he overextended in the extension task as well. When opportunities and responses are
combined, he extended or overextended words to 62.1% of the objects presented to him.

Stephen's lexical extensions and overextensions appeared to be based on a variety of
features including sound, shape, quantity, texture, taste and/or smell. Because objects presented
were not balanced in terms of feature types, no conclusions can be drawn about the relative
importance of one feature type over another in the development of word meaning. It is clear
from Stephen's performance, however, that he is able to rely upon a variety of different features
in acquiring meaning.
Data on spontaneous extension was obtained from diary data provided by Stephen's parents. He spontaneously extended 50% of the words tracked by his parents over a two-week period.

Data on spontaneous overextension was obtained from a language sample obtained from the experimental sessions with Stephen and from diary data collected by his parents. Stephen spontaneously overextended 17 different word types during the experimental sessions and 24 word types within the home. He overextended general nominals, verbs and verb phrases.

Two sorting tasks were given to Stephen to determine whether he displayed classification skills. Stephen displayed successive iterative classification behaviour during these tasks. These results may have underestimated Stephen's classificatory behaviours because the nature of the sorting tasks may have been biased in favour of a successive iteration response. In any case, he clearly demonstrated the ability to categorize.

An analysis of linguistic input provided to Stephen by his mother was conducted to investigate the possible relation between semantic development and linguistic environment. Unlike mothers of blind children studied in previous investigations, Stephen's mother provided rich descriptions of objects in Stephen's environment. She provided comparisons for Stephen between new and familiar objects and related past, present and future experiences with items for him. In addition, she encouraged him to explore his environment by telling him that there were objects within his reach to explore, thereby providing the incentive to discover the environment normally provided by vision. In these ways, linguistic input provided by Stephen's mother was functionally equivalent to information he would have been able to obtain through vision, had he not been blind. It appeared that the linguistic input provided by Stephen's mother facilitated semantic development, and possibly language development in general.
CHAPTER IV: RESULTS--DANNY

This chapter will present results for Danny, a blind child with minimal light perception. Danny did not fulfill all the criteria for subject selection—he had a speech and language delay as well as a mild conductive hearing loss due to chronic otitis media. Despite these additional handicaps, Danny was included in the study for two reasons. First, during the initial interview session with Danny, it was clear that he was willing and able to name objects. This behaviour indicated that Danny was able to perform the required tasks for the experiment. Second, Danny had minimal light perception only. A visual impairment of this degree does not allow Danny to obtain any visual information that could facilitate semantic development. This allowed us to compare results obtained from Danny to performance by Stephen (totally blind with no additional handicaps). Results had already been obtained from Stephen when Danny was first visited and therefore, we knew that Stephen did extend and overextend his words. We were able to predict from these results that if Danny did not extend and overextend, it could be attributed to his additional developmental delays and not necessarily to his blindness. If Danny did extend and overextend his words (despite developmental delays and blindness), results would more strongly indicate that, while theories of semantic development take it for granted that vision provides much of the information on which word meaning is based, blind children do obtain adequate information from other sources from which to build word meaning.
Several changes were made to the experimental method when working with Danny. These changes will be discussed below.

4.1 Subject Profile

At the time of this investigation, Danny was 2;5 (corrected age). Pregnancy and birth history was complicated. Danny was born 17 weeks premature, weighing only 710 grams. Medical complications at birth included patent ductus arteriosus (narrowing of a tube leading to the lungs), and development of a hernia, both problems which required surgical correction. Danny also required methadone treatment due to mother’s use of heroin during pregnancy. Danny spent the first 7 1/2 months of his life in hospital and the first 4 - 5 months on a respirator. He was diagnosed with retinopathy of prematurity and has only minimal light perception in both eyes.

Danny has been followed by the Visually Impaired Program at Children’s Hospital since birth. At 0;10 (corrected age), speech, language, and motor development appeared normal. Audiological testing indicated normal hearing bilaterally. Neurological examination was normal. A re-evaluation by the Visually Impaired Team at age 2;1 (corrected age) indicated that speech and language development was delayed. A mild bilateral conductive hearing loss was also noted due to chronic otitis media, and a myringotomy with tubes was performed to eliminate this problem. Motor development was normal.

Danny was placed in a foster home temporarily for 4 months when he was 1;9 - 2;1 (corrected age). Upon his return home, Danny developed self-abusive behaviour (biting, head banging), which his mother believes resulted from his fear of being taken from the home again.
He was extremely demanding of his mother’s attention at all times and became self-abusive when she was busy with tasks not involving Danny. Danny’s mother reported that he did not behave this way with other people—he behaved very well and did not abuse himself at daycare. Danny was extremely cooperative with the researchers during each of the experimental sessions in this investigation.

Danny’s parents were living commonlaw at the time of this investigation. Danny’s mother was not employed and remained at home. His father was a manual labourer; his job included removing asbestos from buildings. Danny attended daycare four days a week at an integrated special needs preschool. He was on a waiting list to receive speech and language intervention as soon as possible.

At the time of this investigation, Danny was using single-word utterances only. His mother reported that he did produce some two-word combinations (e.g. daddy car; car key), but these utterances appeared to be unanalyzed formulae, rather than productive word combinations. Although formal speech and language testing was not done by the researcher, Danny’s phonological development appeared significantly delayed for his age. In fact, it appeared that an oral-motor deficit may have been present. Danny had very little jaw movement during speech, and tended to drool. In addition, Danny was a very slow eater and appeared to have significant difficulty maneuvering his food bolus to the back of his mouth to initiate a swallow. While drinking a glass of water during one of the experimental sessions, Danny choked and his mother reported that he did this quite often when drinking. The possible oral-motor deficit and phonological delay may have partly been responsible for his language delay.
4.2 Productive Vocabulary

Danny’s total productive vocabulary was estimated through administration of the Infant version of the MacArthur Communicative Inventory (1989). Although Danny’s age (2;5 corrected) warranted use of the Toddler version, the Infant version was chosen because of the presence of a speech and language delay. Total productive vocabulary was 156 words.

Compared to norms provided by Fenson et al. (1990), Danny’s productive vocabulary was significantly smaller than that of his age peers (X=580 words). Danny’s vocabulary size was not unlike that of a child 1;8 (X=175 words).

4.3 Naming Experiment

Thirty-eight objects were presented to Danny to name during this experiment. Thirty-two objects were novel items and provided Danny with the opportunity to extend or overextend words he already used productively. Six objects were familiar to him and provided a means for ensuring that those words were productive.

A total of forty-two responses were obtained from Danny during this experiment. Thirty-eight responses corresponded to the thirty-eight items given to Danny to name. Four additional responses were obtained in the following manner: one item was presented a second time to Danny by sound only; three objects were named in two different ways by Danny as he explored them.

4.3.1 Naming familiar objects

A total of six opportunities was provided for Danny to name familiar objects. After
exploring each object manually, he correctly named three of the six familiar objects, indicating that those words were productive. Danny failed to name one item at all, indicating that, although his mother had noted on the Communicative Inventory that the word was productive, Danny did not produce the word spontaneously. When asked, his mother confirmed that she had never heard Danny say the word, although he did understand it. Two objects were labelled incorrectly by Danny and were actually instances of lexical overextension. Table 4.1 illustrates the familiar objects presented to Danny to name and his responses.

Table 4.1 Familiar objects presented for naming and Danny’s responses

<table>
<thead>
<tr>
<th>FAMILIAR OBJECTS</th>
<th>DANNY’S RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. mother’s keys</td>
<td>key</td>
<td>correctly named</td>
</tr>
<tr>
<td>2. own ball</td>
<td>ball</td>
<td>correctly named</td>
</tr>
<tr>
<td>3. own telephone</td>
<td>did not name</td>
<td>unproductive word</td>
</tr>
<tr>
<td>4. own toy car</td>
<td>daddycar</td>
<td>overextended</td>
</tr>
<tr>
<td>5. own book</td>
<td>book</td>
<td>correctly named</td>
</tr>
<tr>
<td>6. own cup</td>
<td>milk</td>
<td>overextended</td>
</tr>
</tbody>
</table>

4.32 Extension

A total of nineteen opportunities was provided for Danny to extend words. Novel objects from the same nominal category as each target word were given to Danny to explore and name. Responses were coded as extensions, overextensions, failure to extend, noncompliant, or
unintelligible, as defined in 3.22. One additional response category was required to interpret Danny’s responses. This category is defined below:

Idiosyncratic: Objects named by Danny as monkeybar were categorized as idiosyncratic responses. This response type will be discussed in 4.321. Table 4.2 contains a list of objects presented to Danny to elicit lexical extension and his responses.

