

A BLIND CHILD'S MEANING FOR LOOK:  
A REPLICATION OF LANDAU & GLEITMAN

by

Cynthia Maureen Murphy  
B.A., Simon Fraser University, 1984

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF SCIENCE

in

THE FACULTY OF GRADUATE STUDIES  
Faculty of Medicine  
School of Audiology and Speech Sciences

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

October 1987

© Cynthia Maureen Murphy, 1987

In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the head of my department or by his or her representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

School  
Department of Audiology and Speech Sciences

The University of British Columbia  
1956 Main Mall  
Vancouver, Canada  
V6T 1Y3

Date Oct. 15, 1987

## ABSTRACT

Landau and Gleitman's experiments investigating a blind child's meaning for *look*, as it applied to herself, were replicated with a three year old boy who was totally blind, and had no concomitant disorders. Several commands to *look* were presented within informal play sessions. Responses to the *look* commands were compared with responses to instructions to *touch*, *listen* and *taste*. Experiments were video recorded for subsequent analysis. It was found that the blind child associated the haptic perceptual modality with the visual verb, in that an instruction to *look* at an object elicited manual exploration of the object. His meaning for *look* was distinct from his meanings for the other perceptual verbs. These findings were consistent with Landau and Gleitman's findings. Landau and Gleitman's interpretation, of how a blind child's mastery of visual terms bears on the word/meaning mapping problem, is critically discussed.

## TABLE OF CONTENTS

TITLE PAGE	i
ABSTRACT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	iv
ACKNOWLEDGEMENTS	v
INTRODUCTION	1
CHAPTER ONE. BACKGROUND OF THE STUDY	3
What is Currently Known about Blind Language Learners	3
The Motivation for the <i>Look</i> Experiments	10
CHAPTER TWO. THE EXPERIMENTS	18
Method Overview	18
Experiment One	24
Experiment Two	38
Experiment Three	52
Experiment Four	61
Experimentation with the Control Subjects	69
Experiment One	69
Experiment Two	72
Experiment Five	76
CHAPTER THREE. DISCUSSION	80
Summary of Results of the <i>Look</i> Experiments Replicated with a Blind Child	80
Summary of Results of the <i>Look</i> Experiment Replicated with a Blindfolded Sighted Child	82
The Generalizability of Findings of the Original <i>Look</i> Experiments	83
Further Evidence to Delineate the Role of Experience within the Word/Meaning Mapping Task	85
An Alternative Explanation for the Acquisition of Verbs	90
CHAPTER FOUR. CONCLUSION	96
BIBLIOGRAPHY	97

## LIST OF TABLES

TABLE I.	Differentiation of Bryan's Responses to <i>Look</i> and <i>Touch</i> According to the Exploratory/Nonexploratory Parameter	49
TABLE II.	Bryan's Response-Types for Each Experimental Condition	67

## ACKNOWLEDGEMENTS

Grateful acknowledgement is extended to:

Dr. Carolyn Johnson for her close involvement in the collection of data, and expert advice in composing the thesis;

Elizabeth MacLeod for her time and helpful suggestions;

my friends and family for their moral support throughout.

## INTRODUCTION

Through their research, Barbara Landau and Lila Gleitman have addressed a number of theoretical questions pertaining to first language acquisition. One issue which has received a considerable amount of their attention involves the mapping of meaning onto heard utterances. Landau and Gleitman have maintained that extralinguistic experience (i.e. an interpretive context) plays a requisite role in a child's language learning. However, while calling experience mandatory, they have also argued its insufficiency. According to these researchers, the interpretive context is supplemented by a specific innate predisposition which enables the child to use language itself in the initial determination of the meaning of utterances. Landau and Gleitman's theoretical orientation challenges the extreme view that language learning is explained by repeated associations of speech signals and extralinguistic experience.

With the goal of constraining the role of experience within language learning, Landau and Gleitman investigated the linguistic development of blind children. These children were of particular interest to them because their access to an interpretive context for heard utterances was considered to be reduced. Landau and Gleitman reasoned that if language acquisition could proceed normally, given diminished extralinguistic experience, then a biological program for language learning would be indicated.

Landau and Gleitman collected naturalistic data from three congenitally blind children for periods of two to four years. In addition, they conducted a series of experiments with one of their subjects, a little girl named Kelli. The experiments examined this blind child's meaning for words such as *look*, *see* and *color* terms which, in their literal sense, map exactly onto visual experience. Landau and Gleitman showed that in the absence of a conventional interpretive context, Kelli

acquired normal sophistication in the use and understanding of these terms. They asserted that this finding could best be accounted for by an innate capacity to use language itself as a cue to conveyed meaning. In their book, **Language and Experience**, Landau and Gleitman (1985) described their research with blind language learners, and detailed their explanation for these children and all children's success with linguistic development.

This thesis reports a replication of Landau and Gleitman's experiments involving the term *look*. The primary objective of the thesis is to test the generalizability of the findings from their single subject investigation. The secondary objective is to evaluate Landau and Gleitman's interpretation of the relevance of their findings to language acquisition theory.

Chapter one briefly reviews literature relevant to blind children's language development, in order to establish a context in which to consider Landau and Gleitman's research and my replication of their *look* experiments. It will also present the theoretical perspective which prompted Landau and Gleitman to conduct the studies they did, and which influenced the conclusions they drew. Presented in subsequent chapters will be the method used in the original and replicated *look* experiments, the results from each set of experiments, and a discussion of how the findings bear on language development theory.



# **CHAPTER ONE**

## **BACKGROUND OF THE STUDY**

### **WHAT IS CURRENTLY KNOWN ABOUT BLIND LANGUAGE LEARNERS**

To date, the course of language development in blind children has received relatively little research attention. However, due to a growing academic interest in this area, significant expansion in the current knowledge base relevant to the topic is anticipated.

Early investigations of blind children's language tended to be subsumed within general developmental studies. Consequently, language reports were limited to accounts of linguistic milestone attainment. While superficial in depth, these investigations often yielded conflicting findings. Because published reports did not always provide detailed descriptions of the studied populations, some of the variance in findings might be attributed to such factors as heterogeneity among subjects, both within and across studies. Sources of heterogeneity would include (a) degree of blindness, (b) length of gestation term, and (c) concomitant disorders. Andersen, Kekelis and Dunlea (1984) studied the effect of variable visual impairment on linguistic development, and found that children who were had minimal residual vision were more similar to sighted children than to totally blind children in their exploration of the environment, and their early use of words. This study demonstrates the problems that would evolve out of the combining of 'legally blind' and 'totally blind' children within a single group of subjects, simply described as 'blind'. It also suggests the serious limitations on the formation of generalizations when researchers failed to define their populations. Others have indicated that variation in data collection procedures, and comparisons with different sighted norms might also account for incongruous findings. The outcomes of early investigations have been difficult to interpret and compare,

because of these potential sources of discrepancy. (See Mulford 1984, and Andersen et al. 1984 for discussions of the problems involved in interpreting early studies.)

More recently, blind language learners have been studied intensively within longitudinal investigations. Data collection procedures have involved regular audio and video recordings of the children in various contexts. These rich data bases have sometimes been supplemented by lexical diaries kept by parents, and by experimental information. When reporting their studies, researchers have described their subjects extensively, enabling comparisons of findings and the formation of generalizations.

Before outlining what has been found in relation to the word/meaning mapping problem, the global picture of blind children's linguistic development should be considered. A few acquisition deviancies have been reported in the literature with enough frequency to be viewed as characteristic of this population in general. 1) Blind children are commonly mildly delayed in language onset time, which is generally defined as the point when the child acquires its first two words (Landau & Gleitman 1985, Keeler 1958, Burlingham 1961, 1964). 2) They often demonstrate a marked propensity to imitate utterances directed at themselves and even others, sometimes to the point of sounding echolalic (Wood 1970, Urwin 1984). 3) Their acquisition of the I/you pronoun distinction is often delayed (Adelson & Fraiberg, 1974). Less pervasively reported linguistic irregularities, which will be outlined in the balance of this section, may also be widely characteristic of blind children. But because these irregularities have tended to be observed in single studies involving few subjects, it may be premature to use them to typify blind language learners in general. Nevertheless, in spite of obstacles which may or may not be encountered along the way, recent and early studies alike attest to the fact

that blind children having no concomitant disorders will attain full linguistic competence within the normal time frame.

A review of the literature relevant to the role of vision in the assigning of meaning to words should begin with what is known about the development of the visual perceptual system. Studies have indicated that during the first several weeks of the neonatal period, infants can only focus well on objects about eight inches away. Because eight inches is the approximate distance between a breast feeding infant and the eyes of its mother (Robson 1967), Stern (1977:6) suggested that the natural design of anatomy and perception is adaptive towards the infant's "formation of his early human relatedness." Approximately six weeks after birth, the infant becomes capable of eye widening and brightening (Wolff 1963). By exercising this ability, the infant can more earnestly secure its mother's gaze, thereby inviting and reinforcing a myriad of social interchanges. The infant's visual motor system is essentially mature by the end of the third month, meaning that visual tracking from a distance can occur. Implicated in this maturation is the infant's volitional control over what will be maintained within view. Prior to, and during the onset of language, gaze control has been shown to be important for (a) establishing a shared focus of attention between child and caregiver (Stern 1974), (b) enabling a child to follow a change in verbal topic (Collis & Schaffer 1975), (c) allowing a caregiver to monitor the child's understanding of what is being talked about, and (d) helping the caregiver determine the referents of the child's first utterances.

Studies of the speech input to young children have readily described its 'here and now' quality (e.g. Phillips 1973, Snow & Ferguson 1977, Shatz & Gelman 1973) wherein the tendency is to talk about "whatever is directly under the child's eyes", (Clark & Clark 1977:322). This speech attribute is widely believed to facilitate the child's task of determining the meaning of what is being heard.

Reaching to seen, and reaching to heard objects are each thought to be perceptual-motor responses which allow a child to explore its environment. Reaching towards an object within view first occurs for sighted children at approximately six months. On the other hand, reaching to a sounding object emerges later, during the last quarter of the first year for both blind and sighted children (Fraiberg, Seigel & Gibson 1966, Freedman, Fox-Kolenda, Margileth & Millar 1969). In effect, the blind child's opportunity to actively explore its surroundings is comparatively delayed. Landau and Gleitman (1985) have contended that this delay surpasses the time when reaching to sound first emerges, since haptic skills require additional time to develop to the point where they could reasonably be considered as a substitute for vision.

Implicit in language acquisition theories which emphasize the importance of gaze control and visual access to an interpretive context, are predictions that the blind child approaches the word/meaning mapping task with a clear disadvantage. In response to such predictions, Urwin (1984:27) cautioned that developmental theories based on research with typical children "may be wrong or inadequate, even on their own terms." Therefore, pessimistic forecasts for blind language learners may be undue.

Direct investigations of blind infants have shown that, prelinguistically, these children don't develop gestures such as pointing or reaching - gestures which for sighted children serve as early means of expressing desires, and drawing attention to faraway objects. Rowland (1983) reported that three blind children she studied were most successful prelinguistically at expressing affective states such as pleasure and dislike. Moreover, while all three children could attract attention to themselves, none had developed an ability to direct attention towards distant objects. The absence of prelinguistic communicative gestures further inhibits a

blind child's early exploration of its surroundings, and as a result may be partially accountable for a delay in language onset.

Recognizing the difficulty in interpreting a blind infant's focus of attention, or contributions within early communicative interactions, Urwin (1978) explored the development of social relations between two blind children and their parents. She observed that touching and blowing were substituted for more conventional means of attaining these children's attention. Routines which are part of all parent/infant interactions appeared to be exceptionally important to the parents of the blind infants for sustaining social contact, and for building expectancies. The routines were gradually used in new situations, and underwent modifications to represent the children's growing range of interests. By the second year, the children were reported to be exploiting their own variations of the routines, and were lifting portions of them out of context to accompany solitary play. Modifiable routines serve as semantically familiar frameworks in which to consider new lexical items, thereby helping to organize the child's assigning of meaning to words.

Blockberger and Johnson (1985) compared the use of routines with identical twins when one twin was blind. (These are the same children who participated in my replication of the *look* experiments.) They found that, initially, routines were used with both children with nearly equal frequency. As the sighted twin approached age two and was able to introduce his own topics, the use of routines declined. During the same period, the use of routines continued with the blind twin. Even at age three, he occasionally used routines to initiate conversational interactions. By virtue of the fact that their's was a twin study, Blockberger and Johnson's evidence strongly suggests that the high proportion of routines used with a blind child is related to the child's visual impairment as opposed to parenting

style. The outcome of this study serves as impetus for more seriously considering how the frequent use of routines might benefit the word/meaning mapping task.

Several recent studies have addressed various aspects of blind children's emergence into the linguistic stage. (See Mulford 1984 for a review.) For example, Landau (1983) examined how two blind children's first fifty lexemes were distributed across six semantic categories. Those categories were: specific nouns, general nouns, action words, modifiers, personal social words, and function words. Landau compared the outcome of her analysis with the results of a similar analysis which Nelson (1973) performed with sighted children, and concluded that, when matched according to linguistic level, blind and sighted children talk about the same things in the same way. Andersen et al. (1984) studied the first one hundred lexemes of six children having varying degrees of visual ability, ranging from full vision to total blindness. In contrast to Landau, these researchers reported that blind and sighted children's early vocabularies share surface similarities only. By examining how all of the children used their vocabularies, they revealed striking differences contingent on visual ability. The blind children rarely extended the use of common nouns beyond the original contexts in which they were learned, and virtually never overextended the use of their early acquired words. Andersen et al. interpreted these findings to mean,

the process that enables young sighted children to abstract criterial features of a referent and to extend the domain of application of early words is not functioning at the same level for blind children at the onset of language. (p.12)

It was also reported that the blind children tended to use action words to refer solely to their own actions, at a time when sighted children used these words to refer to themselves and others. Regarding this finding, Mulford (1984:14) remarked that sighted children are typically prompted to comment on the actions of others, upon "seeing the agent in the act." She concluded that because a blind

child has limited access to the performances of others, it is not surprising that they are slow to extend the use of their early action words.

Dunlea (1982) examined the illocutionary force of the early utterances of the same children observed in the Andersen et al. study. Her analysis spanned the time when the children were using single word utterances, up until two and three word utterances were being produced. Dunlea found a strong correlation between the relative proportion of requests and visual impairment, and a negative correlation between the relative proportion of assertions and visual impairment. Landau and Gleitman (1985) reported the same relative proportions of requests and assertions in the early utterances of two blind children. Dunlea also found that language was used for attention-getting purposes by the blind children only, and that just one of the sighted children used language to offer/show, and draw attention. This finding demonstrates the continuity of illocutionary force which characterizes a child's communication throughout the prelinguistic and early linguistic stages of development.

Investigations of the nature of maternal linguistic input to blind children are also relevant to the word/meaning mapping problem. While interested in identifying input styles that were either beneficial or detrimental to successful language development, Kekelis and Andersen (1984) studied the maternal input to the six children observed in the Andersen et al. study. They found that the mothers of blind children provided more imperative sentence types (e.g. requests for action), and fewer descriptions of objects, persons, and events in the environment than did mothers of sighted children. Blind children's mothers also initiated a greater proportion of discourse topics. Kekelis and Andersen reported that frequent maternal requests for action were mirrored in some of the children's early language. They cautioned that blind children's reliance on directives can

harmfully limit their practice with other language functions, and can inhibit them from creatively solving their own problems when others readily respond to their requests. They also suggested that the paucity of detailed descriptions provided for blind children can forestall their discovery of the properties, functions, and relationships among objects and persons in their surroundings. These forestalled discoveries have obvious consequences affecting the selection of meaning for words.

In summary, the reviewed literature clearly suggests that blindness provokes complications within the word/meaning mapping task. In general the complications stem from delayed and inhibited opportunities to explore the world. However, the literature also highlights language learning compensatory strategies which can be employed dually by blind children and their caregivers, to overcome the hurdles created by the absence of vision. Landau and Gleitman's explanation for blind children's ultimate linguistic competence would de-emphasize the role of compensatory strategies involving modifications of extralinguistic experience. Alternatively, their explanation stresses an innate language learning ability that prevails in spite of atypical environmental input.

### **THE MOTIVATION FOR THE LOOK EXPERIMENTS**

With the objective of uncovering supporting evidence for a biologically based theory of language acquisition, Landau and Gleitman's research with blind children has been focused on the question, "How does the learner ... discover which of the many words she hears encodes which of the concepts she can understand?" (p.100). The scope of their interest has not encompassed an explanation for a child's initial concept attainment. Rather, it has been limited to the issue of how children assign meaning to words.



In accord with most language developmental theorists, Landau and Gleitman stated that experience plays a necessary role in language acquisition.

We accept as self-evident that any explanation of this learning must take nonlinguistic experience as relevant: When children hear words spoken by adults, they also observe objects, scenes, and events. (p.vii)

and,

Some interpretive context, paired with speech events, is required if language learning is to get off the ground floor. (p.1)

While different theorists have agreed on the necessity of experience, they have proceeded to debate its adequacy as the route to language learning. On one hand, many academics have assigned an emphatic role to experience, claiming that the interpretive context sufficiently enables the deduction of the correct meaning of an utterance. Extreme proponents of experience argue that all that the child must do is apply general cognitive skills in examining the elements of the interpretive context which are consistently present during repetitions of particular sequences of speech sounds. Stated otherwise, the meanings of utterances are to be inferred solely from the extralinguistic contexts in which they are heard, by means of nonspecific learning processes.

