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entitled

Children's Modality Preference for Novel Word Learning

by

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An Abstract of

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Research was conducted using a single subject design format to examine the modality preference of two young children, twenty-two month old twin females, who were introduced to new vocabulary words during four home visits. The purpose of this study was to determine which modality (i.e. sign or verbal) facilitated word learning. Two independent variables were considered, modality and level of difficulty (i.e. “easy” versus “difficult” words). Abilities were rated using a four-point (0-3) scale ranging from a score of 0 (no production) to a score of 3 (accurate sign or verbal production). A descriptive analysis was completed. The analysis indicated that (a) individual children may have preferred word learning modalities and (b) words that are multisyllabic or require combinatorial hand movements may not be more difficult for children to learn.
DEDICATION

This paper is dedicated to five children who have inspired me throughout my studies. Each has taught me a little something different in their own special way. The first two I had the pleasure to work with due to this particular study. For purposes of confidentiality they are named Subject 1 and Subject 2. A grand thank you is expressed to the two of them for excellent participation, enthusiasm to learn, and genuine interest in increasing their vocabularies. They encouraged me to continue my studies and showed me the passion children have to learn words.

The second two children, my twin nephews, Vincent and Devon Peraino, have inspired me in so many ways. I have been able to follow them through their adventurous growth and development. Most inspirational besides their unbelievable energy is their word learning development. They also haven’t let me forget the importance of the little things in life.

The final child to whom I extend this dedication is an incredible little boy named Cole, who in the past year has made so many accomplishments. When I first met Cole he was unable to express himself as others his age were. Now he acts like a word learning magnet and his advances have been a joy to observe. He has taught me that through teaching, learning doesn’t just happen for the child.
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# TABLE OF CONTENTS

Abstract ................................................................. ii
Dedication ................................................................. iii
Acknowledgments ......................................................... iv
Table of Contents ....................................................... v
List of Tables .......................................................... vii
List of Figures .......................................................... viii
Chapter I. Introduction ............................................... 1
Chapter II. Review of the Literature ............................... 4
  Theories of Word Learning ........................................ 4
    Constraints/ Principles Theories ............................. 5
    Social-Pragmatic Theories .................................... 8
    Associationistic Theories .................................... 11
    Emergentist Coalition Theory ............................... 14
  Fast-Mapping ....................................................... 20
  The Effects of Modality Presentation and Its Effects of Vocabulary Learning ............................................... 23
  Facilitating Word Learning ...................................... 27
  Summary ............................................................ 31
Chapter III. Method .................................................. 33
  Subjects ............................................................ 33
1. Item label rating means of easy (E) and difficult (D) words in response to signed and verbal presentations for Subject 1 (S1) and Subject 2 (S2) across four visits.
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Level of Difficulty: Comparison of mean ratings of subjects’ spontaneous labeling of easy or difficult words across four home visits</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Modality: Comparison of mean ratings of subjects’ spontaneous labeling in response to signed or verbal presentation across four home visits</td>
<td>43</td>
</tr>
<tr>
<td>3</td>
<td>Modality and Level of Difficulty: Comparison of mean ratings of subjects’ spontaneous labeling during fourth home visit</td>
<td>44</td>
</tr>
</tbody>
</table>
CHAPTER I.
INTRODUCTION

The purpose of this project is to determine the preferred modality (i.e., verbalized or signed) of young children during a “novel” word learning task. This information will increase understanding of the parameters of vocabulary learning as it relates to children’s language learning processes. Research exploring the benefits of multimodal stimulation suggests that gestures may enhance vocabulary learning. This research has the potential to benefit all children, in addition to parents and caregivers, regardless of their race, gender, or socio-economic status.

A critical feature of early language development centers around the problem of facilitating children’s early word learning. All children, whether or not they have language impairments, face the challenge of connecting an abstract symbol, such as, a spoken word, a formal sign, or a gesture to the concrete or abstract world. Amazingly, by 24 months a typically developing child’s expressive vocabulary is about 200 to 300 words (Hulit & Howard, 1997) and children learn an average of ten words per day between the ages of one and seventeen-years-old (Bloom, 2001). The rapid vocabulary learning ability,
although complex, appears to progress rapidly and efficiently for most children as they begin to use language.