Danny’s overextension of the word car for both the new and toy telephones is interesting. As discussed in 4.31, Danny did not use the word phone productively. The real telephone was presented to Danny near the beginning of the session. He explored it and labeled it with his idiosyncratic phrase monkeybar. When encouraged to continue exploring the phone and to rename it, Danny pushed it on the floor like a car and named it car. The shape of the telephone must in some way have appeared carlike to Danny. The toy telephone was presented approximately midway through the session (15-20 minutes after the real phone had been presented) and Danny labeled it monkeybar. When encouraged to continue exploring the toy phone and to rename it, Danny also pushed it like a car and labeled it car. The toy telephone was carlike in that it had four wheels. In this case, Danny must have been overextending on the basis of similarity in parts between the toy phone and a car.

Of the nineteen opportunities to extend words, Danny extended twelve times, overextended three times, produced unintelligible labels two times and produced idiosyncratic responses two times. These results are illustrated in Table 4.3.
Table 4.2 Objects presented to elicit extension and Danny’s responses

<table>
<thead>
<tr>
<th>OBJECT PRESENTED</th>
<th>TARGET</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. novel set of keys</td>
<td>keys</td>
<td>key</td>
<td>extension</td>
</tr>
<tr>
<td>2. single key</td>
<td>key</td>
<td>key</td>
<td>extension</td>
</tr>
<tr>
<td>3. plastic keys</td>
<td>keys</td>
<td>carkey</td>
<td>extension</td>
</tr>
<tr>
<td>4. medium ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>5. knitted ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>6. golf ball</td>
<td>ball</td>
<td>apple</td>
<td>overextension</td>
</tr>
<tr>
<td>7. tennis ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>8. new telephone</td>
<td>phone</td>
<td>monkeybar</td>
<td>overextension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>car</td>
<td>idiosyncratic</td>
</tr>
<tr>
<td>9. toy phone</td>
<td>phone</td>
<td>monkeybar</td>
<td>idiosyncratic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>car</td>
<td>overextension</td>
</tr>
<tr>
<td>10. small toy car</td>
<td>car</td>
<td>car</td>
<td>extension</td>
</tr>
<tr>
<td>11. large toy car</td>
<td>car</td>
<td>car</td>
<td>extension</td>
</tr>
<tr>
<td>12. soft book</td>
<td>book</td>
<td>unintelligible</td>
<td>unintelligible</td>
</tr>
<tr>
<td>13. hard book</td>
<td>book</td>
<td>unintelligible</td>
<td>unintelligible</td>
</tr>
<tr>
<td>14. coil notebook</td>
<td>book</td>
<td>book</td>
<td>extension</td>
</tr>
<tr>
<td>15. paper cup</td>
<td>cup</td>
<td>cup</td>
<td>extension</td>
</tr>
<tr>
<td>16. small glass</td>
<td>cup</td>
<td>cup</td>
<td>extension</td>
</tr>
<tr>
<td>17. tin cup</td>
<td>cup</td>
<td>cup</td>
<td>extension</td>
</tr>
<tr>
<td>RESPONSE</td>
<td>TOTAL NUMBER</td>
<td>PERCENTAGE</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>12</td>
<td>63.17</td>
<td></td>
</tr>
<tr>
<td>Overextension</td>
<td>3</td>
<td>15.79</td>
<td></td>
</tr>
<tr>
<td>Unintelligible</td>
<td>2</td>
<td>10.53</td>
<td></td>
</tr>
<tr>
<td>Idiosyncratic</td>
<td>2</td>
<td>10.53</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

4.321 Idiosyncratic word usage

Danny used the word *monkeybar* several times during the experimental sessions. He appeared to use the word when language demands made of him were too great, or when he became bored with a task. Excerpts from transcripts of sessions with Danny are presented below in Figure 4.1 to illustrate Danny's use of *monkeybar*.

Figure 4.1 Examples of Danny’s use of *monkeybar*

Example 1: Danny (D) and experimenter (E) were sitting on the livingroom floor. E was giving toys to D to name.

E: Here comes the next toy. (a glass jar with a lid) It's right by your knee.

(D explores the jar with both hands)

E: What's that?

D: XX
  XX
  XX

E: What do we call that Danny?
D: XX (tries to turn lid of jar)

E: You're turning it. What's its name?

D: XX

E: Do you have any idea?

D: monkeybar

E: A monkeybar?

D: XX

E: What's this thing? (while tapping the lid on the jar)

D: XX

E: You're touching it nicely. You tell me what it is.

D: monkeybar

Example 2: Danny (D) was playing with a box of his own toys with the experimenter's assat (A).

A: What else is in here? (box of toys) Quack-quack-quack-quack-quack-quack. What is it?

(no response; Danny throws the duck in front of him)

A: Do you know what it is?

(no response)

A: It's a duck. It's a little duckie.

(Danny searches in front of him for the duck)

A: Where did you put the duck?

(Danny finds a block instead of the duck)
A: What’s that? You found a block

(whining a bit - appears bored with task - begins to crawl away with the block in hand)

A: Oh look what I found Danny. (his book) Can you come and see it? If feels very nice.

(Danny throws the block out of his hand - finds the duck and begins to play with it)

A: Are you throwing the duck?

D: XX

XX

A: Can you come back here Danny? (A goes and gets T and brings him back to the toys)

D: XX

monkeybar

monkeybar

Danny’s use of monkeybar was similar to the use of the phrase *Pop goes the weasel* by a child studied by Brown & Bellugi (1964). These researchers asked their subject (Adam) to make grammatical judgements about correct and incorrect forms of the plural. When asked to tell the researchers which form was right—two shoe or two shoes—Adam replied "Pop goes the weasel" (p. 79). The task was too difficult for Adam and he responded with an idiosyncratic phrase.

4.322 Bases for extension

To determine the bases on which Danny extended his words, a comparison was made between characteristics of the familiar items and characteristics of novel items to which extension applied. Table 4.4 illustrates the apparent bases on which extension occurred. Danny’s lexical extensions were based predominantly on shape, but possibly also on quantity, parts (e.g.
Overextensions in this task were apparently based on shape and attribute. As with Stephen, these results should not be overinterpreted because the items were not selected to balance attribute type. Results do indicate, however, that a variety of attributes on which to base lexical extension were available to Danny. A description of all objects given to Danny to name is included in Appendix C.

Table 4.4 Possible bases for lexical extension--Danny

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL EXTENSION</th>
<th>POTENTIAL BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. set of keys</td>
<td>key</td>
<td>quantity, shape</td>
</tr>
<tr>
<td>2. single key</td>
<td>key</td>
<td>shape</td>
</tr>
<tr>
<td>3. plastic keys</td>
<td>carkey</td>
<td>quantity, shape</td>
</tr>
<tr>
<td>4. medium ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>5. knitted apple</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>6. tennis ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>7. small toy car</td>
<td>car</td>
<td>shape, parts, movement</td>
</tr>
<tr>
<td>8. large toy car</td>
<td>car</td>
<td>shape, parts, movement</td>
</tr>
<tr>
<td>9. coil notebook</td>
<td>book</td>
<td>shape, movement</td>
</tr>
<tr>
<td>10. paper cup</td>
<td>cup</td>
<td>shape</td>
</tr>
<tr>
<td>11. small glass</td>
<td>cup</td>
<td>shape</td>
</tr>
<tr>
<td>12. tin cup</td>
<td>cup</td>
<td>shape</td>
</tr>
<tr>
<td>13. new telephone</td>
<td>car</td>
<td>shape,</td>
</tr>
<tr>
<td>14. toy telephone</td>
<td>car</td>
<td>shape, parts</td>
</tr>
</tbody>
</table>
4.33 Overextension

A total of seventeen opportunities were provided for Danny to overextend words. Novel objects, similar to familiar objects but from different nominal categories, were given to Danny to explore (manually and/or auditorily) and to name. Responses were scored as extensions, overextensions, failure to extend, failure to overextend, noncompliant, or unintelligible as defined in 3.22. Table 4.5 contains a list of objects given to Danny to elicit overextension and his responses.

Of the seventeen opportunities provided to overextend words, Danny overextended twelve times, extended one time, failed to overextend one time and produced three unintelligible labels. Table 4.6 summarizes these results.