Landau and Gleitman have contended that such an explanation for language learning is improbable. To underscore the implausibility, they explained,

scenes relevant to the utterance "The cat is on the mat" are just as relevant to "The mat is under the cat" or "The cat and mat are on the floor." How is the learner to realize that the linguistic encoding (the particular sentence spoken) is of one of these descriptions of the scene and not the other? The real-world context available to the learner is apposite to all of them. ... The problem in short, is that there is always as much positive evidence in the external world for one of these interpretations as for the next. If no child chooses the false solutions, the question is how they all know enough to avoid them. (p.4)

Landau and Gleitman argued that a language learning explanation, consisting of a distributional analysis of speech-signal/experience coordinates, assumes an exorbitant amount of memorial and computational ability. While acknowledging that a child might have the sophisticated capacities to be performing ongoing

distributional analyses, Landau and Gleitman contended that this experience-based theory of acquisition makes predictions about the course of learning which contradict empirical findings. For example, because all children's linguistic environments contain situation/utterance pairings which, when considered against each other, will yield more than just the correct word/meaning mapping, incorrect inductions should be commonly observable. Yet, studies have shown that wrong mappings rarely occur. Landau and Gleitman viewed unlikely predictions which follow from the distributional analysis theory as impetus for advocating an innate component to language learning.

Alone, and in joint effort with a number of co-authors, Lila Gleitman has widely established her position in support of innatist acquisition theory, which de-emphasizes the role of experience. In a discussion of arguments commonly used to promote a biological predisposition for language, Gleitman (in press) stated that both empirical findings and logic are relevant to the defense. Derived from empiricism have been such arguments as uniformity in the course of acquisition, across cultures and in spite of variable linguistic input to the child. Citing Lenneberg (1967) as possibly the first to interpret the significance of this uniformity, Gleitman agreed that the relatively invariable course of language development is a rudimentary basis for considering a biological preprogramming.

Empiricism has also demonstrated that there are systematic disparities between a child's linguistic input and output. Gleitman stated that these disparities are relevant to innatism since they,

can be understood, but only by claiming the learner filters the input data through an emerging system of rules of grammar, rules to which he is never directly exposed. (p.4)

To exemplify the application of innate rules, Gleitman referred to the situation in which a child may be exposed only to questions such as 'What can I eat?', yet early on will produce wordings such as 'What I can eat?'. Gleitman claimed that this

type of error is predictable only if it is supposed that "the child acquires formation rules that underlie the declarative first and countenances movement rules only later" (p.5).

Asymmetries in input and output are also apparent as the child is acquiring closed class, or functor words. Gleitman and Wanner (1982) conjectured that a natural inclination of the language learner is to direct heightened attention to the stressed syllables of speech input. Because functor words are unstressed, subsyllabic units, they are subject to the filtering effect of "preexisting biases as to how to represent the sound wave" (p.6). As a result, the young language learner passes through the developmental stage characterized by 'telegraphic speech'.

Gleitman has also indicated her support of logically based arguments used to promote innatism, such as Chomsky's claim that children acquire knowledge of certain language properties for which the environment provides no insight. As an example, children become competent users of the *wanna* contraction, when the rules for its usage are neither taught explicitly, nor evidenced in extralinguistic experience. Innatists assert that a child's errorless learning that contraction can occur only if *want* and *to* are contiguous in the deep structure of the sentence, is a product of natural biases about the structural properties of language.

Gleitman has built up additional defenses for her theoretical orientation towards linguistic development, through direct research with language learners. In a study of the Motherese Hypothesis, Newport, Gleitman and Gleitman (1977) collected maternal speech samples, and assessed the language growth of fifteen young children across a six month period. The aim of their study was to identify aspects of maternal speech input that predicted rates of linguistic growth. These researchers found that, in general, differences in input were not highly correlated with variable rates of learning. This finding was viewed as support for the conclusion that certain language skills emerge at maturationally fixed times, and

are insensitive to environmental influences. The one aspect of maternal input that was correlated with learning rate involved closed class words. However, as was previously mentioned, Gleitman and Wanner offered an innatist explanation for this correlation, wherein a child, whose maternal input contains excessive use of functor words in stressed positions, will acquire these words more quickly due to a predisposition to attend to stressed units of speech.

In another investigation focused on linguistic input to children, Feldman, Goldin-Meadow and Gleitman (1978) studied the development of 'home sign' in six deaf children born to hearing parents. Home sign is an informal gestural system known to emerge in deaf children whose hearing parents do not teach them any form of gestural language. Though grossly deprived of language stimulation, the children in this study were reported to (a) use single gestures at the same developmental time as single words are produced by hearing children, (b) use two and three gesture sequences when utterances of similar length are used by hearing children, and (c) to express the same semantic/relational roles in their early gesture sequences that are expressed in the two and three word utterances of hearing children. Feldman et al. concluded that an innate predisposition guiding language acquisition was accountable for the sophisticated communication skills that surfaced in the linguistic isolates.

In the two studies just summarized, support for innatist language development theory was sought through investigations of **variable, or absent linguistic input**. Landau and Gleitman's research with blind children was intended to examine how **reduced access to the interpretive context** would impact on language learning. It was reasoned that a comparison of the courses of linguistic development for blind and sighted children could be used to delineate the role of experience within language acquisition. If blind children are little affected by their reduced access to the interpretive context, then innatism would be supported.

Landau and Gleitman collected naturalistic language data from three congenitally blind children, who had no known dysfunctions outside of their visual impairment. As mentioned previously, the data was gathered at regular intervals across periods of two to four years. The findings which emerged from the comparison are summarized below. Although some of these findings were listed earlier in the literature review, they will be restated in order to provide a clearer picture of some of the compiled evidence on which Landau and Gleitman based their conclusions about the role of experience.

- The onset of speech in blind children (i.e. the acquisition of two lexemes) tends to fall below the median onset time for sighted children, but is still within the normal limits. Like others, Landau and Gleitman have suggested that this tendency towards an onset delay is due to the late emergence of haptic exploratory skills, that enable a blind child to survey the interpretive context which accompanies speech.
- The earliest expressed meanings (i.e. the early vocabularies) of blind children are very similar to those of sighted children. "In sum, blind children talk about what most young children talk about: mommies, daddies, dolls, cookies, and toys" (p.30). (Recall that Andersen et al. indicated that an alternative method of analysis revealed contradictory findings.)
- Syntactic growth (i.e. the initial combining of two or more morphemes) occurs later in blind children, though still within the normal limits for sighted children. Despite a late onset for combining morphemes, the rate of syntactic growth for blind children parallels that of sighted children. By age 3;0 (three years;zero months), blind and sighted children are speaking in utterances of equal length.
- When matched according to MLU, blind children are very similar to their sighted peers in terms of the semantic relations expressed in their early multiple-word utterances.

- When matched according to MLU, blind and sighted children's utterances are characterized by similar syntactic complexity. One exception to this statement pertains to the use of the verbal auxiliary. Blind children are slow to acquire this structure. In accord with Gleitman and Wanner's reasoning, Landau and Gleitman concluded that because a blind child's mother asks relatively fewer questions, and gives more commands, the child's maternal input is lacking in stressed verbal auxiliaries. Consequently, blind children acquire this structure more slowly.

Beyond language onset time, and the use of verbal auxiliaries, Landau and Gleitman reported parity in the language development of blind and sighted children.

The two populations are essentially indistinguishable from each other by the third birthday, including internal organization of syntax, thematic relations, and vocabulary. It seems remarkable that children who confront the real world as differently as blind and sighted children come to have so similar a perspective of it, as revealed by this first descriptive look at their language learning. Radically different sensory-perceptual bases for induction yield a similar pattern of language development, suggesting difficulties for any simple experiential account of such learning. (pp.49-50)

In addition to the analyses performed on the naturalistic data, Landau and Gleitman conducted a series of experiments in an attempt to further demonstrate the constrained role of experience in the acquisition process. As mentioned earlier, the experiments were conducted with one of the participants in their longitudinal study, a little girl named Kelli. The experiments examined Kelli's meanings for vision-related terms such as the verbs *look* and *see*, and the color adjectives *red* and *green*. In pursuing their investigation, Landau and Gleitman reasoned that the vision-related terms "represent the case in which the experiences of the blind child and the sighted child appear to be maximally different" (p.viii). Therefore,

if extralinguistic experience provides the route to learning, a blind child should have maximum trouble with these terms, for they seem to refer to the sighted world. (pp.2-3)

Landau and Gleitman's experiments with Kelli showed that a blind child can acquire considerable sophistication with the use of the sighted vocabulary.

Regarding the outcome of their investigation, Landau and Gleitman stated,

The findings from this inquiry ... give little support to the view that first language attainment is explainable as a straightforward derivative of information provided in the environment of the learner. Rather they suggest to us a learning procedure significantly modulated and constrained by the child's natural (innate) biases about the content and form of a natural language. (p.3)

While advocating a distinct biological predisposition for linguistic development, Landau and Gleitman argued that a child initially uses language itself to determine the meaning of utterances. In their own words,

a point often missed is that part of the child's experiential context is linguistic. Very early in the learning process, the systematicity of the language code becomes available to the learner at least in its rudiments. To the extent that the language system is organized in semantically relevant ways, it serves as an important bootstrap into ever more subtle discoveries about the linguistic means for communication. In short, a critical contextual cue to language learning is language itself. (p.20)

Landau and Gleitman claimed that innatist language learning theory best accounts for the successful linguistic development of both blind and sighted children. They also asserted that innatism explains a blind child's acquisition of the sighted vocabulary, in spite of a diminution of experience. The details of how a child, preprogrammed for language learning, is thought to use language itself as an initial cue to the meaning of utterances, will be outlined in the discussion chapter, following the presentation of the *look* experiments.

## CHAPTER TWO

### THE EXPERIMENTS

#### METHOD OVERVIEW

##### Subjects for the Original *Look* Experiments

The experimental subject in Landau and Gleitman's *look* experiments, Kelli, was a child who lost her vision shortly after birth. She was the only survivor of a pair of twins born approximately three months prematurely. Her birth weight was 940 grams. As a tiny, ill infant, she was immediately placed in an isolette. Of great misfortune, Kelli's visual ability became victim to the oxygen rich environment of her isolette, which caused a condition called retinopathy of prematurity (ROP). ROP refers to vascular changes to the retinas of a premature infant. Approximately 20% of premature babies with birth weights less than 1500 grams suffer minor vascular changes in their retinas which cause minimal visual impairment, while approximately 1% suffer vascular changes that are severe enough to result in blindness. With stage 4 ROP in her left eye, and stage 5 ROP in her right eye, Kelli was diagnosed as totally blind. In later testing, it was thought that she might have some sensitivity to light in one eye, enough that she could tell bright light from darkness, but not enough to allow her to distinguish shadows or shapes. After birth, Kelli remained in the hospital for six months.

Because ROP is often associated with concurrent neurological disorders, Kelli's development was monitored throughout the years that she was involved in Landau and Gleitman's longitudinal study. It was reported that no neurological defects were ever detected or suspected. Kelli was delayed in her motor development as compared with sighted norms, though this type of delay is common among blind and premature children. She walked with support at age 1;10, stood independently at age 2;0, and walked without support at age 2;2. Socially, "Kelli seemed happy,



active, and cooperative" (p.23). Her general cognitive and perceptual development was reported as normal according to the Bayley Scales of Infant Development, and the Stanford-Binet Tests of Intelligence.

In the area of language acquisition, Kelli's rate of development was reported to be in the bottom quartile for intact blind children, according to norms derived from a study of 86 neurologically blind children (Norris, Spaulding & Brodie 1957). She said her first word at age 1;11, and combined two words in a sentence at age 2;5. With respect to the sighted vocabulary in particular, she was observed to use the words *look* and *see* before age 2;4, this being the normal time for the appearance of such words in the lexicons of sighted children (Bloom, Lightbrown & Hood, 1975). By age 3;0, when the *look* experiments commenced, Kelli was using *look* and *see* frequently and appropriately in her own spontaneous speech.

Kelli's parents were of middle-class, nonprofessional status, and were described as being very accepting of her blindness, as they provided a nurturing environment that would best enable Kelli's normal development. Kelli also had a sighted sister who was one year younger than herself.

The control subjects in Landau and Gleitman's *look* experiments were four sighted children ranging in age from 2;9 to 3;6. These children were blindfolded during the conduction of each experiment. No more than this was reported about the control subjects.

#### **Subjects for the Replicated *Look* Experiments**

The experimental subject in the replication study was a blind little boy named Bryan, and the control subject was his sighted, identical twin brother, Gregory. The language development of the two boys has been studied longitudinally since they were age 1;1, and is still being observed at present. At monthly intervals, the

twins have been video taped in their home, while engaged in daily play or eating-type activities.

Bryan and Gregory were born approximately three months prematurely, with birth weights of 1080 grams and 1060 grams respectively. As is common for premature infants, both boys experienced many medical complications in the neonatal period, including ROP. Gregory, the firstborn, and smaller twin suffered stage 3 ROP, which left him with near normal vision in one eye, and ability to see only about 15 centimeters in front of the other eye. Bryan, the secondborn and slightly larger twin, suffered stage 4 ROP with bilateral retinal detachments, resulting in total blindness. Bryan is suspected to have some light sensitivity, since he will blink with the flash of a camera fired at very close range. The boys were hospitalized during the first three months of life and were discharged at around term. They were seen at regular intervals in a neonatal follow-up clinic, and are described as having undergone essentially normal neurological and medical development, in spite of their visual impairments. Bryan is still being followed by a multi-disciplinary team for the visually impaired at B.C.'s Children's Hospital. This team provides assessments of Bryan's development, and consultation and advice for his parents.

Bryan and Gregory each said their first words at age 1;7. Their rates of linguistic growth have been normal according to sighted norms. At present, Bryan's linguistic developmental level is at age, not correcting for prematurity, and not taking into account his blindness. With respect to the visual vocabulary, both boys were using the words *look* and *see* at an age when sighted children typically include such terms in their lexicons.

The twins are the only children of a young couple who, like Kelli's parents, have been very accepting of their children's visual impairments, and have constantly provided them with nurturing and stimulating environments. The

father is a blue collar worker, and the mother stays at home fulltime with the children. There is a large extended family including grandparents, great grandparents, aunts, uncles and cousins, who live nearby and assist in the twins' care.

### **Procedure**

A set of five mini-experiments comprised Landau and Gleitman's *look* experiments. Each experiment was motivated by a particular question related to the investigation of Kelli's meaning for the word *look*, as it applied to herself.<sup>1</sup> The stimuli for each experiment consisted of a subset of commands containing the verbs *look*, *touch*, *taste* and *listen*. Testing generally consisted of presenting Kelli and the control subjects with the commands and waiting for their behavioral responses. The children's understanding or interpretations of the stimuli were inferred from the behaviors which the commands elicited.

Each mini-experiment was conducted temporally independent of the others, such that periods of two to eight weeks separated consecutive experiments. Kelli was involved in four of the five experiments, while the fifth experiment involved the sighted controls only. With Kelli, the experiments were conducted in the following order: one, two, four, three. Only Experiments One, Two and Five were conducted with the sighted controls. Order of presentation of these experiments was systematically varied for the control subjects to determine a potential learning effect. Landau and Gleitman later reported that no learning effect was observed. Commands for each experiment were presented during informal play sessions that took place in the homes of the children, or in a familiar laboratory play setting. Time intervals between the delivery of commands within a single session ranged

---

1 These experiments were meant to address four hypotheses (see Landau & Gleitman, 1985:54). Since the hypotheses are problematic and are not explicitly referred to in the authors' subsequent discussions of results, they are not presented here.

between one and thirty minutes. All experimentation was video taped, and results were gathered entirely from the video recordings. All analyzed response behaviors, including verbal responses, were coded according to relevant variables. Sample reliability checks for coding procedures were made by an independent observer. The reported inter-rater reliability was always at or above 0.90 (p.56).

In the replication study, all experimentation was carried out within informal play sessions, in the home of Bryan and Gregory. Two experimenters were used in the data collection procedure. One person (usually myself) delivered the commands, while the second person operated the video equipment and assisted in entertaining Gregory away from the experimental play setting. During the early phase of testing, an attempt was made to keep Bryan and Gregory separated, so that Bryan's responses to commands would not become an obvious model for Gregory come time for him to serve as the control subject in the study. After a certain point in testing, endeavors to separate the boys were discontinued since it became apparent that Bryan had been a natural behavioral model for Gregory long before my experimentation began, and because the twins were uneasy when apart. Test format consisted of presenting the boys with the experimental commands, and awaiting their responses. Within the play context, the pacing of the delivery of test stimuli was varied. Since Landau and Gleitman reported that the order in which experiments were conducted did not influence the children's pattern of responding, the scheduling of command presentations in the present study was managed somewhat flexibly. At a few points in the overall investigation, for reasons of convenience, commands from different experiments were delivered within the same play session. Consonant with the original study, all experimentation was video recorded for subsequent analysis. Codings for all analyzed response behaviors were checked by an independent observer. Inter-rater reliability in the replication study was 100%.

Each of the four *look* experiments which involved Bryan are presented in this chapter as self-contained units. The presentation of each experiment is subdivided into the following sections:

**Objective of Experiment** - This section contains a very brief statement of the motivation for each experiment.

**Landau and Gleitman's Procedure** - This section presents available details of the experimental procedures used by these researchers.

**Critique** - This section critically reviews the procedures used for each experiment in the original study. Included is a discussion of methodological problems that either, 1) existed and were overlooked in the original experiment, or 2) could not a priori be eliminated because of the sparseness of detail in Landau and Gleitman's published description of their procedures.

**Procedure Used in the Present Study** - This section outlines procedures used for each experiment in the replication study, including a description of any implemented procedural modifications. For the first experiment, transcripts of the command presentations and analyzed responses are detailed in the procedure section, to provide an immediately clear image of how all experimentation was carried out.

**Landau and Gleitman's Results and Conclusions** - This section summarizes the results of each of the original experiment, and Landau and Gleitman's interpretation of them.

**Results and Conclusions of the Present Study** - This section reports the results for each experiment in the replication study, and my interpretation of them.

The experiments conducted with Gregory and the control subjects are discussed in a separate section following the presentation of the experiments involving Bryan and Kelli. Although it is nonconventional to separate discussions of the control and experimental subjects in this manner, I judged that the segregation would

assist the reader in organizing the abundance of information reported in relation to each of the five *look* experiments.

## EXPERIMENT ONE

### Objective of Experiment

Through the first experiment, Landau and Gleitman sought to answer the question, 'Does *look* mean *touch* to the blind child?'.