For some children, however, vocabulary learning does not happen as quickly and easily. Approximately 12.4 million people (4.8%) have a condition causing a learning disability in the United States (U.S. Census Bureau, 2003). Many of these individuals will have concomitant vocabulary deficits. Children with language learning disabilities often have small vocabularies (Paul, 2001). Children with special education challenges, such as Down syndrome or other physical or mental disabilities, will have even more significant vocabulary deficits.

Recent research also has indicated that children who face low socioeconomic factors are at increased risk for expressive language deficits and reduced vocabulary. This was demonstrated by Horwitz et al. (2003) in an examination of over 1,000 children between the ages of 12 and 39 months in the New Haven, southern Connecticut area. In this research, the MacArthur Communicative Development Inventory was used to determine the percentage of language delay in the sample population. Their results indicated a 13.5% occurrence of expressive language delay in 18 to 23 month-olds and a 17.5% occurrence of language delay in the 30 to 36 month-old children. These data underscore the importance of early language experience to maintain adequate language development and vocabulary growth.
The effect of limited vocabulary can negatively impact children’s overall language development and potential for academic success throughout the school years. The US Census Bureau (2003) reported a little over two and a half million children in the United States between five and fifteen years of age have a disability affecting academic performance. Increasing vocabulary skills at an early age is one way to mitigate academic failure for young at-risk children. Consequently, it is imperative that researchers and educators continue to explore alternatives facilitating children’s early vocabulary knowledge.

This paper is organized in the following manner. First, theories of word learning will be discussed with particular emphasis on the issue of fast mapping – an intriguing theory of how children learn vocabulary after only a brief exposure (Wilkinson & Mazzitelli, 2003). Then, the issues surrounding vocabulary learning in gestural versus verbal modalities will be explored. Much of the research on the effects of vocabulary learning through gestural or signed exposure has been completed with children with hearing impairments; therefore this paper will discuss research investigations of children with and without normal hearing. Finally, a review of the literature in regard to the facilitative effects of signed communication on early vocabulary learning will be presented.
CHAPTER II.
REVIEW OF THE LITERATURE

Theories of Word Learning

Children usually express their first words around their first birthday. Initially, vocabulary learning appears to be slow and laborious as statistics show that, on average, young children only acquire two words per week (Carey, 1978). Then, at approximately 19 months of age, children's word learning increases rapidly as they become “vacuum cleaners” for words (Pinker, 1994). At this point in development, young children begin to acquire about nine new words a day (Bloom, 1973; Clark, 1973; Nelson, 1973; Templin, 1957). The initiation of this rapid learning rate has motivated researchers to closely examine how children acquire language at such an extraordinary rate. Four key views have been forwarded; these theories include (a) constraints/principles theories, (b) social-pragmatic theories, (c) associationistic theories, and (d) the emergentist coalition theory. Each of these theories will be discussed below.

Each of these four theories is based on one common construct, the notion of single word learning. Quine (1960) highlighted the issues central to single word learning theory by presenting a metaphorical illustration. In this
illustration, a linguist observes a native pointing to a rabbit hopping by and saying “gavagai.” The linguist must determine the meaning of the word “gavagai.” “Gavagai” could refer to the whole rabbit, parts of the rabbit (such as the tail), the rabbit’s action of hopping, or even to the indentations left by the rabbit’s foot. “Theories of word learning can largely be defined by whether they embrace this Quinean conundrum as a foundational assumption or whether they reject it” (Hollich, Hirsh-Pasek, Tucker, & Golinkoff, 2000, p 2). The first theory to be examined, constraints / principles theory, is based on a philosophy that approaches word learning in a way similar to the Quinean illustration. Other theories that will be examined in this paper, such as the social-pragmatic or associationistic theories, do not support the Quinean view of word learning.

Constraints/Principles Theories

The constraints or principles theories highlight the significance of cognitive problem-solving techniques in word acquisition. Researchers believing in this theory consider children to possess a set of word-learning biases that link words to objects, actions, and events. As proposed in the Quinean example, the human mind searches the semantic space by preexisting constraints or principles. Children prefer certain assumptions when deciding what a word means.

The principle of these theories is that a learner is able to make an overwhelming task manageable by reducing the number of hypotheses that must
be considered (Hollich et al., 2000). Some of the other theories or “domains” sharing this view include: the cognitive development domain (Gelman & Greeno, 1989), spatial development domain (Gelman & Greeno, 1989), and object perception (Spelke, 1990).