When the three instances of overextension from the extension task are added in, the number of opportunities rises to 20, with 15 (75%) overextensions. When the extension response on the overextension task is included in this tally, the total opportunities remain 20, but extension/overextension responses are 16, or 80%.
Table 4.5 Objects presented to elicit overextension and Danny’s responses

<table>
<thead>
<tr>
<th>OBJECT PRESENTED</th>
<th>TARGET</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. bubble blower</td>
<td>key(s)</td>
<td>did not name</td>
<td>failure to overextend</td>
</tr>
<tr>
<td>2. knitting bobbins to sound</td>
<td>keys</td>
<td>carkey</td>
<td>overextension</td>
</tr>
<tr>
<td>2. knitting bobbins to touch</td>
<td>keys</td>
<td>carkey</td>
<td>overextension</td>
</tr>
<tr>
<td>3. paperclips</td>
<td>keys</td>
<td>carkey</td>
<td>overextension</td>
</tr>
<tr>
<td>4. orange</td>
<td>ball</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>4. orange</td>
<td>apple</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>5. plastic egg</td>
<td>ball</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>6. receiver rattle</td>
<td>phone</td>
<td>unintelligible</td>
<td>unintelligible</td>
</tr>
<tr>
<td>7. arch block</td>
<td>phone</td>
<td>block</td>
<td>extension</td>
</tr>
<tr>
<td>8. school bus</td>
<td>car</td>
<td>car</td>
<td>overextension</td>
</tr>
<tr>
<td>9. fire engine</td>
<td>car</td>
<td>truck</td>
<td>overextension</td>
</tr>
<tr>
<td>10. wheel</td>
<td>car</td>
<td>unintelligible</td>
<td>unintelligible</td>
</tr>
<tr>
<td>11. tram</td>
<td>car</td>
<td>car</td>
<td>overextension</td>
</tr>
<tr>
<td>12. binder folder</td>
<td>book</td>
<td>book</td>
<td>overextension</td>
</tr>
<tr>
<td>13. folder</td>
<td>book</td>
<td>unintelligible</td>
<td>unintelligible</td>
</tr>
<tr>
<td>14. coffee filter</td>
<td>cup</td>
<td>milk</td>
<td>overextension</td>
</tr>
<tr>
<td>15. tupperware dish</td>
<td>cup</td>
<td>cup</td>
<td>overextension</td>
</tr>
</tbody>
</table>
The question in this research is whether blind children generalize known words to new exemplars, to either in-category (extension) or out-of-category (overextension). Adding extension and overextension task results is a measure of the child’s willingness to generalize. Danny was given 36 opportunities to either extend or overextend. He did extend or overextend 28 times, or 77.78%.

4.331 Bases for overextension

To determine the bases on which Danny overextended his words, a comparison was made between characteristics of the familiar objects and characteristics of the novel items to which overextension applied. Table 4.7 illustrates the apparent bases on which overextension occurred. Appendix C contains a list of characteristics for all familiar and novel objects presented from which these conclusions were drawn.
Table 4.7 Possible bases for lexical overextension

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL EXTENSION</th>
<th>POTENTIAL BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. knitting bobbins</td>
<td>carkey</td>
<td>sound</td>
</tr>
<tr>
<td>to sound</td>
<td>carkey</td>
<td>sound, quantity</td>
</tr>
<tr>
<td>to touch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. paperclips</td>
<td>carkey</td>
<td>sound, quantity</td>
</tr>
<tr>
<td>3. orange</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td></td>
<td>apple</td>
<td>shape, smell, texture</td>
</tr>
<tr>
<td>4. plastic egg</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>5. school bus</td>
<td>car</td>
<td>movement, parts</td>
</tr>
<tr>
<td>6. fire engine</td>
<td>truck</td>
<td>movement, parts</td>
</tr>
<tr>
<td>7. tram</td>
<td>car</td>
<td>movement</td>
</tr>
<tr>
<td>8. hard binder folder</td>
<td>book</td>
<td>shape</td>
</tr>
<tr>
<td>9. coffee filter</td>
<td>milk</td>
<td>shape</td>
</tr>
<tr>
<td>10. tupperware dish</td>
<td>cup</td>
<td>shape</td>
</tr>
</tbody>
</table>

4.4 Spontaneous Extension

Danny’s mother was asked to track Danny’s use of three words (ball, car and keys) over a one-week period to provide spontaneous extension data. Unfortunately, Danny’s mother did not complete the diary. Spontaneous extension data is unavailable for this subject.
4.5 Spontaneous Overextension

Data on spontaneous overextension was obtained from two sources: transcripts of experimental sessions and diary data provided by Danny's mother. Results from each source of data are described below.

4.51 Spontaneous overextension--transcript data

All three experimental sessions were transcribed by the researcher and instances of spontaneous overextension were identified as defined in 3.31. A language sample of 613 child utterances provided the basis for the spontaneous overextension analysis. Only one spontaneous overextension occurred. Table 4.8 illustrates the amount of spontaneous overextension obtained from the data base.

Each utterance in the data base was also coded as either spontaneous or imitative (as defined in 3.31). Table 4.9 illustrates the number of spontaneous versus imitated utterances within the language sample.
Table 4.8 Spontaneous overextension occurring in the language sample

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL NUMBER</th>
<th>TOTAL TYPES</th>
<th>OVEREXTENSION</th>
<th>TYPES OVEREX.</th>
<th>% OVEREX BY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>217</td>
<td>18</td>
<td>1</td>
<td>1</td>
<td>5.56</td>
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<tr>
<td>Single Verbs</td>
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<td>Noun Phrases</td>
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<td>Verb Phrases</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Routines</td>
<td>21</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Yes/No</td>
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<td>2</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
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<td>Prepositions</td>
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<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
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<td>Adverbs</td>
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<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>49</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>613</td>
<td>--</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 4.9 Spontaneous versus imitated utterances

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL NUMBER</th>
<th>TOTAL TYPES</th>
<th>SPON. TYPES</th>
<th>% TOTAL</th>
<th>IMIT. TYPES</th>
<th>% TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>217</td>
<td>18</td>
<td>17</td>
<td>94.40</td>
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<tr>
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<td>0</td>
<td>--</td>
</tr>
<tr>
<td>Noun Phrases</td>
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<td>1</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
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<tr>
<td>Verb Phrases</td>
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<td>1</td>
<td>1</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Routines</td>
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<td>2</td>
<td>2</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Yes/No</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Prepositions</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
<td>1</td>
<td>100.00</td>
</tr>
<tr>
<td>Adverbs</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>49</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>[Æ]</td>
<td>309</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
The overextension was spontaneously produced by Danny. Therefore, it could be compared to the spontaneous word productions to determine overall frequency of spontaneous overextension. This data is illustrated in Table 4.10.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL TYPES</th>
<th>SPONTANEOUS TYPES</th>
<th>SPONTANEOUS OVEREXTENSION</th>
<th>PERCENTAGE OVEREXTEN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>18</td>
<td>17</td>
<td>1</td>
<td>5.88</td>
</tr>
</tbody>
</table>

4.52 Spontaneous overextension--diary data

Danny's mother was asked to record all instances of overextension that she noticed over a three-week period. As mentioned above, Danny's mother did not complete the diary as requested. When asked to think of any overgeneralizations that Danny had made in the recent past, Danny's mother provided one example. He frequently used the word *mirror* to refer to "window."

4.6 Sorting Experiments

Two sorting tasks were given to Danny to determine whether he displayed classificatory behaviour. Danny's behaviour during each of these tasks is described below.

4.61 Sorting food

Danny was given a bowl containing grapes and raisins and encouraged simply to eat his
1. Danny took the bowl containing grapes and raisins.

2. Danny reached into the bowl and touched a grape.

3. Danny selected the grape and ate it.

4. Danny reached into the bowl, touched and selected another grape and ate it.

5. Danny reached into the bowl, touched grapes and raisins simultaneously, selected a grape and ate it.

6. Danny reached into the bowl, selected and ate a grape.

7. Danny reached into the bowl, selected and ate a grape.

8. Danny pushed the bowl aside and was no longer interested in eating his treat.

Danny’s behaviour during this task was similar to the classificatory behaviour described by Sugarman (1983) as simple iteration. He worked with a small number of objects in an array and selected items from one class only. His selection of grapes over raisins was possibly motivated by saliency, but it does demonstrate Danny’s ability to categorize.

4.62 Sorting blocks and balls

Danny was given a shoebox with a hole in the lid and trained to drop blocks into the hole, one at a time. Without Danny knowing, several soft texturized balls were then mixed into the pile of blocks and he was encouraged to continue putting blocks into the box. Danny’s behaviour proceeded as follows:

1. Danny put his hand on the pile of blocks and balls, feeling both classes of objects simultaneously.

2. Danny selected a ball and dropped it into the box.
3. Danny selected a block and dropped it into the box.
4. Danny selected a ball and dropped it into the box.
5. Danny selected a ball and dropped it into the box.
6. Danny selected a ball and dropped it into the box.
7. Danny selected a ball and dropped it into the box.
8. Danny selected a ball and dropped it into the box.
9. Danny selected a ball and dropped it into the box.

As in the Food Sorting task, Danny demonstrated simple iterative classificatory behaviour while sorting blocks and balls. He tended to locate objects predominantly from one class. He located one ball, deposited it in the shoebox and continued to locate other balls and put them in the shoebox also.