### Landau and Gleitman's Procedure

In Experiment One, at age 3;0, Kelli was presented with the commands: *Look up, Look down, Look behind you, Look in front of you, Look over here by me, and Look over there by mommy*. The contexts for command presentations varied such that sometimes there was an object in the location mentioned in a command, and at other times not. When an object was situated in the named location, Kelli may or may not have been aware of this.

### Critique

In reporting the above procedural facts for Experiment One, Landau and Gleitman omitted certain items of information, the absence of which precluded an exact reproduction of the original methodology. This omission of information also necessitated that assumptions be made in order to accept the validity of the reported causal relationship between experimental commands and elicited responses. As an illustration of where assumptions had to be made, consider that no details were provided about the types of objects used as props whenever an object was to be situated in the location named in a command. Although it was mentioned that a *graduated ring tower* was used in conjunction with the command

*Look behind you* (p.56), no more than this was indicated. Due to this lack of specificity, it had to be assumed that highly novel or unfamiliar items were not employed as props, since observed responses consisting of manual exploration of such items could plausibly be attributed to Kelli's curiosity about the objects themselves, as opposed to her interpretation of the heard commands.

Also left unreported was specific information about the situational and verbal contexts in which Kelli was presented with the test commands. At least three approaches to delivering the commands could have been used: 1) the experimenters might have opted to wait for opportune moments, during which it would have been contextually appropriate and logical to instruct the child to *look* in a particular direction, or 2) they could have simply presented the commands 'out of the blue', irrespective of the verbal and situational context at hand, or 3) although unlikely, they could have delivered the commands within a play-type activity centered around the experimental instruction to *look*. The following hypothetical contexts for the presentation of commands demonstrate how response behaviors could have been influenced by factors unrelated to the experimental stimuli.

1) The delivery of commands within contexts that naturally called for an instruction to *look*.

Child X could have been engaged in an activity such as playing with a puzzle, whereby the pieces for the puzzle would have been scattered about her position on the floor. While the child would have been using her hands to locate a puzzle piece, an experimenter might have said, *Look in front of you*. The child might then have oriented her hands in a forward direction on the floor, and have found the puzzle piece. Based on this series of events, it could have been concluded that for this child, *look* means *seek and contact with the hands*. The response-bias in this hypothetical context becomes clear when acknowledging that a statement such as, *there's a puzzle piece in front of you*, would likely have been followed by the same

behavior as that which followed, *Look in front of you*. Because the child was already seeking in order to contact before the command was given, it could not irrevocably have been said that the instruction to *look* had a causal effect on what Child X did with her hands.

2) Presentation of test stimuli 'out of the blue'.

Landau and Gleitman's procedure for delivering commands might have involved any of the following types of verbal contexts:

(A) Experimenter: Oh, there's a ball. Look behind you.

(B) Experimenter: Oh, mommy has a ball. Look over there by mommy.

(C) Experimenter: Oh, I see a ball. Look behind you.

Within a context similar to (A) above, Child X might have been observed to orient her hands behind herself to successfully contact the ball. Based on the temporal proximity between the command presentation and the child's conduct with her hands, it might readily have been assumed that the manual exploration was elicited by the instruction to *look*. Yet, this assumption could reasonably have been challenged by the assertions that the child's response was a function of:

- her own desire to apprehend the ball.
- having been informed through the first utterance that the ball was in her presence.
- having been informed through the second utterance that the ball was 'behind' her.

Extraneous verbal input to the child such as that contained in contexts (A), (B), and (C) above, could strongly influence the behavior that would follow the presentation of a command. As a result, such input could undermine the validity of an inferred causal relationship between the stimulus command and any ensuing behavior.

3) Presentation of test stimuli in the context of a game. Although unlikely, Landau and Gleitman might have delivered the commands within a game-type



activity expressly designed for the delivery of instructions to *look*. Yet, the inherent goal (of seeking or finding) in such an activity would inevitably have biased the elicited responses. Because the presentation of any statement alluding to the location of a sought-after object in this type of context would likely have prompted a single response behavior, use of this context for the delivery of a *look* command, could also have undermined an inferred causal relationship between the the command and the ensuing response. Note that these examples all present *look* in its *look for* as opposed to *look at* meaning.

Since Landau and Gleitman did not describe the situational contexts in which the test stimuli were delivered, it must be assumed that they avoided using response-biasing contexts similar to those described above. In summary, the sparseness of procedural information in Landau and Gleitman's published account leads to much speculation about both the method by which the reported findings were obtained the validity of these researchers' conclusions.

### **Procedure Used in the Present Study**

In accord with all available methodological guidelines, an initial attempt to gather data for the first experiment was carried out with Bryan at age 3;1. This first attempt spanned four experimental play sessions conducted within three consecutive days. During the initial taping sessions, time was allowed for myself and my co-experimenter to acquaint ourselves with Bryan and Gregory, and they with us. Due to the children's high degree of sociability, little to no time was required before they were comfortable interacting with us, meaning that experimentation quickly got under way. However, adverse to the flow of experimentation, at the time that testing began, Bryan was recovering from a cold. As a result, the reliability of behaviors elicited by some of the commands fluctuated with the child's varying degree of alertness. Consequently, a small

portion of the data collected when testing commenced was rendered non-usable due to Bryan's reduced responsiveness.

Because Landau and Gleitman's book did not describe their method for presenting commands in Experiment One, a number of situational and verbal contexts were tried and modified in the replication study, in order to arrive at a procedure that was minimally response-biasing. This process revealed potential problems in Landau and Gleitman's investigation, as discussed in the previous section.

When determining which stimulus-response pairs from all accumulated data would be analyzed in each experiment, the following criteria were adhered to:

1. Bryan demonstrated some form of attending behavior towards the experimenter at the time the command was presented, e.g., sat still and silent as the experimenter spoke, or verbally responded to hearing his name called immediately before the command was delivered, or repeated the command out loud before responding to it.
2. Bryan was not already engaged in searching behavior at the time a command was presented.
3. Bryan's behavior which followed the command presentation was clearly an effort to fulfill the command, meaning that replies such as, "I don't want to," were not analyzed. This criterion also excluded from analysis, any behavior which demonstrated post-hoc that Bryan's attention had not actually been secured prior to the delivery of the command.
4. The command was presented no less than 30 seconds after the delivery of a previous command to which Bryan was criterially attending. This criterion was intended to prevent the establishment of a routine in which Bryan would repeatedly await the directional information contained in a command, then search in the named location.
5. A latency period of no more than 5 seconds existed between the presentation of a command and the initiation of a response.

To follow are descriptions of the exact contexts out of which were derived analyzable data for the first experiment. Bryan's age at the time that each stimulus was presented is indicated adjacent to the commands. As will be apparent, two commands were delivered when Bryan was age 3;4, while all other stimuli were presented when he was age 3;1.

B: = Bryan  
C: = Cynthia

1. Look up. Bryan - age 3;1.

While Gregory and his mother were busy in another room, Bryan and I sat and played on the floor in the children's bedroom. Our play activity consisted of matching circle blocks having variously textured surfaces, with round indentations on a board which had similarly textured surfaces. Several minutes into the activity, Bryan matched one of the circles with its corresponding indentation on the board, though the game was not yet complete.

C: Another one?

B: I got to get another puzzle. (referring to another play item)

C: Okay sit still. Okay sit still and listen.

Bryan remained sitting with the board for the game positioned directly in front of himself on the floor. He began to trace the circle indentations on the board with his right forefinger.

B: I want to get another puzzle.

C: Okay, are you listening?

Bryan began feeling the textured indentations on the board with his left hand, while keeping his right hand still at his side.

B: Where's another puzzle?

C: Okay Bryan? Bryan?

B: Uh.

C: Are you listening to me?

B: Yes.

Bryan continued to sit and feel the indentations on the board with his left hand.

His head was oriented in a forward position. While sitting beside him on the floor,

I held one of the circle shapes above his head.

C: Okay, *look up*.

Immediately after hearing the command, Bryan hyperextended his neck so that his face was oriented approximately towards the ceiling. While holding his head in this position, he continued to feel the indentations on the board with his left hand, as his right hand remained at his side.

C: *Look up* Bryan.

Bryan extended his head back even further and maintained the position for a total of 9 seconds.

## 2. **Look down.**     Bryan - age 3;4.

Bryan and I were alone in the living room, as Gregory and his mother were occupied in the kitchen. Bryan had been talking about wanting to play hockey, though he didn't really know what the game was. He stood in front of where I was kneeling on the floor, and with his feet anchored on the ground, he began to turn from side to side swinging his arms.

B: Hockey, hockey, hockey, I'm playing hockey.

C: No, I'm going to teach you how, okay Bryan?

I then took hold of his arms in order to stop him from swinging from side to side.

C: I'm gonna teach you how. You have to do what I tell you.

C: You have to do what I tell you.

B: Oh.

While holding onto Bryan's hands, I began to sway him from side to side.

C: You have to walk over here, then walk over here.

Bryan laughed in amusement. A few seconds later, I stopped swaying him and he stood still in front of me.

C: And now this is what you have to do. Okay listen. Okay you have to listen.

I released Bryan's hands, and he remained standing still.

C: Okay, Bryan now *look down*.

B: Okay, I'll look down.

Bryan immediately bent at the waist and at the knees, extended both hands towards the floor, and touched the floor between his feet. Next, using each of his hands he felt the floor in front of, and to the sides of his feet, then swung his hands through the air along side his feet twice. Before standing upright again, he scraped the floor between his feet with each of his hands.

### 3. Look behind you. Bryan - age 3;1.

Bryan and I were alone in the living room, as Gregory and his mother were playing in the children's bedroom. Bryan was standing near an end table where he was gathering all of the drink coasters he could find on the table. He proceeded to talk about the coasters, referring to them as cookies on a plate. I was sitting on the floor in the living room, approximately 6 feet away from Bryan.

B: I got to put it in the plate.

C: Where are you putting it?

B: In the plate.

C: In the plate? Hmm.

I stood up from where I had been sitting to see if I could find another coaster somewhere in the room.

C: Let me see if there's another one.

I sighted an additional coaster.

C: Oh here's another one.

I retrieved the coaster, then returned to my place on the floor. As if ignoring me, Bryan continued to fidget with his coasters at the end table. Without him knowing, I placed my coaster on the floor approximately 2 feet behind him.

C: Bryan *look behind you*.

B: Behind you?

Simultaneous to saying, "behind you?", Bryan grasped the edge of the end table with both of his hands, remained facing the table, and extended his right foot backwards. He contacted the coaster with his foot. In a smooth motion, he let go of the edge of the table with his right hand, pivoted his body to the right approximately 90°, bent at the waist and slightly at the knees, and extended his right arm and hand to where his foot was touching the coaster. He took the coaster into his right hand, returned to his upright position facing the end table, and placed the coaster with the others.

C: Where are you putting it?

B: Oh.

C: You're putting it in the ash tray.

Although in the above context, *Look behind you* was preceded by the the statement *Oh here's another one*, behavioral evidence clearly indicated that this extraneous verbal input did not predispose Bryan to a searching response. Consequently, the command presentation was considered analyzable.

#### 4. Look in front of you. Bryan - age 3;1.

Bryan and I were sitting on the floor in his bedroom, as Gregory and his mother were playing in the living room. We continued to play with the game for which the objective was to match the variously textured circles with their similarly

textured, round indentations on a board. More than the criterial amount of time had passed since the command *look up* had been delivered in this context. With the board situated on the floor directly in front of him, Bryan began tracing the shapes of the indentations with each of his forefingers. I was sitting beside him and holding onto one of the circle blocks for the game.

C: You need another piece.

Bryan continued to feel the indentations on the board with his right forefinger. His left hand was held still at his side, and his head was oriented in a forward direction.

C: Does that feel rough?

B: Yes.

C: Or smooth?

B: Smooth.

C: You need to put another piece in there.

B: Yeah.

C: Okay.

Bryan was still tracing and feeling the circles on the board. Without him knowing, I placed the block which I had been holding onto, in front of the board for the game.

C: *Look in front of you* Bryan.

Bryan immediately reached as far forward as he could with both of his arms extended out in front of himself. He contacted the front of the board with his left hand, then leaned back and turned to his right. From there he rose to his knees, and leaned forward across the board, supporting himself with both hands placed on the board.

C: *Look in front of you.*

Bryan then used his right hand to reach in a forward direction beyond the board. He located the circle which I had placed on the floor in front of the board.

5. **Look over here by me.** Bryan - age 3;1.

Bryan and I were alone in the living room. We were sitting on the floor, facing each other with an approximate distance of two feet between us. Situated between Bryan's legs was a stacking toy which he had been playing with. Bryan was holding onto the final piece to be placed at the top of the stack with his right hand, while touching the bottom of the stack with his left hand.

B: It's going to the bottom.

I touched the piece that Bryan was holding onto.

C: Not this piece. This piece goes on top.

B: Oh on top?

Bryan touched the top of the stack with his right hand. I also touched the top of the stack.

C: Yeah, on there.

C: Right there, that's where it goes.

B: Uh.

Bryan switched the piece he had been holding, into his right hand, and felt the middle of the stack with his left hand. I grasped the piece he was holding, and guided his hand up to the top of the stack. Bryan released his grasp of the piece, and I placed it in its position at the stack's peak.

C: There we go.

C: There, it's on.

Bryan dropped his hands to his sides, then touched his left foot with his left hand.



B: I want the ball.

I tapped Bryan's left foot with my hand.

C: What do you need now? You need the ball.

Bryan remained still with the stacking toy between his legs, his right hand at his side, and his left hand touching his left foot. Without Bryan knowing, I had been holding onto the ball that was used in a game played with the stacking toy. I placed the ball on the floor directly in front of me, and a couple of feet away from Bryan.

C: *Look over here by me.*

Bryan immediately extended his left arm and hand in my direction, and quickly located the ball which was within his reach on the floor. He took the ball into his hand and proceeded to place the ball at the top of the stacking toy.

6. Look over there by mommy. Bryan - age 3;4.

Bryan, Gregory and I were playing a game of 'Simon Says' in the living room. I was kneeling on the floor, and the boys were standing in front of me. The boys' mother was sitting on the floor approximately 5 feet from where Bryan was standing. Bryan was aware of his mother's presence in the room.

C: Simon says, "Sit down."

Both of the boys fell quickly to the floor, and landed in a sitting position.

C: Simon says, "Stand up."

The boys both rose to their feet, and stood waiting for the next command.

C: Simon says, "*Look over there by mommy.*"

Bryan pivoted his feet 90<sup>0</sup> so that he was oriented in the direction of where his mother was sitting. He then extended his arms and hands out in front of himself and ran a few steps towards his mother. Upon contacting his mother with his hands, he proceeded to hug her. Meanwhile, Gregory stood back and pointed at his mother.

### Landau and Gleitman's Results and Conclusions

In the first experiment, Landau and Gleitman found that when Kelli was instructed to *look* in a given direction, she consistently oriented her hands in the specified direction, and sometimes explored to find the referred-to object. Never did she tilt her head towards the presumed location of the object. Even when instructed to *look* behind herself, her head remained facing forward. Based on Kelli's responses to the commands for experiment one, Landau and Gleitman concluded that '*look means contact with the hands to the blind child*', (p.56).

### Results and Conclusions of the Present Study

Bryan's responses to the commands delivered for the first experiment, were outlined earlier in the transcripts. However, a summary of the experimental findings is presented below.

#### STIMULUS COMMAND

#### RESPONSE

##### 1. Look up.

Bryan hyperextended-extended his neck, to orient his face towards the ceiling.

##### 2. Look down.

Bryan bent over and oriented his hands towards the floor. He manually contacted the floor while exploring the area around his feet. No object was referred to in this command presentation.

**3. Look behind you.**

Bryan extended his right foot behind himself and contacted the target object with his foot. Next he turned and extended his right hand to where his foot was touching the object. He then picked up the object.

**4. Look in front of you.**

Bryan extended both of his arms out in front of himself so that his hands were oriented in a forward direction along the floor. He then propped himself up so that he could lean further forward. While extending out his right hand, he manually explored the floor in front of himself. Upon contacting the target object with his hand, he picked it up.

**5. Look over here by me.**

Bryan extended his left arm out in front of himself, so that his hand was oriented in the direction of where I was sitting on the floor. He contacted the target object with his hand, and picked it up.

**6. Look over there by mommy.**

Bryan turned so that he was facing his mother. He then extended his arms and hands out in front of himself and ran forward a few steps. He contacted his mother with both hands, and proceeded to hug her.

Bryan demonstrated a similar type of behavior in response to all commands except *Look up*. Upon hearing this particular instruction, Bryan oriented his face in the named direction. Given the peculiarity of this behavior, it was decided that the same command should be delivered at later points in time, in order to test the reliability of the head-tilting response. Following repeated presentations of the command, it was found that Bryan's head-tilting behavior constituted a reliable response. The illogical nature of this response led to an inquiry about its occurrence. Bryan's mother was asked if she regularly instructed Bryan to *Look up* within a specific context. She reported that the command was often presented within the context of having him pose for a photograph. Furthermore, she indicated that the instruction was usually followed by, "Hold your head up." Within the picture-taking context, the implicature of *Look up*, was clearly for Bryan to orient his face towards the camera, which would tend to be situated in an

upward direction, relative to where he would be positioned. In effect, Bryan had been taught a specific response to the instruction *Look up*, such that he had come to interpret the command as an unanalyzed whole. Given this insight into Bryan's previous experience with the first command, I decided to exclude the idiosyncratic stimulus-response pair from the analysis of his meaning for *look*.

As was already mentioned, all other commands for the first experiment elicited seeking behavior from Bryan, for which his goal was to apprehend the target object with his hands. When looking beyond a general description of Bryan's response behaviors, variation is seen with respect to the body part he used to explore his environment. Most often Bryan used his hands to locate the target object. Yet, when instructed to look behind himself, he used his foot for the exploratory purpose. Furthermore, some of the command presentations which had been deemed non-analyzable for experiment one, revealed that Bryan would alternatively use his back, or his arms, or his legs as the instruments of exploration, when seeking a target object.

In conclusion, if Bryan's response to *Look up*, can be exempted from analysis for the first experiment, the findings as reported above indicate that for Bryan, *look* means '*seek through the haptic perceptual modality, in order to apprehend with the hands*.'

## EXPERIMENT TWO

### Objective of Experiment

Observations made in Experiment One led Landau and Gleitman to consider the possibility that *look* and *touch* were synonymous for Kelli. Consequently, their objective in the second experiment was to determine whether or not Kelli's meanings for the two perceptual verbs were distinct.

### Landau and Gleitman's Procedure

Landau and Gleitman prefaced the second experiment by presenting Kelli with various instances of the instruction, *Touch X but don't look at it*. In response to this command, Kelli "would usually simply touch or stroke the object or bang it with her fist" (p.57). Next, Kelli was told, *Now you can look at it*. In response to this instruction, Kelli "would manually explore the object extensively, running her hands all over its surfaces" (p.58).

Having observed this distinction in Kelli's interpretations of *look* and *touch*, Landau and Gleitman designed a task which they reasoned would illustrate a meaning distinction with even greater acuity. In Experiment Two, the researchers presented Kelli with thirteen pairs of commands, in which a variety of adverbial and prepositional phrases were used with each of the two perceptual verbs. In describing the twenty-six test stimuli, Landau and Gleitman reported,

Using several toys, we asked Kelli to *look* or *touch* (1) with spatial modifiers: *up, behind you, in that (container), under some (object), and here*; (2) with intensity modifiers: *real hard, gently, real good*; and (3) with instruments of contact or perception: *with your finger, foot, nose, mouth, ear*. For each of these modifiers two commands were given, one using *look*, and the other using *touch*. (p.58-59)

The commands were presented in a random order across three experimental play sessions, when Kelli was age 3;0 (but "several weeks" older than in Experiment One).

### Critique

As with the previous experiment, Landau and Gleitman described their procedures for Experiment Two with a level of detail that precluded an exact reproduction of their methodology, and which made it difficult for the reader to independently evaluate their reported findings and conclusions.

Landau and Gleitman did not describe the object referred to as "X" in the preliminary commands, *Touch X but don't look at it, Now you can look at it*. Given

that Kelli responded differentially to *look* and *touch* in these commands, it would be interesting to know if the objects used as props had any particular demand characteristics. Itemization of the objects employed could have eliminated concerns about the effects of the objects' inherent attributes on the responses associated with them. Furthermore, evidence of differential responding to the two verbs would be more compelling if the manipulated objects were intrinsically less apt to being handled in varied manners.

Neither did Landau and Gleitman mention whether the "several toys" used in Experiment Two were familiar to Kelli. Because an unfamiliar toy would naturally elicit exploratory behavior from any child, it is presumed that Kelli was not instructed first to *look* at an object that was unfamiliar, then later told to *touch* the same object. Such ordering of command presentations could mean that a comparison would be made between what the child did when encountering a new toy, and what she did in response to a command to *touch* a toy which was no longer new to her.

As a final comment regarding the props in Experiment Two, we do not know if the same object was used in conjunction with both commands to *look* or *touch* in any given manner. Inconsistent use of props would create two potential independent variables (the verb in the command, and the object referred to) in a research design that should have only one variable (the verb in the command). While the use of different objects might have had no effect on Kelli's responses to commands in this experiment, the above concerns cannot be eliminated a priori.

Rather than specifying the verbs and prepositional or adjectival phrases used in the test commands for Experiment Two, Landau and Gleitman might have simply listed the exact wordings of the 26 test stimuli. Without a verbatim report of the presented commands, we do not know for certain whether or not the referred-to objects were named in the commands. Furthermore, if the object was

named, it remains unknown whether the child was instructed to *look at*, or *look for* this object in a specified manner when given a *look* command. Because in the previous experiment *look* was used in commands which implied *look for*, there is reason to suspect that either preposition could have been used in the commands for Experiment Two. Failure to specify which preposition was used is considered nontrivial since *look for* and *look at* have clearly different interpretations, with vision being much less central to the former than the latter.

Without a verbatim list of the test stimuli, we also don't know whether the object, if named, was situated in the same sentential position for both the *look* and *touch* versions of a single command-type. For example, with respect to *look/touch in some container*, the only logical way to word the *touch* command would be, *Touch the object in the container*. On the other hand, the *look* command could logically have been worded, in either of two ways: *Look in the container at/for the object*, or *Look at/for the object in the container*. Although both wordings for the *look* command are grammatical, the latter wording is consistent with the sentence structure of the *touch* command. Using a single sentence structure in which only the verb varied, would be the most controlled way of comparing a child's responses to *look* and *touch*. Aside from leaving the reader uninformed about the controls which may or may not have been used in the original experiment, this omission of procedural information also contributed to the number of independent decisions to be made regarding the procedures to be used in the replication study.

In the Critique section for Experiment One, a few issues were raised regarding the paucity of information provided about the verbal and situational contexts in which Landau and Gleitman presented their commands. Those same issues are relevant to the procedures which may have been used in Experiment Two. Without a description of the contexts in which *touch* and *look* commands were presented to

Kelli, it can only be assumed that response-biasing contexts were not inadvertently employed.

As already noted, Landau and Gleitman presented Kelli with the command *Touch X but don't look at it*, before conducting Experiment Two. This juxtaposition of the two perceptual verbs in a single command may have jeopardized the validity of conclusions drawn about distinctions in Kelli's meanings for *look* and *touch*, prior to hearing the command. Upon being instructed to, *touch* but not *look*, a child who is 'eager to please' would be forced to make a distinction between the two verbs in order to successfully do as she was asked. In effect, the induced distinction might then be learned, and carried over into responses to commands for Experiment Two. In view of what Landau and Gleitman were trying to find out in the second experiment, their timing for the presentation of '*touch* but don't *look*' was nonoptimal (cf. Werth, 1983).

#### Procedure Used in the Present Study

The replication of Experiment Two was carried out across two play sessions when Bryan was age 3;3, and 3;4. Throughout experimentation, all procedural guidelines provided by Landau and Gleitman were adhered to; commands in which *look* and *touch* were each paired with adverbial and prepositional phrases were randomly presented to Bryan in various play contexts. Because of Bryan's exceptional response to *Look up* in the previous experiment, I decided not to include *Look/Touch up* in the set of commands to be delivered in this experiment.

Beyond the methodological guidelines provided by the original experimenters, the following procedural rules were decided upon and adhered to:

1. When an object was to be responded to in a command, that object would be named in the command.
2. Bryan would be familiar with all objects referred to in the commands.
3. The same object would be referred to in both the *look* and *touch* versions of a single command-type.



4. The *look* and *touch* commands containing the same adverbial or prepositional phrase would not be presented contiguously, regardless of the time span that separated their presentations.
5. When an object was to be named in a *look* command, the child would be instructed to *look at*, versus *look for*, the object.
6. A single phrase structure would be employed for all *look* and *touch* commands, such that when an object was to be mentioned in a command, it would be situated in the same sentential position for each of the *look* and *touch* versions of a command.
7. All objects used as props, including the object referred to as "X" in the command, *Touch X but don't look at it*, would have no particular demand characteristics in terms of how they should be handled.
8. The commands, *Touch X but don't look at it*, and *Now you an look at it*, would be delivered after the presentation of the 26 test commands for experiment two.

In order to determine which command presentations would be analyzed for the second experiment, all data was screened according to the analyzability criteria outlined in the procedures section for Experiment One. In striving to meet these criteria, response-biasing contexts were avoided in the delivery of all test commands.

The following is a verbatim list of all of the commands presented to Bryan in Experiment Two:

1. Look behind you.
2. Touch behind you.
3. Look at the tennis ball in the bag.
4. Touch the tennis ball in the bag.
5. Look at the apple under the box.
6. Touch the apple under the box.
7. Look at the alarm-clock here.
8. Touch here.
9. Look at the purse real hard.
10. Touch the apple real hard.
11. Look at the tennis ball gently.
12. Touch the ball gently.
13. Look at the purse real good.
14. Touch the purse real good.
15. Look at the Lego with your finger.
16. Touch the Lego with your finger.
17. Look at the monkey with your foot.
18. Touch the monkey with your foot.
19. Look at the Ogopogo with your nose.
20. Touch the Lego with your nose.
21. Look at the bunny with your mouth.

- 22. Touch the bunny with your mouth.
- 23. Look at the bunny with your ear.
- 24. Touch the bunny with your ear.

- \* Touch the bunny, but don't look at it. Okay now you can look at it.
- \*\* Touch the puppet, but don't look at it. Okay now you can look at it.

Mentioned in some of the commands were a bunny, a monkey, and an Ogopogo. These three objects were all stuffed animals. The purse referred to in a few of the commands was a play item for the children. Procedural rule three was broken for the following command pairs: 9-10, 11-12, and 21-22. Any effects of having broken this rule will be discussed in the results section for this experiment.

#### Landau and Gleitman's Results and Conclusions

When analyzing Kelli's responses to the stimuli for the second experiment, Landau and Gleitman coded all data according to two parameters. First, pairs of responses for a single command-type were described as either differentiated or nondifferentiated. Next, all responses were coded as to whether they were of an exploratory, or nonexploratory nature. To exemplify the difference between exploratory and nonexploratory response categories, the researchers indicated:

extensive manipulation of an object with examination of all its parts was called an exploratory response; banging the object with a closed fist was called nonexploratory. (p.59)

Landau and Gleitman reported that Kelli distinguished her responses to *look* from her responses to *touch* for eight of the thirteen command-types. Those command-types which elicited differential responding included: *Look/Touch up; behind you; real hard; gently; with your foot; with your finger; with your nose; with your mouth*. For the remaining five pairs of commands, Kelli did not respond differentially to *look* and *touch*.

It was also found that, for seven out of the eight command-types for which Kelli differentiated her responses, the behavior associated with the *touch*

commands was a form of contact that involved banging, scratching, or tapping (p.60). In contrast, the behavior associated with the *look* commands for seven out of eight differentiated command-types was consistently an exploratory or apprehending behavior. For example, when instructed to *look*, Kelli would manipulate, feel all over, pretend to eat, or smell the object referred to in a command (p.60). Furthermore, it was noted that, in general, whenever a body part was specified in the command as the instrument with which *looking* or *touching* was to be carried out, e.g. *Look/Touch with your foot*, the responses to *look* commands involved moving the target object to the named body part. On the other hand, responses to *touch* commands involved moving the named body part to the object (p.61).

Statistical analysis of Kelli's responses to the commands for Experiment Two revealed that her pattern of distinguishing between the verbs *look* and *touch* was highly significant, ( $p < .025$ , Fisher exact test) (p.61). Landau and Gleitman concluded that, for this blind child, *touch* implied *physical contact*. On the other hand, *look* meant to *perceive or apprehend*, perhaps amodally. Their inference that Kelli's meaning for *look* was potentially amodal was strongly influenced by her responses to the commands *Look at the object with your mouth/nose*, wherein she *tasted* and *sniffed* the target objects. Prior to these command presentations, it had appeared as if *look* was tied to the haptic perceptual modality. Yet, after the *tasting* and *sniffing* behaviors were observed, Landau and Gleitman were considering that Kelli's meaning for *look* was not unimodal.

### **Results and Conclusions of the Present Study**

Bryan's responses to the stimuli for Experiment Two are summarized below.

**STIMULUS COMMAND****RESPONSE****1. Look behind you.**

(Taken from experiment one.) Bryan extended his right foot behind himself and contacted the target object with his foot. Then he turned and picked up the object.

**2. Touch behind you.**

Bryan pivoted 90° to his left and swung both arms up in the air. He pivoted further to his left, and shouted, "Touch, touch, boom, boom", while still swinging his arms.

**3. Look at the tennis ball in the bag.**

Bryan reached into the bag containing the ball, secured his grasp of the ball, and pulled it out of the bag. He then rolled the ball between both of his hands, while feeling the entire surface of the ball.

**4. Touch the ball in the bag.**

Bryan reached into the bag and grasped the ball. While holding onto the ball he said, "The ball's in the bag." He then pulled the ball out of the bag and said, "There."

**5. Look at the apple under the box.**

Bryan banged the top of the shoe box once with each hand, then lifted the box up and placed it right side up on the floor. He made no attempt to locate or contact the apple.

**6. Touch the apple under the box.**

Bryan banged the shoe box once with each hand, then said, "Where is it?". When told that the apple was under the box, he turned the box over, and felt the inside of the box. He made no contact with the apple.

**7. Look at the alarm clock here.**

Bryan took the clock into his hands, and turned it repeatedly between his hands, feeling all surfaces of the clock.

**8. Touch here.**

Bryan clapped the fronts of his hands together once. He then slapped the front of his left hand against the back of his right hand five times.

**9. Look at the purse real hard.**

While holding the purse with his left hand, Bryan banged the purse once with his right hand.

**10. Touch the apple real hard.**

At first Bryan held the apple still between both hands. He then pressed the back of his left hand against the apple.

**11. Look at the tennis ball gently.**

Bryan held the tennis ball against his chest with his left hand.

**12. Touch the tennis ball gently.**

Bryan placed the ball on the floor, and flicked the three middle fingers of his right hand against the ball.

**13. Look at the purse real good.**

Bryan held one of the handles for the purse with his right hand, and felt the surface of the purse with his left hand. He then used both hands to feel one of the handles on the purse.

**14. Touch the purse real good.**

Bryan held onto the purse with his hands as he touched it with his feet. He then said, "Touch the purse with my foot." Next he slid his feet through the handles on the purse.

**15. Look at the Lego with your finger.**

At first Bryan rolled the block between both of his hands. Then, he held it in his right hand, while contacting various surfaces of the block with his extended left index finger.

**16. Touch the Lego with your finger.**

Bryan held the block with his right hand while pressing the three middle fingers of his left hand against the block.

**17. Look at the monkey with your foot.**

Bryan picked up the monkey, and drew his feet in close to his body. He then tapped the monkey against his toes. Next, he placed the monkey underneath his feet and brushed the surface of the monkey with his feet.

**18. Touch the monkey with your foot.**

Bryan held the monkey with both hands and tapped his right foot with it, three times.

**19. Look at the Ogopogo with your nose.**

Using both hands, Bryan raised the Ogopogo up and held it against his nose. He then shook his head, thereby rubbing his nose over the surface of the object.

20. **Touch the Lego with your nose.**

Bryan held the block in his right fist, and tapped his nose with the block three times.

21. **Look at the bunny with your mouth.**

Bryan raised the bunny up towards his open mouth, and tapped it against his mouth four times.

22. **Touch the bunny with your mouth.**

Bryan drew the bunny up and held it against his mouth.

23. **Look at the bunny with your ear.**

Bryan raised the bunny up and pressed it against his right ear.

24. **Touch the bunny with your ear.**

Bryan raised the bunny up to his left ear, and held it against his ear.

\* **Touch the bunny, but don't look at it.**

Now you can look at it.

\*\* **Touch the puppet but don't look at it.**

Now you can look at it.

No reliable responses obtained. Upon repeated presentations of the instructions (\*, \*\*), Bryan demonstrated neither looking nor touching behavior.

Following Landau and Gleitman's data analysis procedure for Experiment Two, Bryan's responses to the *look* and *touch* versions of each command-type were initially judged as differentiated or nondifferentiated. All responses were then coded as either exploratory or nonexploratory. If the two responses to a single command-type, were coded similarly along the exploratory/nonexploratory parameter then the pair of responses were categorized as nondifferentiated. Likewise, if the responses were coded dissimilarly along the same parameter, they were described as differentiated.

When assigning an exploratory coding to Bryan's responses, particular behavioral attributes were consistently watched for, including: physical contact with much of the surface area of an object, versus contact with a very restricted surface area; enduring contact with an object, versus either quick contact, or

repetitions of instantaneous contact with the object; and the presence of scanning or surveying of the environment, versus the absence of such behavior, when no prop was used during a command presentation.

Analysis of Bryan's responses to the commands for Experiment Two revealed the results detailed in Table I below.

TABLE I

**Differentiation of Bryan's Responses to *Look* and *Touch*  
According to the Exploratory/Nonexploratory Parameter.**

COMMAND TYPES	LOOK	TOUCH
<b>DIFFERENTIATED</b>		
behind you	exploratory	nonexploratory
in the bag	exploratory	nonexploratory
here	exploratory	nonexploratory
real good	exploratory	nonexploratory
with your finger	exploratory	nonexploratory
with your foot	exploratory	nonexploratory
with your nose	exploratory	nonexploratory
<b>NON-DIFFERENTIATED</b>		
under the box	undetermined	undetermined
real hard	nonexploratory	nonexploratory
gently	nonexploratory	nonexploratory
with your mouth	nonexploratory	nonexploratory
with your ear	nonexploratory	nonexploratory

As is indicated in Table I, Bryan differentiated his responses to *look* from his responses to *touch* for seven of the twelve command-types. It can also be seen that whenever differential responding was observed, the behavior associated with the verb *look* was always of an exploratory nature, while the behavior elicited by *touch* was always nonexploratory. Furthermore, with the exception of *Look/Touch under the box*, all command-types for which nondifferentiated responses were obtained elicited nonexploratory behavior, regardless of the verb contained in the command. Bryan's responses to *Look/Touch the apple under the box* suggested that he did not understand the preposition *under*. Although he always sought the apple referred to

in the two commands, he never succeeded in apprehending it. Consequently, the exploratory/nonexploratory parameter of his responses could not be determined.

General similarities existed between Bryan and Kelli's response patterns in Experiment Two. For example, both children differentiated their responses for several command-types. Additionally, when differential responding occurred, each child tended to associate exploration with *look*, but not with *touch*. Yet, in spite of such broad similarities, some interesting variations also existed. For example, there were only four command-types for which both children contrasted their interpretations of *look* and *touch*. This meant that each child responded differentially to a number of command-types for which the other child did not. Moreover, Bryan's exploratory behaviors always involved the haptic perceptual modality, whereas Kelli additionally explored with olfaction and taste.