Danny’s reason for choosing balls over blocks may have been the fact that the balls were novel to him. Danny had been playing with the blocks just prior to this sorting task but had never touched the balls before. Sugarman (1983) reported that children displaying simple iterative classification skills tended to chose novel objects over familiar items in sorting tasks similar to the one Danny participated in. As discussed in section 3.42, this task may bias the child toward simple iterative behaviour and underestimate classificatory ability.

4.7 Summary

Danny was a 30-month-old boy, blind from retinopathy of prematurity. He had minimal light perception in both eyes. His searches and exploration of objects were manual/tactile, typical of totally blind children. An evaluation of Danny’s development three months prior to this
investigation indicated that speech and language skills were delayed, and a mild bilateral conductive hearing loss was present due to chronic middle ear infections. Motor development was assessed to be normal. Danny was, however, observed to have difficulty swallowing and was difficult to understand.

Danny's total productive vocabulary was 156 words. This vocabulary size was significantly smaller than that of sighted peers, consistent with a speech and language delay. Danny's vocabulary size was similar to that of a sighted child aged 1;8.

In the naming experiment, Danny was given novel objects to name to elicit lexical extension and overextension. Some of these objects were from the same nominal category as objects familiar to Danny and provided the opportunity for Danny to extend his words. He extended words to 63.17% of the objects presented to him. Other objects were similar to items which Danny was familiar with, but were from different nominal categories. These items provided the opportunity for Danny to overextend his words. He overextended words to 70.59% of the objects presented to him. These figures underestimate Danny's ability to generalize because he overextended in the extension task and vice versa. When opportunities and responses are combined, he extended or overextended words to 77.78% of the objects presented to him.

Danny's lexical overextension appeared to be based on a variety of features, including sound, shape, movement, texture and smell. Sound and movement appeared particularly predominant bases for overextension. Lexical extensions were apparently based on shape, action, movement, quantity and parts.

Data on spontaneous overextension was obtained from a language sample obtained from the experimental sessions with Danny. Spontaneous overgeneralization did occur--Danny
overextended 5.56% of his single noun type productions.

Two sorting tasks were given to Danny to determine whether he displayed classification skills. Danny displayed simple iterative classificatory behaviour during these tasks. His behaviour was similar to that displayed by sighted children 1;6 - 2;0--delayed for his age, but not unexpected, given that other areas of development were also delayed. This result must be interpreted cautiously, because the nature of the task biased the child’s behaviour toward a level that may underestimate his classificatory ability.
CHAPTER V: RESULTS--MARGARET

This chapter will present results for Margaret—a child designated legally blind, but with some functional vision in one eye. Margaret did not fulfill all criteria for subject selection—she had some usable vision in one eye, lived in a bilingual (French-English) home, and had Fetal Alcohol Syndrome. Despite these complicating factors, Margaret was included in the study for two reasons. First, she was used as a pilot subject to ensure that methodological tasks for this study were appropriate. Second, previous research investigating lexical extension and overextension by blind children (Dunlea 1982; Andersen et al. 1984) had included partially sighted children in their study. Including Margaret in this study allowed for comparisons to be made between her performance and that of the partially sighted children in the previous investigation. Methodological procedures were similar to those described in Chapter III and will not be repeated at this time. Changes made to experimental method will be described below.

5.1 Subject Profile

Margaret was a native American Indian child, aged 2;1. She was blind from retinopathy of prematurity and had no sight in her right eye, but had some functional vision in her left eye. Ophthalmologists had estimated that she should have enough vision to read large print with her left eye. In the experiments in this study, it was very clear that Margaret did have functional vision. She used vision to search for objects, to look at objects and to guide her as she moved about her
environment.

Margaret was born 13 weeks premature, weighting only 810 grams. She remained in hospital for the first 4 1/2 months of her life. Medical complications of premature birth included a heart murmur, which was surgically corrected before her release from hospital. Margaret was also on a respirator for 2 1/2 months following birth, which caused severe vocal fold scarring. As a result of the scarring, Margaret made very little sound at 4 1/2 months, and at 2;1, her voice remained extremely hoarse.

Margaret was also born with Fetal Alcohol Syndrome. Her biological parents were both alcoholic. Margaret was placed in foster care immediately upon release from hospital and has remained with the same foster family since that time. At the time of study, Margaret had no contact with her natural parents, and Margaret’s foster family had no information about their medical histories.

Margaret’s foster family consisted of a foster mother and three older foster siblings (aged 21, 19 and 16 years). The first language of the home was French, although all family members were bilingual. Margaret’s foster mother estimated that Margaret heard approximately 60% English, 40% French daily.

Margaret’s foster mother remained at home with Margaret each day. She cared for two other special needs children approximately one day per week each, providing some opportunity for Margaret to interact with other children.

Margaret was assessed by the Visually Impaired Programme at her local Children’s Hospital when she was 1;1 (corrected age). Motor development was normal and audiological testing indicated normal hearing bilaterally. Speech and language was not evaluated at that time.
Speech and language development was assessed when Margaret was 1;8 (corrected age) and skills were within the normal range for her corrected age. Her productive vocabulary at that time was estimated at approximately 50 words.

5.2 Productive Vocabulary

Margaret’s total productive vocabulary was estimated through administration of the Infant version of the *MacArthur Communicative Development Inventory* (1989). Margaret’s age (2;1) warranted use of the Toddler version, but since a speech and language evaluation three months prior to this investigation had estimated Margaret’s vocabulary to be quite small (approximately 50 words), the Infant version was the appropriate tool to use. Total productive vocabulary was 59 words.

Compared to Fenson et al.’s (1990) norms, Margaret’s productive vocabulary was much smaller than that of her sighted age peers. Mean productive vocabulary size for sighted children, at 2;1 is approximately 380 words. Margaret’s total vocabulary size was smaller than that of 90% of her sighted age peers. It was more comparable to average vocabulary sizes of sighted children 1;4 - 1;5 (X=50-60 words). Of course, caution is warranted when comparing Margaret’s vocabulary size to Fenson et al.’s (1990) norms as Margaret was not compatible with the standardization sample. Fenson’s standardization sample consisted of normal, caucasian, sighted children. Margaret was a visually impaired, native American Indian child, raised in a bilingual foster family. She had the additional complication of having Fetal Alcohol Syndrome.
5.3 Naming Experiment

Seventeen objects were presented to Margaret to name during this experiment. Fourteen objects were novel items and provided the opportunity for Margaret to extend or overextend her words. Three objects were familiar to Margaret and provided a means for ensuring that target words were indeed productive. A total of seventeen responses were obtained from Margaret, corresponding to each of the seventeen objects given to her to label.

5.31 Naming familiar objects

Three opportunities were provided for Margaret to name familiar objects. After touching each item and looking at it with her eyes, Margaret correctly named all of these items. The items included Margaret’s drinking bottle, her own ball and her favourite doll.

5.32 Extension

Eight opportunities were provided for Margaret to extend words she used productively. Novel objects from the same nominal category as target words were given to Margaret to examine and name. Responses were coded as extension, overextension, failure to extend, noncompliant or unintelligible, as defined in 3.22. Table 5.1 contains a list of objects given to Margaret to elicit lexical extension, the predicted responses (target) and her responses. Of the eight opportunities provided for Margaret to extend her words, she extended five times and was noncompliant three times. Table 5.2 illustrates these results.
Table 5.1 Objects presented to elicit extension and Margaret’s responses

<table>
<thead>
<tr>
<th>OBJECT PRESENTED</th>
<th>TARGET</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. large ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>2. golf ball</td>
<td>ball</td>
<td>ball</td>
<td>extension</td>
</tr>
<tr>
<td>3. small wool ball</td>
<td>ball</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
<tr>
<td>4. wool apple</td>
<td>ball</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
<tr>
<td>5. baby bottle</td>
<td>bottle</td>
<td>bottle</td>
<td>extension</td>
</tr>
<tr>
<td>6. doll’s bottle</td>
<td>bottle</td>
<td>bottle</td>
<td>extension</td>
</tr>
<tr>
<td>7. novel doll</td>
<td>baby</td>
<td>baby</td>
<td>extension</td>
</tr>
<tr>
<td>8. scarecrow doll</td>
<td>baby</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
</tbody>
</table>

Table 5.2 Opportunities to extend and Margaret’s responses

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>TOTAL NUMBER</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>Noncompliant</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>8</td>
<td>100.00</td>
</tr>
</tbody>
</table>
5.3.3.1 Bases for extension

To determine the bases on which Margaret extended words, a comparison was made between features of the familiar items and features of the novel objects to which extension occurred. Table 5.3 illustrates the bases on which extension occurred. Refer to Appendix D for a description of all objects used in the naming experiment from which these conclusions were drawn.

Margaret's lexical extensions were based predominantly on shape, although this is in part due to the selection of objects. The most salient property of each object given to Margaret was shape—had other objects been presented to her, she may have relied on other properties to extend her words.