Variation in the children's response behaviors also existed in relation to the nonexperimental commands: *Touch X but don't look at it. Now you can look at it.* Kelli's responses to the instructions suggested that she made a semantic distinction between the perceptual verbs. That distinction was consistent with the divergence which characterized her responses to the verbs within the test stimuli for the experiment. On the other hand, repeated presentations of the nonexperimental commands to Bryan elicited a variety of irrelevant behaviors. In effect, only unreliable responses could be obtained for the instruction to *touch but not look*. The unreliable nature of Bryan's behaviors provoked the suspicion that the child may have been uninterested in deciphering the meaning of the confusing instructions. Alternatively, it is possible that the unreliable responses may have reflected a metalinguistic inability to distinguish two words that did not have overtly different meanings for him. Regardless of how the behaviors might be explained, Bryan's responses to the nonexperimental commands contrasted with Kelli's. As a



result, variation in the children's response behaviors could be observed with respect to one more component of the second experiment.

Before stating my conclusions for experiment two, a methodological issue relevant to the replication study must be addressed. It was mentioned in the **Procedures** section, that despite all efforts to be consistent in referring to the same object in both the *look* and *touch* versions of a single command-type, three of the thirteen command pairs were inconsistent. For commands 9 and 10, *Look at the alarm clock here/Touch here*, Bryan associated exploratory behavior with the instruction to *look*, but not with the instruction to *touch*. However, because an object was referred to in only one of these commands, the possibility arose that the referral/nonreferral to an object affected the obtained responses. In order to rule out this possibility, responses to additional command pairs were considered. In commands 3 and 4, *Look behind you/Touch behind you*, reference to an object was never made; yet, differential responding according to the verb in the command was observed. Such findings suggest that the absence of referral to an object could not have been associated with a particular type of response. Furthermore, when objects were referred to in both the *look* and *touch* versions of a command-type, (e.g. 15, 16, 17 and 18) differential responding according to the verb in the command was also observed. Hence, it would appear that explicit referral to an object did not influence the exploratory/nonexploratory aspect of a response. A similar line of reasoning was followed to determine that the inconsistency in commands 21 and 22 did not affect Bryan's responses to those stimuli.

Different objects were also referred to in commands 11 and 12, *Look at the purse real hard/ Touch the apple real hard*. However, nondifferentiated responses were elicited by these commands. Evidence could be found within the experimental data, to suggest that the responses associated with commands 11 and 12 were not influenced by variable reference to an apple or purse. However,

because failure to validate the nondifferentiated responses would not have affected the outcome of the experiment, presentation of the validating evidence is not necessary.

On the basis of Bryan's responses to the *look* and *touch* commands, I concluded that he interpreted the two verbs to be distinct in meaning. For this blind child, *touch* seemed to imply *physical contact that is short in duration, and which involves a restricted surface area of the contacted object*. In keeping with the previous experiment, Bryan interpreted *look* as meaning *exploration through the haptic perceptual modality*.

### EXPERIMENT THREE

#### Objective of Experiment

Having observed in the previous experiment that Kelli *tasted* and *sniffed* in response to the commands *Look with your mouth/nose*, Landau and Gleitman were considering the possibility that this child's interpretation of *look* could involve any perceptual modality. In Experiment Three, Landau and Gleitman investigated to see if Kelli had glosses for the perceptions *tasting* and *listening* by comparing her meaning for *look* with her meanings for these two perceptual verbs. Their goal was to determine whether Kelli's responses to *Look with your mouth/nose*, could be explained by a meaning for *look* which implicated nonspecific perceptual modalities, or if the responses had to be accounted for otherwise.

#### Landau and Gleitman's Procedure

Experiment Three was conducted when Kelli was age 3;3. The stimuli for the experiment consisted of a set of commands instructing Kelli to *look* at, *touch*, *listen* to, or *taste* various objects. There were three commands containing each verb, for

a total of twelve experimental commands. Landau and Gleitman was reported that the objects referred to in the commands varied in terms of the plausibility with which they could be acted upon in the specified manner (e.g. *Look at the orange ring*, *Taste the radio*, and *Listen to the orange ring*). The test commands were randomly presented to Kelli during a single play session. Landau and Gleitman indicated that one of the commands was inadvertently omitted, meaning that eleven stimuli were used in Experiment Three.

### Critique

The first item to be raised in a critique of Experiment Three has to do with Landau and Gleitman's choice of stimuli, considering their objective for the experiment. Close inspection of the conditions under which *look* commands elicited nonhaptic perceptual behaviors revealed that amodal exploration occurred when the message within the stimulus was 'Look with a body part that has a perceptual capability which is not haptic.' In general, when responding to this type of command, Kelli recruited the perceptual ability inherent in the body part specified to do the *looking*. Hence, it is clear that a particular form of request was correlated with the amodal responses to *look*. In view of their objective for this experiment, Landau and Gleitman should have examined this very correlation further. As an alternative to the stimuli presented in this experiment, instructions to *listen* to, *taste* and *smell* objects, with perceptual organs which would not normally be used for such purposes, might have provided more direct insight into Kelli's *sniffing* and *tasting* responses in Experiment Two. It is possible that a command such as *Listen to the object with your mouth*, would also have elicited a *tasting* response. Realization of this hypothetical stimulus-response pair, in addition to what Kelli did for *Look with your mouth/nose*, would have suggested that the perceptual modality used to carry out a request to *look* would likely be the

natural modality for the perceptual organ specified for the fulfillment of the command. Stimulus-response pairs such as this, would have served as compelling evidence to counter the suggestion that Kelli's meaning for *look* encompassed amodal perceptions. In summary, it is unclear why Landau and Gleitman chose to contrast Kelli's *listening* and *tasting* behaviors with her *looking* behaviors, under conditions which were not previously suspect of eliciting responses involving nonconventional perceptual modalities.

Further critical comments regarding Landau and Gleitman's third experiment derive from bits of procedural information gleaned from their results and discussion section. In that section it was stated, "When asked to *listen* to some object, she (Kelli) became quiet and oriented her head to the sound but did not move toward it" (p.64). To supplement this report, Landau and Gleitman provided an illustration in which an experimenter was holding a radio a few inches away from the child's ear as the command *Listen to the radio* was presented. From all of this, it could reasonably be assumed that the object referred to in the instruction to *listen*, was being sounded concomitant to the command presentation.

Although there was no reason to suspect that a command for Kelli to *listen* to a radio would elicit anything other than *listening* behavior, I am suspicious that the inferred context in which the command was delivered may have determined the response obtained. Because the radio was sounding and held at Kelli's ear as the instruction was given, it is highly possible that her *listening behavior* had nothing to do with the verbal command, but was a function of having had a noise-making object held at her ear.

A more optimal way to determine Kelli's interpretation of *listen*, might have been to present her with an object which had the potential to produce noise, but was not sounding at the time the command was given. After hearing the command, Kelli might have attempted to affect the object so that it emitted sound, and then

have proceeded to *listen* to it. This series of events would have demonstrated that the child knew that sound was required in order for her to *listen*. Observed listening behavior within this context would more likely have been a product of the verbal instruction, than a product of the context itself. In view of the bias inherent in Landau and Gleitman's context for presenting Kelli with commands to *listen*, it is believed that little non-refutable insight was gained into the child's interpretation of the aural perceptual verb.

Also contained in the results and discussion section for Experiment Three was the statement, "When asked to *touch* or *look* at objects, she (Kelli) reached out and took them" (p.64). The behaviors outlined in this statement, were considered as constituting Kelli's responses to the *look* and *touch* commands. Because no specific information was reported about the contexts in which commands were given, there is nothing to prevent the reader from considering that, when Kelli 'reached out and took' the objects she was instructed to either *look* at or *touch*, it may have been that she was not intentionally *looking* at or *touching* anything. Rather, she may simply have been accepting objects that she believed were being offered to her. In view of what *look* and *touch* elicited from Kelli in the previous experiment, the modestly defined and nondifferentiated responses to the same verbs in the present experiment might reasonably be doubted for their legitimacy as responses at all.

All considered, it appears that there was significant variation in the conditions under which objects were presented to Kelli as commands for the third experiment were delivered. When asked to *look* at or *touch* an object, it seemed as if the objects were being handed to her. Yet, when asked to *listen* to an object, the object was sounded and held at her ear. Landau and Gleitman's general procedure for Experiment Three could have been improved by using a consistent manner of presenting objects to be acted upon in the fulfillment of each command. Without

this control, it can't be said that the reported findings were not significantly influenced by the varied manners in which objects were used as props.

### Procedure Used in the Present Study

The replication of Landau and Gleitman's Experiment Three was carried out with Bryan at age 3;3. All twelve test commands involving the four perceptual verbs were presented. In keeping with the original study, the objects used in conjunction with each command varied in terms of the plausibility with which they could be acted upon in the named fashion. The specific objects employed as props included: a buzzer - this being a small box which emitted a "buzzing" sound when the button on the side of the box was depressed; an apple; a monkey (stuffed animal); an alarm clock; a bunny (stuffed animal); a doll which looked as if it were crying - referred to as "the baby"; a jewelry box which played music when wound up - referred to as "the music box"; and Bryan's own hand, which was referred to in one of the commands to *taste*. All objects used as props were familiar to Bryan.

Consonant with Landau and Gleitman's procedure, the objects referred to in commands were varied in terms of where they were situated in relation to Bryan, and whether or not they were sounding as the commands were presented. In effect, simultaneous to the delivery of each *look* and *touch* command, the object referred to was placed in Bryan's lap, and was not sounding. Additionally, when a *listen* command was presented, if the object referred to was capable of producing noise, it was sounded and held at Bryan's ear.

While replicating Landau and Gleitman's method for Experiment Three with as much exactitude as possible, two supplemental commands were presented to Bryan in order to monitor the effects of the varied location, and aural qualities of objects referred to in the stimuli delivered in the original study. The first supplemental

command was an instruction to *look* at a noise-making object. As this command was presented, the object was held near Bryan and was sounded. The second supplemental command was a *listen* command in which the object referred to was also capable of emitting noise. However, during this stimulus presentation, the object was placed in Bryan's lap and was not sounding.

In accord with procedures used for the replication of Experiments One and Two, precautions were taken to avoid the situation in which Bryan's responses to test stimuli might have been undesirably biased by the verbal and situational contexts in which commands were delivered. The criteria used to determine which data would be analyzed for Experiment Three, were the same criteria outlined for this purpose in the **Procedures** section of Experiment One.

#### Landau and Gleitman's Results and Conclusions

Landau and Gleitman reported that Kelli appropriately varied her responses according to the verb contained in a command for ten of the eleven stimuli presented. When told to *touch* or *look* at objects, Kelli reached out and took them. When instructed to *listen* to an object, she became quiet and oriented her head to the sound but did not move towards it. Finally, whenever she was instructed to *taste* something, Kelli responded by licking the object. The one command which elicited a questionably inappropriate response was *Listen to the raisins*. Upon hearing this command, Kelli reportedly sat still, then reached out saying "raisins". The difference between appropriate and inappropriate responding according to the verb contained in a command was statistically significant ( $p = .005$ , Binomial Test).

Landau and Gleitman concluded that Kelli's responses in Experiment Three indicated that for a blind child, "*look* is interpreted as calling for haptic exploration, while other specific verbs are used for apprehension by other means" (p.64).

### Results and Conclusions of the Replication Study

Bryan's responses to the commands for Experiment Three were as follows:

<u>STIMULUS COMMAND</u>	<u>RESPONSE</u>
1. Look at the apple.	At first Bryan held the apple in his right hand and banged it with his left hand. Next, he felt the surface of the apple with both hands.
2. Look at the monkey.	Using his hands, Bryan felt much of the surface of the monkey which had been placed in his lap.
3. Look at the buzzer.	Bryan picked up the buzzer and immediately depressed the button to cause the object to emit its "buzzing" sound.
3. *Look at the music box (with the music box playing at the time the command was delivered).	At first Bryan tried but failed to open the lid to the music box. He then held the sounding object at his ear.
4. Touch the bunny.	Using the palms of both hands, Bryan repeatedly stroked the top surface of the bunny.
5. Touch the apple.	Bryan picked up the apple that had been placed between his legs, and held it in both hands.
6. Touch the alarm clock.	Bryan placed both hands on the clock which was situated on the floor between his legs. He then picked up the clock and held it in the air.
7. Taste the apple.	Bryan raised the apple to his mouth and held it against his closed lips.
8. Taste your hand.	Bryan raised both hands up to his mouth and touched his lips with his fingers. He then licked his finger tips.
9. Taste the monkey.	Bryan raised the monkey up to his open mouth, and pressed it against his lips.



**10. Listen to the monkey.**

At first Bryan placed the monkey on top of his feet. After the command was repeated, he replied, "I can't."

**11. Listen to the baby.**

Bryan placed the doll aside and said, "The baby's gonna cry."

**12. Listen to the buzzer.**

Bryan became still and leaned his ear closer to the sounding object. He then reached up to grasp the buzzer, and held it against his ear.

**12.\*Listen to the buzzer (with the object not sounding at the time the command was delivered).**

Bryan took the buzzer into his hands, and immediately depressed the button to cause the object to sound. He didn't speak while the buzzer was sounding, and ignored all else that was going on around him.

To restate the findings in more general terms, when instructed to *taste* an object, Bryan used his lips or tongue to contact the object. In effect, his interpretation of the perceptual verb *taste* was entirely conventional. In accord with the findings for the previous experiment, when instructed to *touch* an object, Bryan always made nonexploratory manual contact with the object. Hence, as was already suspected, Bryan's interpretation of *touch* was tied to the haptic perceptual modality. These findings were consistent with what Landau and Gleitman reported about Kelli.

When instructed to *listen* to a sounding object, Bryan demonstrated *listening behavior*. However, when told to *listen* to an object which did not naturally produce sound, he replied, "I can't." Throughout all experimentation, this was the only instance in which Bryan stated that he couldn't do as he was asked. The exclusiveness of this reply, in addition to the fact that Bryan really could not *listen* to something that was incapable of producing noise, prompted the conclusion that the response to the command was reliable. In drawing this conclusion, it was inferred that Bryan knew that he couldn't *listen* without a sound source.

The instruction to *listen* to the baby (an object that was not realistically capable of producing sound), also elicited a response indicating that Bryan knew that sound was required before *listening* could occur. After hearing the command, Bryan stated, "the baby's gonna cry". In accepting this as a reliable response, it was judged that Bryan was prepared to *listen* with the pretending expectation that the doll was about to emit noise. Finally, Bryan's response to the supplemental command also suggested that he had a conventional interpretation for the verb *listen*. When told to *listen* to an object that was silent, but capable of emitting noise, Bryan caused the object to sound. All obtained responses to the *listen* commands were interpreted as support for the conclusion that Bryan, like Kelli, associated the aural perceptual modality with the aural verb.

Bryan's responses to the *look* commands in the third experiment were somewhat discrepant with Kelli's reported responses to the same commands. When given an instruction to *look* at an object which did not naturally emit sound, Bryan responded by exploring the object manually. However, when told to *look* at an object that was capable of producing noise, Bryan did not explore the object manually, but did what was necessary to cause the object to sound. This response behavior was judged as having been influenced by the demand characteristics of the object referred to in the command. The supplemental command added as a control in the replication study also elicited an interesting response. When told to *look* at an object that was sounding concomitant to the command presentation, Bryan demonstrated *listening behavior*, as opposed to *looking behavior*. This stimulus-response pair also suggested that Bryan's response behaviors were affected by the demand characteristics of the object referred to in the command. The finding associated with the supplemental command supports the previous conjecture that Kelli's response to *listen* to the radio, may have had little to do

with the verb contained in the command, but instead was elicited by the aural characteristics of the object placed near her ear.

Bryan's response to the supplemental command is also relevant to the suggestion that Kelli's responses to *Look with your mouth/nose* in Experiment Two were influenced by forces extraneous to her meaning for *look*. By *listening* to a sounding object when instructed to *look* at it, Bryan demonstrated that the inherent qualities of the object referred to in the command could successfully distract his attention from the literal meaning of the request given him. In an analogous fashion, Kelli's responses to *Look with your mouth/nose*, could have been confounded by the competitive forces of the inherent abilities of the body parts through which the *looking* was to occur. In summary, the response obtained to the supplemental command illustrated the logic by which Kelli's *sniffing* and *tasting* behaviors could be explained by something other than an amodal interpretation of *look*.

In conclusion, Bryan's responses to the commands for Experiment Three were interpreted as additional evidence to indicate that his meaning for *look* is restricted to *haptic exploration*. In effect, the deductions made in the first two experiments were further supported.

## EXPERIMENT FOUR

### Objective of Experiment

In the fourth experiment Landau and Gleitman further investigated the possibility that, for Kelli, *look* implied perception through nonspecific sensory modalities. Their objective was to fully ascertain the child's meaning for the perceptual verb as it applied to herself.

### Landau and Gleitman's Procedure

In this experiment, *look* commands were presented within contexts that either challenged the ease with which haptic exploration of objects could take place, or in contexts that made available auditory perceptual information, as an attempt to bias the modality through which Kelli would respond. Landau and Gleitman rationalized that if modality nonspecificity did characterize Kelli's meaning for *look*, then supporting evidence would be most apt to surface in the conditions under which some of the commands would be presented in this experiment.

Twelve commands comprised the stimuli for Experiment Four. Through each stimulus, Kelli was instructed to *look* at an object that was capable of producing noise (e.g. a radio, or a squeaking toy fish, p.65). Four of the commands were presented under each of three conditions involving varying available perceptual information. In the first condition, identified as the **tactile condition**, tactile information was immediately available. Simultaneous to the delivery of a command, Kelli's hand was placed on the object referred to in the command. For two stimulus presentations the object was situated in front of the child, while for the other two presentations, the object was located behind her. The tactile condition was thought to be more conducive to haptic exploration than the experimental conditions which follow.

The second condition, identified as the **aural condition**, involved the immediate availability of aural perceptual information. Simultaneous to a command presentation, the object referred to in the command was sounded. In contrast to the previously described condition, the aural condition did not make available tactile information. For the delivery of two commands, the sounding object was situated far from Kelli, i.e. 8 feet away, while for the remaining two stimuli, the object was located within arm's reach. The aural context was intended to

influence Kelli to recruit the auditory perceptual modality when responding to the test commands.

In the third experimental condition, identified as the **visual condition**, Kelli was provided with neither tactile nor auditory information simultaneous with the delivery of a command. For two trials, the object referred to in a command was not sounding and was held far from the child, while for the other two commands, the object was also silent but was situated near her. This condition required that Kelli choose between the perceptual modalities that she would draw on in order to fulfill the instruction to *look*.

Kelli was age 3;1 at the time of experimentation. The number of play sessions required for the delivery of all test stimuli was not reported.

### **Critique**

Landau and Gleitman's description of procedures used for Experiment Four were in keeping with what was reported for all previous experiments. That is to say that little detail was provided with respect to the situational and verbal contexts in which commands were delivered. Therefore, concerns raised in the **Critique** sections of the first three experiments regarding the inadvertent use of response-biasing procedures are equally relevant to this experiment. Beyond these general remarks, there are no issues to raise with respect to the procedures employed for the fourth experiment.

### **Procedure Used in the Present Study**

The replication of Experiment Four was conducted across two play sessions. Bryan was age 3;3 at the time of the first play session and 3;4 at the time of the second session. All twelve commands were presented under the three experimental

conditions described by Landau and Gleitman, such that four commands were delivered under each condition.

The same set of objects was referred to in the commands presented under all three experimental conditions. Those objects were: the buzzer used in Experiment Three; the alarm-clock also used in Experiment Three; an elephant (stuffed animal which when wound up, played music); and a birdie (stuffed animal which when shaken, produced a whistling sound). Bryan was familiar with all of these objects prior to the conduction of the experiment.

The situational and verbal contexts employed for the presentation of commands in Experiment Four were similar to what were used for the delivery of stimuli in all previous experiments. In effect, commands were never given at times when Bryan was already in the process of seeking, exploring or aurally focused on an object. Whether or not stimulus-response pairs would be accepted as analyzable was determined by the criteria outlined for this purpose in Experiment One.

### Landau and Gleitman's Results and Conclusions

Before stating their results for Experiment Four, Landau and Gleitman presented a line of reasoning according to which they were prepared to interpret their findings. They explained,

If *look* means 'perceive by hand,' then Kelli should find a way to explore the named object by hand under all (the experimental) conditions. If *look* means 'perceive using any modality,' Kelli still might seek to explore the objects manually under all conditions, but it is likely that in certain conditions, such as hearing a radio from afar, she might assume she is already looking and therefore need do nothing beyond quieting and orienting to the sound. (p.66)

Given these implications that would be associated with particular patterns of responding, Landau and Gleitman reported that for the entire set of commands, irrespective of the experimental condition, Kelli exhibited a single type of behavior. At all times, when instructed to *look* the child retrieved the object referred to, and proceeded to explore it by hand.

Landau and Gleitman stated that the behaviors observed in the fourth experiment, served as compelling evidence to support the conclusion that, for Kelli, *look* could not be actualized by amodal means. Rather, this term meant *explore or apprehend manually*, i.e. through the haptic perceptual modality.

Still to be accounted for were the behaviors elicited by the commands *Look with your mouth/nose* in Experiment Two. Landau and Gleitman suggested that Kelli's responses to these commands constituted rare events. As such, the *tasting* and *sniffing* behaviors were not to be explained by a meaning for *look* which implicated perception through any plausible perceptual modality.

### Results and Conclusions of the Present Study

Bryan's responses to the test stimuli, presented under the three experimental conditions were as follows:

#### STIMULUS COMMAND

#### RESPONSE

(Tactile Condition)

1. **Look at the elephant.** (in front)

Bryan took the elephant into both hands, and immediately sought out the dial that he could wind, in order to cause the music to be emitted from the elephant. After winding the dial, he proceeded to sit and listen to the music.

2. **Look at the alarm clock.** (in front)

Bryan took the clock into both hands, and felt much of the surface of the object with both hands.

3. **Look at the buzzer.** (behind)

Bryan picked up the buzzer, depressed the button to cause the object to sound, then held the sounding object against his ear.

4. **Look at the buzzer.** (behind)

Bryan picked up the buzzer, sought out the button on its side, and depressed the button. He then sat and listened to the "buzzing" sound.

(Aural condition)

5. **Look at the buzzer. (far)**

Bryan retrieved the buzzer from the experimenter who was holding it, and continued to cause the object to sound.

6. **Look at the birdie. (far)**

Bryan retrieved the birdie from the experimenter who was holding it, then continued to shake it so that it would sound.

7. **Look at the buzzer. (near)**

Bryan took the buzzer into his hands depressed the button to cause the "buzzing" sound to continue.

8. **Look at the elephant. (near)**

Bryan took the elephant into his hands and felt much of the surface of the object.

(Visual condition)

9. **Look at the elephant. (near)**

Bryan took the elephant into both hands, and felt much of the surface of the object.

10. **Look at the alarm clock. (near)**

Bryan took the clock into his hands and felt much of the surface of the object.

11. **Look at the buzzer. (far)**

Bryan retrieved the buzzer, then continued to cause the object to sound.

12. **Look at the birdie. (far)**

Bryan retrieved the birdie from the experimenter who was holding it, then shook the object so that it would make its squeaking sound.

Two general response-types existed among all the behaviors which the commands in Experiment Four elicited from Bryan. In one instance, he apprehended the object and proceeded to explore it, while in the other instance, he apprehended the object and caused the object to produce its noise. The distribution of Bryan's response-types across experimental conditions is summarized in Table II below.



TABLE II

**Bryan's Response-Types for Each Experimental Condition**

<b>STIMULUS COMMAND</b>	<b>RESPONSE TYPE</b>	
	<b>APPREHEND &amp; EXPLORE</b>	<b>APPREHEND &amp; LISTEN</b>
<b>(TACTILE CONDITION)</b>		
1. Look at the elephant.		+
2. Look at the alarm clock	+	
3. Look at the buzzer.		+
4. Look at the buzzer.		+
<b>(AURAL CONDITION)</b>		
5. Look at the buzzer.		+
6. Look at the birdie.		+
7. Look at the buzzer.		+
8. Look at the elephant.	+	
<b>(VISUAL CONDITION)</b>		
9. Look at the elephant.	+	
10. Look at the alarm clock.	+	
11. Look at the buzzer.		+
12. Look at the bird		+

Bryan's pattern of responding did not share the orderliness which characterized the set of responses elicited from Kelli in the fourth experiment. Whereas Kelli consistently apprehended and explored the object referred to in a command, Bryan responded in this fashion to only four of the twelve stimuli.

When analyzing Bryan's response pattern, it was interesting to note that no correlation existed between particular response behaviors and the experimental conditions. Conversely, each of the two response-types were rather evenly distributed across the three conditions. The implications of the obtained findings are somewhat complicated since Bryan's pattern of responding did not conform with either of the postulations which Landau and Gleitman made. To reiterate, these authors hypothesized that if a blind child thought that *looking* could be carried out only through the haptic perceptual modality, then such a child should respond to all commands in the fourth experiment by apprehending and exploring the target objects. If, on the other hand, *looking* could occur through either the haptic or aural perceptual modalities, then *listening behavior* might be

associated with any of the stimuli presented in the experiment, but would be most apt to occur under the aural condition. The overall high incidence of Bryan's *listening* responses to the *look* commands initially suggested that, for him, aural behavior could be paired with the verb *look*. Yet, in light of this implication, the insignificant correlation between his aural behaviors and the aural experimental condition, was rather curious.

By relating Bryan's response-types to the objects referred to in the test stimuli, it can be observed that whenever instructed to *look* at the *buzzer* or *birdie*, regardless of the condition under which a command was presented, Bryan always caused the target object to sound. Moreover, whenever instructed to *look* at the *alarm clock*, Bryan always apprehended and haptically explored the object. And lastly, when told to *look* at the *elephant*, either response-type would occur. Viewing Bryan's response-types from the perspective of the object referred to in a command, reveals some striking correlations. Based on those correlations, it is proposed that the *listening behaviors* observed in the present experiment were a function of the inherent attributes of the objects to which Bryan's attention was directed through the stimulus commands. Stated otherwise, it is thought that the demand characteristics of the noise-making objects served as competitive forces in determining how Bryan would respond when instructed to *look* at these objects.

Whether or not the interesting attributes of an object, would distract a child's attention from the wording of a command related to that object, should depend on the disposition of the child hearing the command. While serving as the experimental subject in this replication study, Bryan often presented as a child with his own agenda, i.e. a child who was less "eager to please" than Kelli might have been. Consequently, he may have been more inclined than Kelli to respond to the inherent characteristics of an object in his presence, than to a verbal instruction given in relation to that object.

While viewing Bryan's *listening* responses in this experiment as having been determined by the aural qualities of the objects to which he was asked to attend, I

concluded, once again, that his meaning for *look* was *to apprehend and explore through the haptic perceptual modality*.

## **EXPERIMENTATION WITH THE CONTROL SUBJECTS**

At the time of testing, the age-matched, blindfolded sighted control subjects were similar to Kelli in that they were barred from vision. Yet, throughout testing, these children differed from Kelli in terms of their historical inductive bases for the assigning of meaning to words. Whereas the controls had previously learned the verb *look* in a visual world, Kelli had not. Landau and Gleitman considered this difference in historical inductive bases to be the only relevant variable distinguishing Kelli from the controls. Consequently, any observed differences in the children's respective meanings for *look* would be attributable to historically different inductive bases. Conversely, similarities in meanings would be usable as evidence to demonstrate the constrained role of extralinguistic experience in the assigning of meaning to words.

### **EXPERIMENT ONE**

#### **Landau and Gleitman's Procedure and Results**

For the first experiment, Landau and Gleitman presented the control subjects with the commands *Look up*, *Look down*, *Look behind you*, *Look in front of you*, *Look over here by me*, and *Look over there by mommy*. These are the same commands delivered to Kelli for the same experiment.

Upon hearing each of the six commands, all control subjects displayed a single response-type with 100% consistency. That response-type involved simple

orientation of the head in the named spatial direction. For example, when instructed to *Look up*, each child tilted her head back (p.56). Based on this pattern of responding, Landau and Gleitman made a preliminary conclusion that for the sighted blindfolded children, *look* meant 'turn one's eyes toward' (p.56).

### **Procedure and Results of the Present Study**

Commands for the first experiment were presented to Gregory, while he was blindfolded, across three play sessions. Gregory was age 3;2, 3;3, and 3;4 at the time of each successive play session. The situational and verbal contexts used for experimentation were very similar to contexts employed during testing with Bryan.

It was reported in the Method Overview section that Gregory was initially separated from Bryan while Bryan was being presented with the *look* commands. To reiterate, the intent of the separation was to preserve Gregory's integrity as a control subject, whose conduct within testing would not have been influenced by how he had seen his brother respond to the experimental instructions to *look*. Following the initial separation, experimentation with Gregory was commenced. In spite of the separation, this blindfolded child's responses to the test commands indicated that his interpretation of *look* must previously have been influenced by all that he had ever seen Bryan do as he naturally attempted to perceive his environment. Therefore, it was decided that anything Gregory would witness during continued experimentation with Bryan could have no greater influence on his own response behaviors, than had the fact that he had spent the entirety of his three years of life with a blind twin. Consequently, Gregory may or may not have previously observed his brother's responses to any of the experimental commands with which he was being presented. It was found that no obvious correlation existed between Gregory's responses to commands, and whether or not he had previously observed his brother's responses to the same commands. Therefore, even

though Gregory was present during segments of experimentation with Bryan, it was confidently felt that his integrity as a control subject in the replication study had not been altered as a result.

Gregory's responses to the stimuli for experiment one were as follows:

<u>STIMULUS COMMAND</u>	<u>RESPONSE</u>
1. Look up.	Gregory oriented his face towards the ceiling while his hands remained still.
2. Look down.	Gregory felt the floor in front of himself with his right hand, all the while keeping his head in a stationary position.
3. Look behind you.	Gregory turned around and oriented his face towards the floor behind himself while doing nothing with his hands.
4. Look in front of you.	Gregory extended both hands out along the floor in front of himself while doing nothing with his head.
5. Look over here by me.	Gregory extended his right hand towards me and touched my foot, but did nothing with his head.
6. Look over there by mommy.	Gregory extended his left hand in the direction of where his mother was sitting, and contacted her. His head remained in a stationary position all the while.

In summary, Gregory responded to four of the six commands by orienting his hands in the named spatial direction. For the two remaining commands he oriented his head in the specified direction. Gregory's response tendency was markedly different from that of the sighted blindfolded children in Landau and Gleitman's study. Conversely, his behaviors greatly resembled those of his brother. Based on Gregory's responses to the stimuli for Experiment One, I concluded that when barred from visual input, this child's meaning for *look* involved *orientation of*

*either the hands or eyes towards a target.* In effect, his interpretation of *look* implicated either haptic or visual perception.

## **EXPERIMENT TWO**

### **Landau and Gleitman's Procedure and Results**

For the second experiment, Landau and Gleitman presented their control subjects with 14 of the 26 commands that were delivered to Kelli in Experiment Two. Those commands were: *Look/Touch up; behind you; with your foot; with your mouth; with your finger; with your nose; with your ear.* It was reported that all commands were delivered to each child in a random order, within a single session.

The analysis of responses obtained from the control subjects involved a procedure that was somewhat similar to that employed for the analysis of responses elicited from Kelli. Initially, the behaviors which each child associated with both the *look* and *touch* versions of a given command-type were coded as either differentiated or nondifferentiated. Next, all responses were assigned to one of six categories. Those categories were:

- |               |                                     |
|---------------|-------------------------------------|
| <b>MANUAL</b> | 1) exploratory                      |
|               | 2) nonexploratory (contact)         |
|               | 3) orients hands only               |
| <b>VISUAL</b> | 4) orients head only                |
|               | 5) orients head, plus hand movement |
|               | 6) makes analogy to vision          |

Landau and Gleitman found that on average, the sighted children differentiated their responses to 4.8 of the 7 command-types. Of those 4.8 command-types, on average 3.5 of the *touch* commands were paired with nonexploratory manual contact of the target object, whereas 2.5 of the *look* commands were paired with head-orienting behavior towards the target object. An additional 1.2 of the *look* commands were associated with an "analogy to vision"

response-type, wherein the child behaved as though the body part named in a command could see. For example, in response to *Look with your foot*, the child would bring her foot close to but not touching the target object as if her foot had eyes (p.62).

Based on the pattern of responses observed in this experiment, Landau and Gleitman concluded that for their control subjects, *look* was a visual verb, whereas *touch* was a tactual verb meaning *contact*.

### Procedure and Results of the Present Study

Commands for the second experiment were presented to Gregory, while he was blindfolded, across two play sessions. He was age 3;3 during the first play session and 3;4 at the time of the second session. His responses to the commands were as follows:

<u>STIMULUS COMMAND</u>	<u>RESPONSE</u>
1. <b>Look up.</b>	(Taken from experiment one). Gregory oriented his face towards the ceiling.
2. <b>Touch up.</b>	Gregory raised his right hand up in the air and touched the top of his head.
3. <b>Look behind you.</b>	(Taken from experiment one). Gregory turned around and oriented his face towards the floor behind himself.
4. <b>Touch behind you.</b>	Gregory touched the floor behind himself with both hands. His head remained facing forward.
5. <b>Look at the monkey with your foot.</b>	Gregory placed the monkey in front of where he was sitting, and contacted it with his right foot for approximately 3 seconds.
6. <b>Touch the monkey with your foot.</b>	Gregory placed the monkey under his foot, and lowered his foot to contact the monkey.

**7. Look at the elephant with your finger.**

Gregory pressed his left forefinger against the surface of the elephant.

**8. Touch the apple with your finger.**

Gregory contacted the apple with his right index finger for approximately 2 seconds.

**9. Look at the bunny with your mouth.**

Gregory raised the bunny up to his mouth, and pressed it against his lips for approximately 2 seconds.

**10. Touch the bunny with your mouth.**

Gregory pressed the bunny against his lips for approximately 2 seconds.

**11. Look at the apple with your nose.**

Gregory held the apple still against his nose for approximately 3 seconds.

**12. Touch the apple with your nose.**

Gregory raised the apple up and contacted his nose with it, for approximately 2 seconds.

**13. Look at Ogopogo with your ear.**

Gregory raised the object up and held it against his right ear for approximately one second.

**14. Touch the sail with your ear.**

Gregory raised the object up and held it against his left ear for approximately 3 seconds.

Gregory's responses to the *look* and *touch* versions of each command-type were coded as either differentiated or nondifferentiated. Coding indicated that Gregory responded differentially according to the verb in the command for only two of the seven command-types. Those command-types were, *Look/Touch up* and *behind you*. For the *look* versions of these command-types, Gregory oriented his eyes in the named direction, whereas for the *touch* versions he made manual contact with anything he found situated in the specified direction. In response to all other stimuli, Gregory simply contacted the target object with the body part specified in the command to do the *looking* and *touching*.

Gregory's responses to the *touch* commands in the present experiment were similar to the behaviors elicited by the same commands from the control subjects



in Landau and Gleitman's study. On the other hand, Gregory and the other control subjects varied greatly in terms of the behaviors they each associated with the instructions to *look*. Never did Gregory pretend that the body part named in a command had eyes. In effect, the "analogy to vision" response-type, common among Landau and Gleitman's controls, was never observed with Gregory. Moreover, while the other children rarely associated manual contact with the verb *look*, Gregory did so for five of his seven responses to the *look* commands.

While contrastive with the other sighted children in terms of the behaviors he paired with *look*, Gregory was both similar to, and different from his brother in the same regard. In Experiment Two, when Bryan differentiated his responses for a command-type, he tended to associate *looking* with *exploration through the haptic perceptual modality*. Although exploratory behavior did not characterize Gregory's responses to the *look* commands in this experiment, perception through the haptic modality was observable.