Table 5.3 Possible bases for lexical extension—Margaret

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL EXTENSION</th>
<th>BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. large ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>2. golf ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>3. small wool ball</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>4. wool apple</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>5. baby bottle</td>
<td>bottle</td>
<td>shape</td>
</tr>
<tr>
<td>6. doll's bottle</td>
<td>bottle</td>
<td>shape</td>
</tr>
<tr>
<td>7. new doll</td>
<td>baby</td>
<td>shape</td>
</tr>
</tbody>
</table>
5.33 Overextension

A total of six opportunities were provided for Margaret to overextend words she used productively. Novel objects, similar to the familiar objects but from different nominal categories, were given to Margaret to examine and name. Responses were classified as overextension, extension, failure to overextend, noncompliant, or unintelligible, as defined in 3.22. Table 5.4 contains a list of objects given to Margaret to elicit lexical overextension and her responses.

Table 5.4 Objects presented to elicit overextension and Margaret’s responses

<table>
<thead>
<tr>
<th>OBJECT PRESENTED</th>
<th>TARGET</th>
<th>RESPONSE</th>
<th>CODED RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. grapefruit</td>
<td>ball</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>2. small egg</td>
<td>ball</td>
<td>ball</td>
<td>overextension</td>
</tr>
<tr>
<td>3. eye dropper</td>
<td>bottle</td>
<td>bottle</td>
<td>overextension</td>
</tr>
<tr>
<td>4. glass jar</td>
<td>bottle</td>
<td>bottle</td>
<td>overextension</td>
</tr>
<tr>
<td>5. glow worm</td>
<td>baby</td>
<td>baby</td>
<td>overextension</td>
</tr>
<tr>
<td>6. teddy bear</td>
<td>baby</td>
<td>did not explore</td>
<td>noncompliant</td>
</tr>
</tbody>
</table>

Of the six opportunities provided to overextend words, Margaret overextended five times and was noncompliant when naming one object. Table 5.5 illustrates these results.
Table 5.5 Opportunities to overextend and Margaret's responses

<table>
<thead>
<tr>
<th>RESPONSES</th>
<th>TOTAL NUMBER</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overextension</td>
<td>5</td>
<td>83.33</td>
</tr>
<tr>
<td>Noncompliant</td>
<td>1</td>
<td>16.67</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>100.00</td>
</tr>
</tbody>
</table>

5.321 Bases for overextension

To determine the bases on which Margaret overextended her words, a comparison was made between characteristics of the familiar objects and characteristics of the novel items to which overextension occurred. Table 5.6 illustrates the bases on which overgeneralization occurred. Margaret overextended her words on the basis of similarities in shape, texture, and parts. Appendix D contains a description of all familiar and novel objects presented to Margaret to name.

Table 5.6 Possible bases for lexical overextension

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LEXICAL OVEREXTENSION</th>
<th>BASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. grapefruit</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>2. small egg</td>
<td>ball</td>
<td>shape</td>
</tr>
<tr>
<td>3. eye dropper</td>
<td>bottle</td>
<td>texture</td>
</tr>
<tr>
<td>4. glass jar</td>
<td>bottle</td>
<td>shape</td>
</tr>
<tr>
<td>5. glow worm</td>
<td>baby</td>
<td>similar part</td>
</tr>
</tbody>
</table>
5.4 Spontaneous Extension

To determine whether Margaret extended words she used, Margaret's foster mother was asked to track Margaret's use of five words (cat/chat, bottle, ball, bike, baby) over a one-week period. These words were chosen on the basis of the following rationale:

**cat/chat:** Margaret's foster mother reported that Margaret used both the French and English form of this word to refer to her own family's pet cat. Margaret's foster mother was asked to track the use of both forms in order to determine whether the words were used interchangeably and whether either of the words (or both) were extended (or overextended) spontaneously to other referents.

**bike:** Margaret's foster mother reported that this was one of the newest words Margaret had acquired. Because the word was newly acquired, Margaret may have been using it with only a partial meaning, making it particularly vulnerable to overextension. The original referent for this word was her foster brother's motorcycle.

**bottle, baby, ball:** These three words were produced by Margaret during her initial play session with the experimenter in reference to her own drinking bottle, favourite doll, and own ball, respectively. The words were chosen as the three target words around which the naming experiment (see 5.3) was designed to elicit extension and overextension. Margaret's foster mother was asked to track Margaret's spontaneous use of the words because spontaneous data on the same words would allow direct comparisons between spontaneous and elicited results.

The data provided by Margaret’s foster mother indicated that Margaret did extend her words to new referents. Table 5.7 illustrates Margaret’s original and extended use of the words baby, cat, and ball. Extension data was not available for the word bike as, to her foster mother's
knowledge, Margaret did not produce that word during the one-week period when the diary was being compiled. Margaret’s foster mother recorded two examples of Margaret’s use of bottle, but in both cases Margaret was referring to the original referent and did not display extension.

<table>
<thead>
<tr>
<th>WORD</th>
<th>ORIGINAL REFERENT</th>
<th>EXTENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ball</td>
<td>Margaret’s own terry cloth ball</td>
<td>Margaret said &quot;ball&quot; as she a new ball out of a basket in a store she went to with her foster mother</td>
</tr>
<tr>
<td>baby</td>
<td>Margaret’s own doll</td>
<td>Margaret said &quot;baby&quot; when she heard the cry of a baby on a tape of familiar sounds</td>
</tr>
<tr>
<td>cat</td>
<td>Margaret’s family pet</td>
<td>Margaret said &quot;cat&quot; at a friend’s house as the friend’s cat came in the house from outside</td>
</tr>
</tbody>
</table>

5.5 Spontaneous Overextension

Data on spontaneous overextension was obtained from two sources: transcripts of experimental sessions with Margaret and diary data collected by Margaret’s foster mother. Results from each source of data are described below.

5.51 Spontaneous overextension--transcript data

Both of Margaret’s experimental sessions were transcribed by the researcher and instances
of spontaneous overgeneralization were identified as defined in 3.31. A language sample of 154 child utterances provided the basis for the spontaneous overextension analysis. Five spontaneous overextensions involving two types of single nouns were identified. Table 5.8 illustrates the amount of spontaneous overgeneralization obtained from the data base.

Table 5.8 Spontaneous Overextension Occurring in the Language Sample

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL NUMBER</th>
<th>TOTAL TYPES</th>
<th>OVEREXTENSION</th>
<th>TYPES OVEREXT</th>
<th>% OVEREXT BY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>68</td>
<td>18</td>
<td>5</td>
<td>2</td>
<td>11.11</td>
</tr>
<tr>
<td>Single Verbs</td>
<td>9</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Noun Phrases</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Verb Phrases</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Routines</td>
<td>17</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Yes/No</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Adverbs</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Pronouns</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>53</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>154</td>
<td>--</td>
<td>5</td>
<td>2</td>
<td>--</td>
</tr>
</tbody>
</table>

Each utterance in the data base was coded as either spontaneous or imitative (as defined in 3.31). The majority of Margaret's utterance types were spontaneously produced. Table 5.9 illustrates the number of spontaneous versus imitative utterances within the language sample.

Overextensions were all utterances produced spontaneously by Margaret. Therefore, spontaneous overextensions could be compared to total spontaneous utterances to determine the overall incidence of spontaneous overextension. This data is illustrated in Table 5.10.
Table 5.9  Spontaneous versus imitated utterances

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL NUMBER</th>
<th>TOTAL TYPES</th>
<th>SPONT. TYPES</th>
<th>% TOTAL</th>
<th>IMIT. TYPES</th>
<th>% TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>68</td>
<td>18</td>
<td>14</td>
<td>77.78</td>
<td>4</td>
<td>22.22</td>
</tr>
<tr>
<td>Single Verbs</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>40.00</td>
<td>3</td>
<td>60.00</td>
</tr>
<tr>
<td>Noun Phrases</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Verb Phrases</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>100.00</td>
</tr>
<tr>
<td>Routines</td>
<td>17</td>
<td>7</td>
<td>7</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Yes/No</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Adverbs</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
<td>1</td>
<td>100.00</td>
</tr>
<tr>
<td>Unintelligible</td>
<td>53</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 5.10 Overall frequency of spontaneous overextension

| CATEGORY         | TOTAL TYPES | TOTAL SPONTANEOUS TYPES | TYPES OF SPONTANEOUS OVEREXTENSION | PERCENTAGE OVEREXTE.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Nouns</td>
<td>18</td>
<td>14</td>
<td>2</td>
<td>14.29</td>
</tr>
</tbody>
</table>

5.52  Spontaneous overextension—diary data

Margaret’s foster mother was asked to record all instances of overextension that she noticed over a one-week period. Margaret’s foster mother reported that she did pay close attention to Margaret’s words during that week, but did not notice any overextension. As a result, no examples of spontaneous overextension were recorded in the diary. Perhaps one week was not a long enough period for Margaret’s foster mother to capture examples of spontaneous overextension. More comprehensive spontaneous data may have been obtained if Margaret’s foster mother had collected diary data for two or three weeks.
5.6 Sorting Experiments

Three sorting tasks were given to Margaret to determine whether she displayed classification skills. Procedures for two of these tasks (sorting food, sorting blocks and balls) have been described in 3.51 and 3.52. Procedures for a third sorting task not given to other subjects in this investigation is described below along with Margaret’s results.