The results obtained from Gregory in the second experiment confirmed the suspicion that, when blindfolded, this three year old, sighted child had a meaning for *look* which reflected the fact that he had continuously shared the company of a blind sibling. Unlike typical sighted three year olds (e.g. those in Landau and Gleitman's study), Gregory had a default perceptual modality which could be drawn on, when his visual modality was barred from use. It seems reasonable that his early awareness of the default modality would have arose from his constant observation of Bryan's dominant means of perceiving. As a result, the haptic component of Gregory's responses to the *look* commands might easily be accounted for. However, it is less clear why exploration was not also a component of Gregory's response-type as it was for his brother in this experiment. It is possible that because Gregory was previously familiar with, and had a visual image of the objects referred to in the commands, he may have felt no need to explore them

further. The artificial context in which he was commanded to *look* may in itself have precluded a natural motivation to explore. In any event, Gregory's response behaviors supported the conclusion that, when barred from vision, his meaning for the perceptual verb *look* involves the recruitment of either the visual or haptic perceptual modalities.

## EXPERIMENT FIVE

### Landau and Gleitman's Procedure and Results

In the previous two experiments, Landau and Gleitman observed that their sighted, blindfolded children associated only visual gestures with the verb *look*. In the fifth experiment, these researchers queried whether this association merely reflected a bias in the children, "without in principle denying that they could understand *look* to be interpretable as *explore haptically* " (p.67). In an attempt to determine if the children's meaning for *look* could be bimodal, Landau and Gleitman presented their subjects with commands through which they were explicitly instructed to *look* with their hands.

Modified versions of the commands presented in the first experiment were used as stimuli for Experiment Five. Specifically, the children were given the instructions: *Look up with your hands; Look down with your hands; Look behind you with your hands; Look in front of you with your hands; Look over here by me with your hands; and Look over there by mommy with your hands*. Landau and Gleitman reported that the order in which commands were delivered for Experiment Five was consistent with the presentation order used in the first experiment.

Landau and Gleitman found that the sighted blindfolded children became confused by the instructions to *look* with their hands. One third of the total set of obtained responses, consisted of the same behaviors which were elicited by the *look*

commands delivered in the first experiment. In other words, the children oriented their heads in the named spatial direction while doing nothing with their hands. For the remaining two thirds of the total set of responses, the children "oriented their heads toward the target object, and then tried to do something with their hands as well" (p.67). But the behavior involving their hands was not at all of an exploratory or apprehending nature. Rather it tended to be quite irrelevant. For example, a typical response to *Look up with your hands*, "was to tilt the head upward ... and simultaneously to position the hands near the face, palms upward" (p.67). Never did the children indicate that they thought their "hands could serve as the exploratory organs for looking" (p.67).

Since Landau and Gleitman's sighted blindfolded subjects could not be induced to associate the haptic modality with the perceptual verb *look*, it was decided that for these young children, *look* was tied exclusively to the visual modality.

### Procedure and Results of the Present Experiment

Considering that the objective of Experiment Five was to test the possibility that a sighted child could arrive at a bimodal interpretation of *look*, conducting this experiment with Gregory was redundant. Gregory had already demonstrated his bimodal interpretation of the perceptual verb. Nevertheless, the experiment was conducted. The six *look* commands were presented to Gregory, while he was blindfolded, across two play sessions. He was age 3;3 and 3;4 at the time of each successive taping session.

The responses elicited by the stimuli for Experiment Five were as follows:

<u>STIMULUS COMMAND</u>	<u>RESPONSE</u>
-------------------------	-----------------

1. <b>Look up with your hands.</b>	
------------------------------------	--

	Gregory extended both hands up in the air above his head, and waved them through the air as though exploring the space above him.
--	---

**2. Look down with your hands.**

Gregory extended both hands towards the floor in front of himself, and slid them along the floor.

**3. Look behind you with your hands.**

Gregory reached behind himself with both hands, and felt his back.

**4. Look in front of you with your hands.**

Gregory extended his hands in the air in front of himself, drawing his hands together and apart as though exploring the space in front of him.

**5. Look over here by me with your hands.**

Gregory extended his left hand towards me and grasped my hand.

**6. Look over there by mommy with your hands.**

Gregory extended both hands out towards his mother, and reached in her direction until he contacted her with his hands.

In summary, Gregory responded to all of the commands by orienting his hands in the named direction. For *Look behind you*, no exploratory behavior was incorporated into the total response. However, for all other commands, Gregory followed up his hand orienting behavior with exploration of the space associated with the direction named in a command.

As in Experiments One and Two, Gregory's responses to the stimuli for the fifth experiment set him apart from the control subjects in Landau and Gleitman's study. Whereas the other sighted blindfolded children could not be induced to exercise the haptic perceptual modality when responding to instructions to *look*, Gregory could. Furthermore, Gregory's responses in Experiment Five were distinct from what he had been observed to do in the first experiment when the implicature of the commands was also to *look for*; his interpretation of *look* in Experiment Five involved a strong exploratory component, perhaps because he expected that some unknown object would be situated in the spatial directions in which he was instructed to *look*.

On the basis of all data gathered in the investigation of Gregory's meaning for *look*, I concluded that this sighted child interpreted the perceptual verb to mean *exploration through the haptic modality* when the visual modality is barred from use. His bimodal interpretation of the verb is believed to be directly linked to the fact that prior to experimentation, he had been constantly exposed to someone else who interpreted the word in a nonconventional, yet effective manner. Bryan's predominant means of perceiving the world had clearly influenced how his brother thought he himself could also perceive and explore.

## CHAPTER THREE

### DISCUSSION

#### SUMMARY OF RESULTS FOR THE LOOK EXPERIMENTS REPLICATED WITH A BLIND CHILD

**EXPERIMENT ONE:** In response to five commands<sup>2</sup> to *look* in various spatial locations (wherein the implicature was to *look for* versus *look at*), Bryan oriented his hands or feet in the appropriate direction while attempting to locate a target object. Upon contacting the object, he apprehended it with his hands. These responses prompted the conclusion that, for Bryan, when the implicature is to *look for*, *look* means *seek through the haptic perceptual modality in order to apprehend with the hands*.

**EXPERIMENT TWO:** In response to seven out of twelve commands to *look at* objects in various spatial directions, in particular manners, or with various body parts, Bryan demonstrated exploratory behavior. In response to the same seven command-types containing the verb *touch*, Bryan demonstrated nonexploratory manual behaviors. Four of the five remaining pairs of *look* and *touch* commands elicited nondifferentiated, nonexploratory behaviors. Responses to the last pair of *look* and *touch* commands could not be determined. Based on Bryan's pattern of responding in this experiment, I concluded that his meanings for *look* and *touch* are distinct. For him, *look* (i.e. *look at*) means *explore through the haptic perceptual modality*, while *touch* means *make physical contact which is short in duration, and involves a restricted surface area of the contacted object*.

---

<sup>2</sup> Recall that the sixth look command in this experiment was excluded from analysis.

**EXPERIMENT THREE:** In response to three commands to *taste* various objects, Bryan contacted the objects with his lips or tongue. Three commands to *touch* various objects elicited nonexploratory manual contact. In response to three commands to *listen* to objects that were either sounding or capable of sounding, Bryan demonstrated listening behavior. When instructed to *listen* to an object which could not emit sound, Bryan replied, "I can't." Finally, when commanded to *look* at an object which did not produce sound, Bryan explored it by hand. On the other hand, when instructed to *look* at objects that were either sounding or capable of emitting sound, Bryan demonstrated listening behavior. Taken as a whole, this set of responses prompted the conclusion that perceptions through nonhaptic modalities (e.g. listening and tasting) have their own lexical encodings for Bryan. Furthermore, I concluded that his meaning for *look* does not involve amodal perception. Although Bryan listened in response to some of the *look* commands, I judged those responses to be reflective of the demand characteristics of the objects referred to in the commands. I did not consider the listening behaviors to be part of Bryan's meaning for *look*.

**EXPERIMENT FOUR:** Bryan responded with manual exploration to one of four commands to *look* at objects which were capable of emitting sound, and which he was already contacting. For the other three commands presented under the same circumstances, Bryan responded with listening behavior. An identical response pattern was elicited by four commands to *look* at objects which were sounding, and which Bryan was not already contacting. In response to two of four commands to *look* at objects which were capable of emitting sound but were silent, and which were situated far from him, Bryan apprehended the objects and explored them manually. In response to the other two commands delivered under these conditions, Bryan apprehended the objects, caused them to sound, and listened to them. This

pattern of responding confirmed the previously stated conclusion about the unimodality of Bryan's meaning for *look* as it applies to himself. Once again, I considered all of the listening responses which he paired with some of the instructions to *look* to be a function of the demand characteristics of the objects referred to in the commands.

Taken together, the results obtained from all four experiments support the conclusions that, for Bryan, to *look at* an object is *to explore it by hand*; and to *look for* an object is *to seek it through the haptic perceptual modality in order to apprehend it with the hands*.

#### **SUMMARY OF RESULTS FOR THE LOOK EXPERIMENTS REPLICATED WITH A BLINDFOLDED SIGHTED CHILD**

**EXPERIMENT ONE:** In response to four of six commands to *look* in various spatial locations (wherein the implicature of the command was to *look for* versus *look at*), Gregory oriented his hands in the specified direction. In response to the remaining two commands, he oriented his head in the named direction. Based on this set of responses, I concluded that, in the absence of visual input, Gregory's meaning for *look* is *to orient the eyes or hands towards a target*.

**EXPERIMENT TWO:** Gregory exhibited nondifferentiated responses to five out of seven *look* and *touch* command pairs. The response behavior elicited by the each of the five command pairs was simple contact of an object with the specified body part. On the two occasions when he distinguished his *look* and *touch* responses, *looking* involved orientation of the eyes in the named direction, while *touching* involved manual contact with anything situated in the specified location. Results obtained in this experiment further supported the conclusion that, in the absence



of visual input, Gregory's meaning for *look* can involve either the haptic or the visual perceptual modalities.

**EXPERIMENT FIVE:** In response to six commands to *look* in various spatial locations with his hands (wherein the implicature was to *look for*), Gregory oriented his hands in the named direction. For five of the six commands, he followed up the hand-orienting behavior with manual exploration of the relevant location. The sixth response did not include exploratory behavior. These responses further demonstrated that Gregory's meaning for *look* can involve the haptic perceptual modality.

The responses obtained from Gregory in all three experiments collectively supported the conclusion that, when barred from visual input, this child's meaning for *look* can involve either the visual or haptic perceptual modalities. Furthermore, if the implicature of the command is to *look for*, then haptic perception becomes a medium for exploratory behavior.

#### **THE GENERALIZABILITY OF FINDINGS OF THE ORIGINAL LOOK EXPERIMENTS**

The results and conclusions which emerged from the *look* experiments conducted with both Bryan and Kelli are generally consistent with each other. However, findings did vary in that Kelli's haptic behaviors engaged her hands only, whereas Bryan's haptic behaviors sometimes engaged additional body parts. Variance in findings may also have existed with respect to the *nature* of the haptic behaviors which the commands elicited from each child. In the second experiment, Landau and Gleitman concluded that Kelli's meaning for *look* was to explore or apprehend. It is not clear what was meant by *apprehend*. However, if this verb

can be interpreted as ‘to take possession of’, or ‘to seize’, then it would appear that Kelli had a dual meaning for *look* when the implicature is to *look at*. Although Bryan responded to *look* commands by apprehending the referred-to objects, he always proceeded to explore the objects once they were in his possession. Because, logically, it seemed that he could not explore without first apprehending the objects, the apprehending was not considered a significant component of his interpretation of the command. Therefore, if ‘seizing’, or ‘taking possession of an object’, sometimes constituted Kelli’s *looking* response, then she and Bryan were contrastive in this regard. The children also contrasted in terms of the perceptual modalities they each employed when instructed to *look* at objects that were capable of emitting sound. While Kelli’s responses to these specific instructions always involved haptic perception, Bryan often responded with *listening behavior*. In a discussion of language development in children over five, Karmiloff-Smith (1979) persuasively argued that children’s understanding of many linguistic structures is multidetermined. Bryan’s *listening* responses to certain *look* commands exemplify just such a mixture of determinants. His *listening* was elicited by the characteristics of the objects referred to in the commands, i.e. something extraneous to his well established interpretation of *look*, which he demonstrated in other responses. Consequently, although Bryan and Kelli differed with respect to the behaviors they paired with requests to *look* at sound-emitting objects, the difference was not treated as representative of contrastive interpretations of the perceptual verb.

Aside from variation in the range of body parts used to perceive haptically, and possible inconsistency in the coupling of exploration with apprehending within their *looking* behaviors, Kelli and Bryan seemed to interpret the visual term *look* in a similar fashion. In effect, the findings from the *look* experiments that Landau and Gleitman conducted with a single blind child were replicated in my study.

On the other hand, the results which emerged from Landau and Gleitman's experimentation with the blindfolded sighted children were not replicated with such consistency in my study with Gregory. Whereas Landau and Gleitman's subjects construed *looking* with the visual modality only, Gregory demonstrated an awareness that his hands could alternatively serve in the perceptual activity. I concluded that Gregory's bimodal interpretation of *look* developed out of his early, constant exposure to a sibling whose dominant perceptual modality was haptic.

**FURTHER EVIDENCE TO DELINEATE  
THE RESTRICTED ROLE OF EXPERIENCE  
WITHIN THE WORD/MEANING MAPPING TASK**

Landau and Gleitman viewed Kelli's success at acquiring a meaning for the visual term *look* as support for the claim that the role of experience within language learning is more constrained than commonly believed. To reiterate, these authors reasoned that blind children have reduced access to extralinguistic experience, and that vision-related terms are lexical items for which blind and sighted children should have maximally different interpretive contexts. They further rationalized that, "if extralinguistic experience provides the route to learning, a blind child should have maximum trouble with these terms" (pp.2-3). Because Kelli had no trouble in assigning a meaning to *look* as it applied to herself, Landau and Gleitman concluded that an experience-dominated theory of acquisition was contra-indicated.

So far, Landau and Gleitman's case involving the *look* experiments, for constraining the role of experience in language learning has been purely logically based. As with any rationalization, the strength of their argument is contingent on the plausibility of their logic. In effect, Kelli and Bryan's mastery of *look* exemplifies the constrained role of experience only to the extent that it is agreed

that (a) blind children really do have reduced access to extralinguistic experience, (b) the sighted vocabulary can be associated with inductive bases that are maximally different for blind and sighted children, and (c) that a haptically-based interpretation of *look* does reflect trouble-free mapping of meaning onto words.

With respect to point (a) above, the literature reviewed in chapter one supports the assertion that blind children's access to an interpretive context does not parallel the access of a sighted child during the first year of life. However, whether a blind child's access is 'reduced' rather than merely 'altered' by the time the child is approaching three years of age is debatable. By showing that blind and sighted children's experiential differences are more qualitative than quantitative, one could contend that a blind child's linguistic development does not represent language learning in "a situation in which the opportunities to observe the world are diminished" (p.vii). In other words, it could be argued that the element of experience is as present in the learning situation of a blind child as it is for a sighted child, the differences resting only in the substance of the children's respective experiences. Consistent with this argument would be the view that neither Kelli nor Bryan's linguistic competence demonstrates the constrained role of experience. Because Landau and Gleitman did not present compelling evidence to show that blind children's relevant extralinguistic experience is 'diminished' versus simply 'altered', the vulnerability of their logic is apparent from the outset.

Point (b) of Landau and Gleitman's argument states that the sighted vocabulary is the optimal test case for showing up any difficulties that a blind child might have in assigning meaning to words. At a superficial level, Landau and Gleitman's choice of tests seems appropriate. Blind children can't see. Therefore, they should have difficulty interpreting, for example, the word *look*. However, even within an experience-dominated theory of language learning, the

effectiveness of this vocabulary becomes obscured when considering the abstract level of meaning of visual terms. For instance, many uses of the word *look* imply 'attend to' or 'perceive and obtain an image of'. But attending to, or obtaining an image of something do not necessarily require visual perception. Consequently, it is reasonable to expect that learning a visual verb as it applies to oneself and as it pertains to such meanings, should be no more difficult for a blind child than learning any other perceptual verb. One who contested component (a) of Landau and Gleitman's argument, would challenge component (b) with the counterargument that blind and sighted children have different, yet equally consistent experiences each time they hear utterances containing visual verbs. As a result, both groups of children should be equally effective at arriving at meanings for the verbs, though their meanings should be consonant with their own respective perceptual capabilities.

Point (c) of Landau and Gleitman's argument can also be challenged. Recall that Kelli's haptic interpretation of *look* was treated as an achievement that exemplified trouble-free mapping in spite of a diminished interpretive context. In bold contrast to Landau and Gleitman's view of Kelli's success with *look* is the opinion that the uniqueness of her extralinguistic experience is accountable for the ways in which her meaning for the visual term deviated from that of her sighted peers. At variance with the control subjects, Kelli's interpretation of *look* made no allusions to vision. Rather, her meaning implicated her own dominant perceptual modality. Kelli's understanding of *look* as it applied to herself is analogous to a physically handicapped child's decision that *run* means *turn the wheels quickly*. Consequently, it is unclear how such word/meaning mapping demonstrates reduced utility of the extralinguistic context.

Landau and Gleitman's *see* experiments were conducted two years after the *look* experiments, when Kelli was approximately five years old. In those

experiments, it was observed that Kelli had a visually-based interpretation for *see* as it applied to others. Her mastery of *see* is a better example of language learning in the absence of a rich interpretive context. However, because by age five, a blind child would have had significant tutoring pertaining to the visual abilities of others, the word/meaning mapping represented in Kelli's understanding of *see* is a questionable model of what typically occurs in initial language acquisition. With respect to the outcome of the *look* experiments, Kelli's unadulterated meaning of *look* at age three could be treated as support for an experience-based theory of linguistic development, though Landau and Gleitman used it as evidence for the contrary.

While confident about the logical implications of Kelli's success with the term *look*, Landau and Gleitman sought to strengthen their case for constraining the role of experience. They did this by examining the possibility that Kelli's maternal linguistic input might have contained utterances of *look* that were consistently paired with particular contextual circumstances. The existence of such pairings would have supported the simplistic theory of language learning which they opposed.