5.6.1 Sorting food

Margaret was given a bowl with grapes and raisins and encouraged simply to eat her snack. One by one, Margaret selected and ate all of the grapes in the bowl. She did not eat any raisins at this time. After eating her second grape she did pick up a raisin and look at it briefly, but quickly put it back in the bowl and selected another grape to eat. After all of the grapes were finished, Margaret selected and ate several raisins one-at-a-time.

The behaviour displayed by Margaret during this task was similar to the classificatory behaviour described by Sugarman (1983) as successive iteration. Margaret selected one group of things that were the same and then went on to select a second group of things that were the same.

Her reasons for selecting grapes first may have been twofold. First, grapes are larger than raisins and, in this respect, may have been more salient to Margaret. Second, Margaret’s foster mother reported that Margaret preferred the taste of grapes to that of raisins. Margaret may have known that the grapes were her preferred food item and, therefore, may have chosen that item first, leaving the raisins uneaten until the grapes were finished. Regardless of her motivation for selecting grapes first, Margaret’s behaviour was clearly classificatory in nature.
5.62 Sorting blocks and balls

When given a mixture of blocks and soft texturized balls to drop into a shoebox, Margaret proceeded in the following manner:

Trial 1:
1. Margaret visually searched the pile of blocks and balls.
2. Margaret selected two balls simultaneously, one with each hand.
3. Margaret dropped each ball into the box.
4. Margaret visually searched the block/ball array and selected another ball.
5. Margaret dropped the ball into the box.
6. Margaret visually searched the block/ball array and selected another ball.
7. Margaret dropped the balls into the box.
8. Margaret visually searched the block/ball array and selected another ball.
9. Margaret dropped the ball into the box.
10. Margaret visually searched the array again, but no more balls were present.
11. Margaret selected five blocks successively and dropped them into the box.

Trial 2: On a second trial, Margaret visually searched the pile of blocks and balls and consecutively selected seven balls, and dropped them into the box. After the seventh ball, no balls were left in the array. Margaret began to drop blocks into the box, one at a time, for a total of nine blocks.

As in the Food Sorting task, Margaret displayed successive iteration classificatory behaviour while sorting blocks and balls. She chose one group of objects that were the same and then went
on to chose a second group of similar objects. In both trials, Margaret chose all of the balls first and then chose the blocks. Her reason for doing so may have been the fact that the balls were novel items to her. Margaret had played with the blocks in this experiment just prior to this sorting task and had other similar blocks of her own which she enjoyed playing with. The texturized balls, on the other hand, were novel. Sugarman (1983) reported that young children tended to chose novel objects over familiar items in sorting tasks similar to the one described above.

5.63 Sorting blocks and nesting cups

Margaret was presented with an array of blocks and nesting cups and told to "fix them up." The experimenter continued to encourage her to "fix up the toys" when she became disinterested in the task. Margaret proceeded to "fix up the toys" in the following manner:

1. Margaret selected a large nesting cup.
2. Margaret put one block inside the cup and said block.
3. Margaret put a second block in the cup.
4. Margaret put a third block in the cup.
5. Margaret picked up the cup with the blocks inside it and took it to her mother. She offered the cup to her mother and said cup.
6. Margaret took the blocks out of the cup and held them in one hand, while holding the cup in her other hand.
7. Margaret shook the cup in her hand and said cup.
8. Margaret looked at the blocks in her hand and said block.
9. Margaret put the three blocks back into the cup and said cup.
10. Margaret picked up another block, said block, and put it into the cup.

11. Margaret shook the cup with the blocks inside.

12. Margaret picked up another block and put it into the cup.

13. Margaret put the cup and blocks down on the floor and mixed the items back in with the remaining items on the floor.

Margaret's behaviour during this sorting task was classificatory and resembled the type of classification described by Sugarman (1983) as simple iteration. Margaret tended to select from one class of objects only (i.e. blocks). While she did use one nesting cup throughout the task, Margaret was using it as a tool for sorting the blocks—it functioned purely as a container for holding the blocks.

5.7 Summary

Margaret was a 25-month-old girl, blind from retinopathy of prematurity. She had no vision in her left eye, but functional vision in her right eye. Margaret behaved much like a sighted child in that she used vision to search for objects, to examine objects, and to guide her about her environment. In experimental tasks, Margaret behaved much like the partially sighted children studied by Andersen et al. (1984).

Margaret's total productive vocabulary was 59 words. This vocabulary size was significantly smaller than sighted peers, comparable to vocabularies of sighted children 1;4 - 1;5.

In a naming experiment, Margaret was given novel objects to name to elicit lexical extension and overextension. Some of these objects were from the same nominal category as objects familiar to Margaret and provided the opportunity for Margaret to extend her words. She
extended words to 62.5% of the objects presented to her. Other objects presented during the naming experiment were from different nominal categories. These items provided the opportunity for Margaret to overextend her words. She overextended words to 83.33% of the objects presented to her.

Although choice of objects given to Margaret to name may have influenced results, Margaret’s lexical overextension appeared to be based predominantly on similarity of shape. In this regard Margaret was like sighted children who most commonly use the visually-based property shape as a basis for overextension. Lexical extensions also appeared to be based predominantly on similarity in shape.

Data on spontaneous extension was obtained from diary data provided by Margaret’s foster mother. Margaret spontaneously extended 60% of words tracked by her foster mother to new referents.

Data on spontaneous overextension was obtained from transcripts of the experimental sessions with Margaret. Margaret spontaneously overextended 11.11% of her single noun types.

Three sorting tasks were given to Margaret to determine whether she displayed classification skills. Margaret displayed simple and successive iterative classificatory behaviour during these tasks. Her behaviour was similar to that displayed by sighted 18-30 month old children in similar sorting activities (with the same qualification due to the nature of the task expressed in Chapters III and IV).
CHAPTER VI: DISCUSSION

The purpose of this study was to investigate lexical extension and overextension by blind children. Specifically, five questions were asked:

1. Do blind children extend their words to objects within the same nominal category?
2. Do blind children overextend their words to objects that are similar but from different nominal categories?
3. On what bases do blind children extend and overextend their words?
4. How are categorization abilities related to the child’s abilities to extend and overextend words?
5. How does linguistic environment appear to influence semantic development by the blind child?

The answers to each of these questions will be discussed below. It is important to remember while reading this discussion that this is a descriptive study. Only three children participated in the investigation (only one of whom was totally blind) and results from such a small sample size are not sufficient to make comparative claims.

6.1 Do Blind Children Extend Words?

Each of the blind children studied in this investigation did successfully extend his or her words. Stephen extended his words to 55.0% of the objects selected to elicit extension during the naming experiment and he spontaneously extended 50% of the words tracked by his parents
over a two-week period. Danny extended his words to 65% of the objects chosen to elicit extension during the naming experiment. Data on spontaneous word extension was unavailable. Margaret extended her words to 62.5% of the objects presented to her in the naming experiment and she spontaneously extended 60% of the words tracked by her foster mother over a one-week period. Based on these results, it is clear that blind children do extend their words. Their visual impairment does not prevent them from recognizing other exemplars of a referent.

The question that arises, then, is why has previous research (Bigelow 1987; Dunlea 1982; Andersen et al. 1984) indicated that blind children rarely extend their words? One explanation is the fact that previous investigations have focused on the earliest stages of lexical acquisition by blind children and the extension of those words. Bigelow (1987), for example, investigated early lexical development in three blind children from onset of first words until a 50-word vocabulary had been acquired. Bigelow found that her subjects showed evidence of significantly constrained word meaning—her subjects rarely extended their early words. Bigelow concluded that the failure to extend word meaning by her subjects reflected a lack of experience with other similar items. Although this interpretation is a plausible one, another explanation for her subjects' lack of lexical extension is possible. Because Bigelow focused on extension during the earliest stages of language development (i.e. during acquisition of the first 50 words) she may have failed to capture her subjects' true lexical extension abilities. Even normal sighted children have been reported to use words with constrained word meaning (underextension) when they are beginning to acquire their lexicon (Bowerman 1978).
6.2 Do Blind Children Overextend Words?