Using audio and video recordings of maternal speech to Kelli before age three, Landau and Gleitman analyzed the contextual correlates of *look* and *see* within an examination of the situational pairings of a number of commonly used verbs. The investigation was initiated with the possibility in mind that Kelli associated haptic behaviors with *look* because her mother uttered this word at times when Kelli was either in tactual contact with, or close to target objects.

For the present case, we are asking if 'perceive or explore manually' is the inevitable conjecture about the meaning of *look* just because this verb, as opposed to others, occurs in maternal speech when the child is holding and manipulating some object, or at least has it within arm's reach. (p.102)

Landau and Gleitman set up the contextual categories *near* (within arm's reach), and *far* (out of arm's reach) to refer to Kelli's position in relation to target objects and people, as her mother uttered *look*. Approximately 1500 utterances containing the verbs *look*, *see*, *come*, *get*, *give*, *go*, *have*, *hold*, *play*, and *put* were assigned to one of the two categories. Thirty-four of the coded utterances contained the verb *look*, and eighteen contained the verb *see*.

The analysis revealed that 73% of the maternal utterances of *look* occurred when Kelli was near to, or holding the target object. However, almost 100% of the maternal utterances of *give*, *hold* and *put* were also produced under the *near* condition. Although the *near/far* categories did differentiate between some of the verbs, the categories failed to distinguish *look*. Landau and Gleitman treated the outcome of this analysis as additional support for the claim that extralinguistic experience is an insufficient source of meaning.

Because Kelli's success at responding to the implicature *look for* in Experiment One did not require that an object be near at hand, I question why any such uses of the verb wouldn't have been treated separately in the analysis of the contextual correlates for *look*. Landau and Gleitman's own data predict that certain maternal uses of this verb should not be assigned a *near* spatial coding. Consequently, their finding that the visual verb was inconsistently given a *near* coding comes as no surprise. Furthermore, because these researchers' own experimental design demonstrated that objects did not need to *near*, or even *present* in order for Kelli to respond to an instruction to *look*, their choice of coding schemes for an analysis of the contextual correlates for commonly heard verbs must be questioned. These authors acknowledged that one might contest their contextual categories as inadequate for the type of analysis they attempted to perform, and that such inadequacy would undermine the relevance of their results to the contextual learning hypothesis. But this acknowledgement was followed up with a defense

(See Landau & Gleitman 1985:106-107) in which it was insisted that "the coding categories chosen were relevant" (p.106). Confident about the adequacy of their situational pairings analysis, Landau and Gleitman maintained that the conclusions derived from the analysis were valid.

It is my opinion that the *near/far* coding scheme was inadequate. In addition to coding Kelli's proximity to target objects associated with various verbs, Landau and Gleitman could also have noted whether or not Kelli was already attending to the targets as the verbs were heard. Consider that a command to *look* could be used to *direct* one's attention towards something which is nearby, and a command to *give* might be used to refer to a nearby object to which the person is *already* attending. In effect, proximity to an object would not be effective at differentiating between *look* and *give*. On the other hand, ' $\pm$  previously attending to target object' could distinguish the verbs. Landau and Gleitman's attempt to determine a consistent contextual correlate for *look* should have entailed a more detailed coding scheme. The general nature of the categories employed precludes these researchers from justifiably claiming, that *look* could not be distinguished from other verbs on the basis of contextual factors which accompanied the verb's usage.

#### **AN ALTERNATIVE EXPLANATION FOR THE ACQUISITION OF VERBS**

After presenting their evidence to constrain the role of experience in language learning, Landau and Gleitman proceeded to elaborate on their explanation for how Kelli, and any child assigns meaning to verbs. Recall that these authors' interest did not encompass the origin of a child's concepts. Rather it was limited to the accountability for a child's success at mapping previously conceived meanings onto lexical items occurring in heard speech.



At the base of Landau and Gleitman's explanation for the mapping task were a set of claims. 1) Phrasal and lexical categories are innately known, or learned by the child before mapping occurs. 2) The child is biologically endowed with an ability to perform syntactic analyses on utterances heard in her linguistic environment. These analyses yield syntactic parse trees, containing hierarchically arranged phrasal categories (e.g. NP, VP), which in turn contain lexical categories such as nouns, prepositions etc. The child uses suprasegmental/perceptual properties of the speech wave to make the correct phrasal and lexical parsings. (See Gleitman & Wanner, 1982, for a discussion of how this is so.) These parsings indicate to the child which specific sound sequences in the speech wave represent verbs. 3) The child has the conceptual knowledge represented in predicate/argument sentence structure, and knows that verbs encode predicates, and that nominals encode arguments. 4) The child knows the type and number of arguments which specific verbs require.

Landau and Gleitman contended that the child examines the meaning of an utterance within the syntactic representational format of a parse tree. These syntactic analyses effectively distinguish between different verbs, and provide the child with information about the verbs meanings.

Landau and Gleitman tested their explanation for verb learning, while hypothesizing that the verbs previously analyzed in the maternal speech to Kelli, could be individuated in terms of the syntactic environments in which they occurred. These authors further hypothesized that,

the spatial-locational coding of the situation of use (near, far, no object) would provide trustworthy information about the meanings, but now only as constrained by the syntactic structure of the mother's sentences. (p.111)

Landau and Gleitman re-examined the 1500+ utterances produced by Kelli's mother in Kelli's presence before age three, which contained the verbs *look*, *see*, *give*, *put*, *hold*, *play*, *get*, *have*, *go*, and *come*. Utterances were coded according to

subcategorization frames, defined as the phrasal categories that followed a verb in a sentence. This analysis revealed particular syntactic environments in which only *look* and *see* occurred. A subset of these environments was reserved for the use of *look*. For example, only *look* appeared in deictic interjective commands, e.g. "Look!" and "Look, that's a boot" (p.113). *Look* was also the only verb to appear deictically with a free *how* relative, e.g. "Look how I do it" (p.113). There was also a subset of subcategorization frames which permitted only the verb *see*. Likewise, there were environments in which neither *look* nor *see* could appear, yet other common verbs could. (See Landau & Gleitman 1985:112 for a summary of the subcategorization frames associated with each of the ten verbs.)

Landau and Gleitman combined the spatial-locational analysis for each use of *look* and *see* with an analysis of the subcategorization frames permitted by the two verbs. This combined analysis revealed greater individuation of *look* and *see*. Whereas the spatial codings alone had revealed that only 73% of all uses of *look* occurred when Kelli was near to, or holding the target object, the combined analysis indicated that certain syntactic environments were associated with the *near* spatial category with 100% consistency. Landau and Gleitman claimed that a child's dual inspection of the spatial and syntactic environments in which verbs are used will lead to clearer distinctions among them.

Landau and Gleitman demonstrated the relevance of syntactic analyses to the inference of meaning by showing how distinctive syntactic encodings for verbs are correlated with their semantic properties. They began by stating their agreement with Gruber's (1968) position that verbs of motion and perceptual exploration are related, in that *look* involves the 'movement of gaze', or in the case of a blind child, 'movement of the hands'. Furthermore, they expressed their agreement with the claim that the similarity in meaning for the verb types is reflected in the fact that they each take locative prepositions and particles freely. Landau and

Gleitman maintained that if Kelli treated *haptic exploration* as motional, then she would know that its lexical encoding would be a verb which took locative prepositions freely. Application of this knowledge would automatically exclude verbs that are highly restricted in the locative prepositions they allow (such as *have*, *say* and *play*), from being considered as possible lexical candidates for the concept '*explore haptically*'.

The range of possible candidates for encoding '*explore haptically*' would be further reduced upon examining the arguments required to accompany this predicate. '*Explore haptically*' takes two arguments - a subject and an object, whereas some verbs such as *give*, *put*, *get*, and *hold* are three argument predicates. Since verbs which require three arguments, or which are limited in the locative prepositions they allow, can't be considered as lexical encodings for a predicate that takes only two arguments, and can take locative prepositions freely, all that would remain in the set of verbs that were commonly heard in maternal speech to Kelli, would be *come*, *go*, *look*, and *see*.

Landau and Gleitman explained that syntactic analyses could also distinguish *look* and *see* from *come* and *go*. While all of these verbs are motional, and each requires two arguments, only the perceptual verbs can take sentential complements, or *how* relatives. Given exposure to uses of the perceptual verbs only in such syntactic environments, the child would begin to rule out *come* and *go* as candidates for the meanings *explore* and *perceive haptically*. Furthermore, by performing a combined analysis of the spatial codings and syntactic environments associated with these four verbs, Kelli would have seen that whenever *look* and *see* shared syntactic contexts with *come* and *go*, there would have been a strong tendency for the former pair of verbs to be used when she was near to, or holding the target object. Conversely, she would have noted that the latter pair of verbs were predominantly used when she was far from the target objects. In effect, the

combined analysis would have further distinguished the perceptual verbs from *come* and *go*.

Landau and Gleitman claimed that once a child is aware of the semantic distinction between *look* and *see*, she should be able to make the correct mappings between the two meanings and their lexical representations. For example, in knowing that *see* is stative, and *look* is active, the child should not expect that the former would appear in an imperative sentence structure, since after all, one cannot command another to be in a state. As was evidenced in Kelli's maternal speech sample, only *look*, and not *see*, was used imperatively.

Following Gruber's analysis of the motion verbs, Landau and Gleitman agreed that *look* and *see* are also distinguishable in terms of their memberships to groups of verbs that either allow the locative preposition *to* or the locative preposition *toward*. *Look* is a member of the *toward* group (motion in the direction of a goal), and *see* is a member of the *to* group (motion to a goal). These locative prepositions are syntactic markers encoding subtly different notions, that can be used in the deduction of meaning of verbs with which they are associated. Gruber's analysis took into account the usages of the visual verbs to encode motion to, or in the direction of a goal, in sentences which do not contain lexical representations of the prepositions. Gruber asserted that while the prepositions are not present in the surface structures, they exist in the deep structures of the sentences. Landau and Gleitman expressed their conservative agreement with this explanation, while stating,

We accept at least provisionally the notion that verbs may have semantic substructure not exhibited in the surface syntactic frame; in particular, with *see* the function usually handled with a separate preposition (*to*) is a component of the meaning of the verb itself. (p.145)

Landau and Gleitman further stated that such covert encodings for components of meaning demonstrate the complications inherent in the word/meaning mapping task, and that the relative difficulty of learning a certain verb should be

predictable based on the structural level at which all components of its meaning are represented.

In summary, according to Landau and Gleitman's explanation for verb learning, the child begins the word/meaning mapping task with a knowledge of the predicate-argument logical structure of sentences; a knowledge (perhaps naturally endowed) about phrasal and lexical categories; and an ability to perform syntactic analyses of the utterances she hears. By performing syntactic analyses, the child depicts utterances in terms of parse trees which serve as the representational format against which she considers word meaning. Components of meaning are encoded in the syntactic properties of verbs which become discernible in the parse trees. Landau and Gleitman contend that the semantic information represented in syntactic markers that surround a verb is exploited by the child who is endeavoring to determine the verb's meaning.

## CHAPTER FOUR

### CONCLUSION

As proponents of innatist language acquisition theory, Landau and Gleitman agreed that a child uses the extralinguistic context when assigning meaning to words. However, simultaneously they argued that the extralinguistic context is an insufficient source of meaning, and that it is supplemented by the interpretive context provided within language itself. To demonstrate the insufficiency of extralinguistic experience, and the necessity for an alternative source of meaning, Landau and Gleitman showed how a blind child developed a sophisticated ability to use and understand the sighted vocabulary - terms for which she had no conventional extralinguistic experience. These authors viewed Kelli's success with visual words as evidence to support an innate predisposition in the child to syntactically analyze heard utterances, in order to gain additional insight about their meanings.

Through my replication study, I also showed that a blind child can master the visual term *look*, as it applied to himself. While not refuting Landau and Gleitman's explanation for verb learning, I contend that the outcomes of our *look* experiments do not necessarily suggest that experience plays a constrained role in language acquisition. Rather, I claim that because the haptic basis for Bryan and Kelli's initial meaning for *look* uniquely reflected these children's experiences with the world, the children's understanding of this term could be used to highlight the role played by the extralinguistic context in language learning. Landau and Gleitman's interpretation of the results from the *look* experiments demonstrates how theoretical perspective determines the light in which we view empirical findings.

## BIBLIOGRAPHY

- Adelson, E., & Fraiberg, S. (1974). Gross motor development in infants blind from birth. *Child Development*. 45. (114-126).
- Andersen, E. S., Dunlea, A. & Kekelis, L.S. (1984). Blind children's language resolving some differences. *Journal of Child Language* 11. (645-664).
- Blockberger, S. J. & Johnson, C. E. (1986). "How big are you today?": interaction routines with twins when one is blind. Paper presented at the Tenth Annual Boston University Conference on Language Development, October.
- Bloom, L., Lightbrown, P. & Hood L. (1975). Structure and variation in child language. *Monographs for the Society for Research in Child Development*. 160.
- Burlingham, D. (1961). Some notes on the development of the blind. *Psychoanalytic Study of the Child*. 16. (121-145).
- Burlingham, D. (1964). Hearing and its role in the development of the blind. *Psychoanalytic Study of the Child*. 26. (121-145).
- Clark, H. H. & Clark, E. V. (1977). *Psychology and Language: an introduction to psycholinguistics*. New York. Harcourt Brace Jovanovich.
- Collis, G. M. & Schaffer, M.R. (1975). Synchronization of visual attention in mother-infant pairs. *Journal of Child Psychology*. 165. (315-320).
- Dunlea, A. (1982). *The role of visual information in the emergence of meaning: a comparison of blind and sighted children*. Unpublished Ph.D. dissertation. University of Southern California.
- Feldman, H., Goldin-Meadow, S. & Gleitman, L. R. (1978). Beyond Herodotus: The creation of language by linguistically deprived deaf children. In A. Lock (ed), *Action, Gesture, and Symbol: The emergence of language*. London. Academic Press.
- Fraiberg, S., Siegel, B. & Gibson, R. (1966). The Role of Sound in the Search Behavior of a Blind Infant. *Psychoanalytic Study of the Child*. 21. (327-357).
- Freedman, D., Fox-Lokenda, B., Margileth, D. & Miller, D. (1969). The development of the use of sound as a guide to affective and cognitive behavior: a two-phase process. *Child Development*. 40. (1099-1105).
- Gleitman, L. R. (in press). *Biological dispositions to learn language*.
- Gleitman, L. R. & Wanner, E. (1982). Language Acquisition: The state of the state of the art. In E. Wanner & L. R. Gleitman (eds), *Language acquisition: The state of the art*. New York. Cambridge University Press.
- Karmiloff-Smith, A. (1979). Language Development After Five. In P. Fletcher & M. Garman (eds), *Language Acquisition*. Cambridge. University Press.

- Keeler, W. (1958). Autistic patterns and defective communication in blind children with retrolental fibroplasia. In P. Hoch & J. Zubin (eds), *Psychopathology of Communication*. New York. Grune and Stratton, Inc.
- Kekelis, L. & Andersen, E. (1984). Family communication styles and language development. *Journal of Visual Impairment and Blindness*. Feb. (54-65).
- Landau, B. (1983). Blind Children's language is not 'meaningless'. In A. Mills (ed), *Language Acquisition in the Blind Child*. London. Croom Helm.
- Landau, B. & Gleitman, L. R. (1985). *Language and Experience: Evidence from the Blind Child*. Cambridge, MA. Harvard University Press.
- Mulford, R. (in press). First words of the blind child. In M. Smith & J. Locke (eds), *The Emergent Lexicon: the Child's Development of a Linguistic Vocabulary*. New York. Academic Press.
- Nelson, K. (1973). Structure and strategy in learning to talk. *Monograph of the Society for Research in Child Development*. 38. (1-2).
- Newport, E., Gleitman, H. & Gleitman, L. R. (1977). Mother, I'd rather do it myself: some effects and non-effects of maternal speech style. In C. E. Snow & C. A. Ferguson (eds), *Talking to Children: Language Input and Acquisition*. Cambridge, England. Cambridge University Press.
- Phillips, J. R. (1973). Syntax and vocabulary of mothers' speech to young children: Age and sex comparisons. *Child Development*. 44. (182-185).
- Robson, K. S. (1967). The Role of Eye to Eye Contact in Maternal-Infant Attachment. *Journal of Child Psychology and Psychiatry*. 8. (13-25).
- Rowland, C. (1983). Patterns of interaction between three blind infants and their mothers. In A. Mills (ed), *Language Acquisition in the Blind Child*. London. Croom Helm.
- Shatz, M., & Gelman, R. (1973). The development of communication skills: Modifications in the speech of young children as a function of listener. *Monographs of the Society for Research in Child Development*. 38. (Serial No. 52).
- Snow, C. E. & Ferguson, C. A. (eds) (1977). *Talking to children: Language input and acquisition*. Cambridge. Cambridge University Press.
- Stern, D. (1974). Mother and Infant at Play: The Dyadic Interaction Involving Facial, Vocal and Gaze Behaviors. In M. Lewis and L. Rosenblum (eds), *The Effect of the Infant on Its Caregiver*. New York. Wiley.
- Stern, D. (1977). The First Relationship. In W. Damon (ed), *Social and Personality Development: Essays on the Growth of the Child*. New York. W. W. Norton & Company, Inc.
- Urwin, C. (1978). The development of communication between blind infants and their parents. In A. Lock (ed), *Action, Gesture and Symbol: the emergence of language*. London. Academic Press.



- Urwin, C. (1984). Communication in infancy and the emergence of language in blind children. In R. Schiefelbusch & J. Pickar (eds), *The acquisition of Communicative Competence*. Baltimore. University Park Press.
- Wolff, P. H. (1963). Observations on the Early Development of Smiling. In B. M. Foss (ed), *Determinants of Infant Behavior*. 2.
- Werth, P. (1983). Meaning in Language Acquisition. In A. Mills (ed), *Language Acquisition in the Blind Child*. London. Croom Helm.
- Wood, M. (1970). *Problems in the development and home care of preschool blind children*. Unpublished doctoral dissertation. University of Nottingham, England.