All of the children studied in this investigation did overextend their words. Stephen overextended his words to 60.3% of objects chosen to elicit overextension during the naming experiment. He also overextended to 10% of objects chosen to elicit extension. When these results are combined, Stephen overextended his words to 64% of objects presented to him to name. In addition, Stephen spontaneously overextended 17 word types during experimental sessions and 24 word types (to his parents knowledge) over a one-month period. Danny overextended his words to 70.59% of objects chosen to elicit overextension during the naming experiment. He also overextended one word to an object selected to elicit extension, making his overall percentage of overextension 75%. In addition, Danny spontaneously overextended one word type during the experimental sessions with the researcher and at least one type with his mother at home. Margaret overextended her words to 83.33% of objects chosen to elicit overextension during the naming experiment. Her foster mother did not notice any spontaneous overextension within the home, but Margaret did spontaneously overextend two word types during the experimental sessions with the researcher.

These results indicate that blind children do overextend words. Their visual impairment does not prevent them from applying words they know to objects that are similar to original referents but, on the basis of criterial features, properly belong to other nominal categories.

Why, then, has previous research (Bigelow 1987; Dunlea 1982; Andersen et al. 1984; Landau & Gleitman 1985) indicated that blind children do not overextend words, or overextend them only rarely? Several explanations are possible. First, previous research may have focused on the wrong stages of language acquisition. Bigelow (1987) focused on lexical development
in three blind children from the onset of first words until a 50-word vocabulary had been acquired. Dunlea (1982) and Andersen et al. (1984) studied the development of the first 100 words by two totally blind and two partially blind subjects, and the extension and overextension of those words. The choice of subjects in this early stage of lexical development is curious, since much research has indicated that overextension is most likely to occur after children have acquired at least 50 words, are over 1;6 and are beginning to use propositional language. Results of this study support this--our one totally blind subject (Stephen) overextended words he learned late in development, including verbs and phrases. He may or may not have overextended during his early stages of lexical development, but we cannot comment on this because his productive vocabulary was quite large (481 words) at the beginning of the study. Previous research may have overlooked valuable data by focusing on early acquired words only.

In addition, previous research has focused on overextension during the single-word stage of language development, although Clark (1973) claims that the period of frequent overextension lasts until about 2;6 when most children are using many word combinations. In this study, Stephen overextended words even when he was well into combinatory stages of language development. In fact, he overextended word combinations. Previous research may have overlooked overextension data by focusing on the single-word stage of language acquisition only. Landau & Gleitman's (1985) research supports this hypothesis with an example of an overextension by their subject Kelly. When given a pumpkin, Kelly replied "oh, a ball" (Landau & Gleitman 1985:32). She overextended a word, but was past the single-word stage of language development. Urwin (1984) also supports this when she noted that her blind subjects did not overextend words until development progressed through the single-word period.
Previous researchers, then, have made strong claims about semantic development based on the wrong stage of development.

6.3 On what bases do blind children extend and overextend their words?

Based on results of this study, blind children appear to use a variety of features to extend and overextend their words. Evidence for extension and overextension on the possible bases of sound, shape, texture, quantity, action, parts, taste and smell was provided by the children in this study. This indicates that, like sighted children, blind children have available to them a variety of features upon which to extend words and use a variety of features to do so. As previous research with sighted children has indicated (Clark 1973), it is often difficult to separate out features of an object and, therefore, it is not possible to determine whether blind children rely more heavily on nonvisual cues (i.e. taste, smell, texture) than on those that are most often visually-based for sighted children (shape, size). Likewise, while research with sighted children indicates that nonvisual properties (taste, smell) are not as commonly used as the bases for lexical extension and overextension by sighted children, this may in part have been due to the objects involved. If presented with objects similar in taste and/or smell, sighted children may indeed extend and overextend on those bases with a greater frequency than is indicated by spontaneous extension and overextension data.

6.4 How are categorization abilities related to the blind child’s abilities to extend and overextend words?

Andersen et al. (1984) and Dunlea (1982) investigated language acquisition in six children with varying degrees of visual impairment. These researchers found that their blind subjects were
unusually restricted in their ability to properly extend word meaning beyond the original context. The researchers also noted that their blind subjects did not display spontaneous sorting behaviour, nor could classificatory behaviour be elicited in individualized experiments. Such behaviour by sighted children indicates the existence of categories, and lexical extension and overextension assume categorization abilities. The investigators concluded that the absence of visual information had "a detrimental effect on category formation" resulting in the inability of blind children to extend and overextend their words.

Two sorting experiments were included in this study to further investigate classification skills in blind children. The results of this part of the study would be particularly important if the children had not extended or overextended their words. All three of the children displayed classificatory behaviour. Their visual impairments did not have a detrimental effect on category formation and, thus, did not impair lexical extension and overextension abilities.

Why did subjects in the investigations by Dunlea (1982) and Andersen et al. (1984) not display categorization abilities? Unfortunately, this question cannot be fully answered because neither Dunlea (1982) nor Andersen et al. (1984) described their method for eliciting or analyzing classificatory behaviour by their subjects. It is possible that their bases for determining whether behaviour was classificatory or not was not adequate, given their subjects’ ages. As Sugarman (1983) noted, classificatory behaviour is displayed differently depending on the child’s age. Perhaps Dunlea (1982) and Andersen et al. (1984) did not adjust their criteria for determining whether behaviour was classificatory or not depending on the age of their subjects.
6.5 How does the child's linguistic environment appear to influence semantic development by the blind child?

Previous research by Kekelis & Andersen (1984) has indicated that speech of parents addressing a blind child differs from that of parents addressing a sighted child. Parents of the blind children in their study tended to provide linguistic input consisting largely of labels—they ensured that their child heard names for things, but, in contrast to parents of the sighted children, tended not to provide detailed descriptions of the environment and its stimuli. In this study, Stephen and his mother were observed during a play session and their interaction analyzed. Contrary to findings of Kekelis & Andersen, Stephen’s mother provided linguistically rich input to her son. She compared new and familiar objects, related new events to past experiences and used language to provide incentive for Stephen to explore his environment. The language input provided by Stephen’s mother’s was functionally equivalent to the information normally obtained through vision by sighted children.

Stephen’s language development was advanced for his age. His productive vocabulary at the beginning of the study was larger than that of 90% of sighted peers. At the end of the study, when Stephen was only 1;10, he was producing three-, four-, and five-word utterances. In addition, Stephen did extend and overextend his words both spontaneously and in experiments. While it is not possible to conclude that Stephen’s language development was advanced because his mother’s input to him was so rich, it is certainly possible that this input facilitated language development. Her input--particularly her attempts to compare objects to one another and relate new learning situations to previous experiences--may have encouraged development of categorization skills, allowing Stephen to extend and overextend his words.
6.6 Implications for Further Research

This study indicates that blind children do extend and overextend their words, but comparative claims cannot be made because of the small number of children who participated in the investigation. Further research is warranted. First, it would be valuable to obtain information from a larger data pool—lexical extension and overextension abilities from other blind and partially sighted subjects should be combined with this data. This information would allow us to describe the role of vision in semantic development more completely.

Second, longitudinal data on lexical extension and overextension abilities of blind children would be extremely valuable. The ideal subject for this study would be a child much like our subject Stephen—totally blind but normally developing in all other areas, with a supportive home environment. The child’s word extension and overextension should be studied from onset of first words until s/he is well into the combinatory stages of language acquisition. This data would allow us to follow the development of word meaning over time and to study the child’s changing abilities to extend his/her words through development.

Finally, further research investigating the nature of lexical extension and overextension is warranted. On what bases do blind children extend and overextend their words? An answer to this question could be obtained by replicating the naming experiment used in this study, while balancing the experimental items in terms of feature types. This would provide the analyst with information about the relative importance of one feature type over others to blind subjects.

6.7 Summary and Clinical Implications

This study investigated lexical extension and overextension by blind children. Results
indicated that, despite the fact that visual information about objects and events was unavailable to subjects, they were able to extend and overextend words both spontaneously and in experiments. A visual impairment did not prevent the children from recognizing other exemplars of a referent, or from applying words they knew to objects that were similar to original referents, but properly belonged to other nominal categories. In addition, the subjects in this study clearly displayed classificatory behaviour during sorting tasks, indicating that their visual impairment did not have a detrimental effect on category formation.

Results of this study also indicated that language input may play a significant role in the development of meaning by blind children. Previous research has indicated that blind children's word meanings are highly constrained and, that language input provided by parents consists mainly of object names. The totally blind subject investigated in this study extended and overextended words frequently and input from his mother was extremely rich. These findings imply that linguistic input plays a role in facilitating semantic development by blind children.

Several clinical implications can be drawn from the results summarized above. First, if a blind child is acquiring word meaning in a constrained manner, it is important to remember that this is not due to the "blindness" itself. While theories of semantic development take it for granted that vision provides much of the information necessary for development of meaning, that information can be obtained from other sources. Nonvisual percepts such as hearing, touch, smell and taste are still available to the blind child and can provide some information about word meaning. The blind child should be encouraged to explore his/her environment using as many of these percepts as possible. More importantly, language input can become "functionally equivalent" to the eyes--linguistic input to the child can provide much of the information typically
obtained through vision by sighted children. Parents and educators of the blind should be counselled about how vision facilitates the acquisition of meaning and how their language can replace that lost information for blind children.
REFERENCES


APPENDIX A:

List of Characteristics for Each Object Presented to Stephen to Name

1. familiar keys: several metal keys on a leather key ring
   a. novel keys: several metal keys on a ring without leather
   b. single plastic key: one plastic key
   c. single metal key: one common house key
   d. plastic keys: three plastic keys on a ring, each about three times the size of a regular house key
   e. diaper pin: metal diaper pin, somewhat similar to a single metal key
   f. bubble blower: utensil used by children to blow bubbles with soap mixture
   g. paper clips: several metal paperclips on a ring
   h. bobbins: three plastic knitting bobbins on a knitting stitch holder

2. familiar spoons: set of metal measuring spoons, held together by a ring
   a. new measuring spoons: identical to the familiar set but made of plastic
   b. wooden spoon: single wooden spoon
   c. steel spoon: single teaspoon
   d. steel spoons: three teaspoons, not hooked together
   e. ladle: soup ladle
   f. serrated spoon: large serving spoon with slots in it
   g. ice cream scoop: regular plastic ice cream scoop

3. familiar ball: small (tennis ball size) smooth, plastic ball that rattled when moved
   a. large ball: large (pumpkin size) plastic ball
   b. golf ball
   c. medium ball: medium (cantaloupe size) plastic ball
   d. plum
   e. grapefruit
   f. plastic egg

4. familiar book: hardcover, rectangular-shaped book with braille dots on each page representing the text, approximate dimensions 6" X 11"
   a. new book: hardcover, rectangular-shaped book, without braille dots, 8" X 11"
   b. coil notebook: small notebook with a coil binding, 3" X 5"
   c. magazine
   d. t.v. guide
e. covered clipboard: clipboard that opens and closes like a book with a clip inside of it to hold a pad of paper, 8" X 11"

f. soft folder: common file folder

5. familiar phone: large phone with a dial
   a. new phone: smaller than familiar phone, similar in shape but with buttons rather than a dial
   b. toy phone: Fisher Price toy phone with wheels
   c. dial chip: plastic disc with holes around the outside resembling a dial of a telephone
   d. receiver rattle: baby rattle shaped like a telephone receiver
   e. arch block: wooden block in the shape of an arch or bridge
Appendix B: Spontaneous Overextensions Produced by Stephen

The following examples are quoted directly from the diary completed by Stephen’s parents.

While at a restaurant, Stephen climbed up onto a bench or booth seat, stood up and felt the flat area on top of the backrest of the seat and said *table*.

While at a house birthday party, Stephen felt the pant leg of a man standing beside him and said *daddy*. Later at the same party, he was playing on a bed and when he touched a lady’s arm he said, *mommy*.

At lunch, I gave him a dish with cubes of cantaloupe and he exclaimed *honeydew!* (I can’t remember if he had already started eating it but he had been getting a fair amount of honeydew with his meals that week.

While playing around/at the patio door, Stephen banged his hand on the screen door and said *kick it*.

Stephen was playing with the frying pans. When he touched a frying pan lid handle he asked me to *wind it*.

At a friends house, Stephen felt the front of a fish aquarium and said *tv*.

Stephen was playing on our bed. Stephen was lying down and I was sitting beside him. He asked me to *sit down* when I knew he meant he wanted me to "lie down" beside him.

Stephen was playing with the water hose outside. He held it (the end) up to the side of the house and said *plug it in*.

We were at our in-laws house, my husband was changing Stephen’s diaper in the laundry room. After Stephen felt the linoleum floor and the cupboards, he said *kitchen*.

Stephen was patting his brother’s bum and said *tummy*. His brother was lying down on his stomach.

Stephen was getting frustrated trying to get his shoe off and screamed *get it out*!

When we walked into a public washroom, after touching the tile floor and walls he said *swimming pool* (similar to where we’ve taken him swimming).

Stephen got up onto a tandem swing seat (two seats facing each other), sat on the foot rest and said *seat*. 
Stephen and his Dad went up on the upper deck of a ferry boat. It was quite windy and Stephen said big fan.

Stephen was lying on the floor, kicking his feet on the floor as fast as he could and said running.

While affectionately exploring his baby brother, Stephen put his arm down Patrick’s shirt and said Patrick have a brassiere.

On two occasions, once with a toilet seat lid and another time with a container lid, Stephen said open door and close door as he opened and closed the lids.

While playing with a container, Stephen placed it on his head and said hat on, then placed it on his foot and said shoe on. (These may not be examples of overextension but rather, pretend play).

Stephen, while playing with the garden hose outside, put the nozzle up to the house and said don’t play with it, you get big shock.

Stephen held the tips of my thumbs together and said plug it in.

With a smile on his face, Stephen held up a container of cheerios to his mouth and said drink it.

Stephen and I were playing in the kitchen on the floor, he picked up a cow (from his pail of farm animals) and said pig.
APPENDIX C:

List of Characteristics for Each Object Presented to Danny to Name

1. familiar ball: small, round, plastic ball that rattles when moved
   a. medium ball: medium-sized plastic ball
   b. knitted apple: knitted toy resembling an apple
   c. golf ball
   d. tennis ball
   e. orange
   f. plastic egg: identical in shape and size to a real egg, with a crease across its middle that opens into two halves when turned

2. familiar phone: square-based telephone with buttons rather than a dial
   a. new phone: rectangular-based telephone with buttons rather than a dial
   b. toy phone: Fisher Price toy phone with wheels
   c. receiver rattle: baby rattle shaped like a telephone receiver
   d. arch block: wooden block in the shape of an arch

3. familiar keys: several metal keys on a leather key ring
   a. new keys: several metal keys on a ring without the leather piece
   b. single key: single metal house key
   c. plastic keys: three plastic keys on a ring
   d. bubble blower: utensil used by children to blow bubbles with soap mixture
   e. bobbins: three plastic knitting bobbins on a knitting stitch holder
   f. paper clips: several metal paperclips on a ring

4. familiar car: wooden car with 4 wheels
   a. small Mattel car, made of metal
   b. plastic car: metal car with 4 wheels, approximately the same size as the familiar car
   c. school bus: plastic school bus with 4 wheels, 5 times the size of the familiar car
   d. fire engine: metal fire engine with 4 wheels, the same size as the familiar car
   e. wheel: single rubber wheel, approximately the same size as a silver dollar
   f. tram: plastic tram with 4 wheels, the same size as the familiar car

5. familiar book: square-shaped book made of cotton fabric, 8" X 8"
   a. new soft book: square-shaped book the same size as the familiar book, made of soft paper, the same size as the familiar book
b. hard book: hardcover book, square-shaped, the same size as the familiar book
c. coil notebook: small notebook with a coil binding, 3" X 5"
d. covered clipboard: plastic clipboard that opens and closes like a book with a clip inside of it to hold a pad of paper
e. soft folder: common file folder

6. familiar cup: plastic drinking cup without handles

   a. small glass
   b. paper cup
   c. tin cup: tin cup with a handle
   d. coffee filter: single cup size
   e. tupperware container: approximately the same size as Danny's familiar cup, slightly wider
APPENDIX D:

List of Features for Familiar and Novel Items Presented to Margaret during the Naming Experiment

1. familiar ball: small round ball made of terrycloth, slightly larger than a tennis ball
   a. large ball: large plastic ball, pumpkin size
   b. golf ball
   c. wool ball: small knitted soft ball, slightly larger than a golf ball
   d. knitted apple: knitted toy resembling an apple, the same size as the familiar ball
   e. grapefruit
   f. small egg: tiny plastic egg-shaped toy

2. familiar bottle: plastic drinking baby-bottle with soft nipple
   a. new bottle: plastic drinking baby-bottle, larger than the familiar bottle with a hole in the centre used by the child as a handle
   b. doll’s bottle: small plastic doll’s bottle
   c. eye dropper
   d. glass jar: glass preserving jar with a lid on it

3. familiar baby: hard doll with synthetic hair and eyes that open and close when the doll is moved, approximately 1 1/2 feet long
   a. new doll: hard doll with synthetic hair; eyes did not open and close when the doll is moved, approximately the same size as the familiar baby
   b. scarecrow: knitted toy resembling a scarecrow with hair made of wool as well
   c. glowworm: doll-like toy with a face like a baby but worm-like in that it has no arms or legs
   d. teddy bear: approximately 6” long