Clark (1983) and Markman (1987) first introduced the concept of word learning principles or constraints theories. Markman labeled his word learning principle the “whole object principle.” He proposed that, in the whole object principle, children tend to assume that the word labels a whole object rather than an object part or attribute. This theory is useful in that it explains children’s rapid word learning suggesting that they focus on the whole rather than the more vague subparts of the targeted item.

Research supports this assumption. For example, three-year-old children were presented with novel objects containing salient parts and labels for only a select few of these objects (Markman & Wachtel, 1988). During a subsequent presentation, the examiner gave a label for all items; resulting in the previously labeled items being given two different names. In a conclusion supporting the whole object principle, children assigned the label to the whole object if it had not been previously labeled but assigned the label to the salient part if the object had been previously labeled.

Woodward (1992) supported another part of the whole object principle by examining children’s labeling ability when naming unfamiliar “boring” items versus interesting novel items. Eighteen month old female subjects preferred to
look at the interesting substance (e.g. a lava flow) until the novel boring object (e.g. garlic press) was given a label. The child’s attention shift to the whole object was interpreted to suggest that children assumed the label belonged to an object (thus confirming the use of a label as a “whole object” descriptor) over the interesting substance or action.

In ways similar to the whole object principle, other constraints or principles have been proposed as being prospectively salient for word learning. Other potentially important constraints include the noun-category bias, mutual exclusivity, and taxonomic assumption (Hollich et al., 2000). Noun-category bias states that a novel count noun will refer to the object to which it was applied as well as other parts of the same category of objects (Waxman & Kosowski, 1990).

Mutual exclusivity is an assumption that has been demonstrated in 16-month-olds by their rejection of second labels for familiar objects. Mutual exclusivity suggests that the second label is rejected because the word learner assumes that objects can have only one name. Interpretation of this principle suggests that children increase the number of objects named, but are initially limited in their ability to learn multiple names for an object. Since the belief here is that the children reject the familiar object when given a label they may wrongly attach the label to an unfamiliar object.

The taxonomic assumption has been forwarded to suggest that children relate word labels to taxonomically related items (i.e., items of the same group) (Woodward, 2000). To examine the taxonomic assumption, Waxman and Hall
(1993) explored 16-month-olds' abilities to label items when presented in a triad (i.e. cup, cup, and doll). The children were introduced to all items both taxonomically (cup and cup) and thematically (doll drinks from a cup). The experimenter labeled one item (i.e. “This is a cup.”) and asked the child for another in the experimental group. However, in the control group the label was not given, instead the child was asked to “find another”. The children tended to select the taxonomic match if provided the label; in contrast, when no item label was provided the children correctly selected the item only 50% of the time. In conclusion, similar to the whole-object assumption, data were interpreted to suggest that children interpreted novel words as category labels (Woodward, 2000).

Research is continually being completed that supports new interpretations of constraints and principles theories to word learning. The challenge for the future is to organize these theories and to identify basic principles to judge the validity of newly proposed constraints (Golinkiff, Mervis, & Hirsh-Pasek, 1994).

Social-Pragmatic Theories

The second major theoretical position to word learning includes social-pragmatic theories. In general, social pragmatic theories emphasize children’s use of the expert word learners as mentors as they begin the word learning task
Carpenter, Nagell, & Tomasello, 1998). Social-pragmatic theories do not support the Quinean philosophy because of the emphasis placed on the social scaffolding provided by children's communication partners. Nelson (1988) elaborated on this important difference,

The typical way children acquire words... is almost completely opposite of the Quinean paradigm. Children do not try and guess what it is that the adult intends to refer to; rather... it is the adult who guesses what the child is focused on and then supplies the appropriate word. (pp. 240-241)

Other examiners have come to similar conclusions. Adults focus their conversations on the interests of children, whether it is an object, action, or event. Thus children do not need to seek another interpretation for a word; their attention is already focused on the correct explanation (Bloom, 1993).

Research has supported the ability of children, during the second year of life, to use social cues for the word-learning process. There are many examples of the profound influence of social construction on word learning. A few examples of this research are provided.

Baldwin (1995) examined word learning in nineteen-month-old children. Children were paired with an adult who peered into a bucket and stated that a specific object was present in the bucket, while at the same time pulling out and holding another object. Following this presentation, children were capable of showing the adult the named object, even though the object in question had not
been seen by the child. Children demonstrated that they were able to ignore the visually presented item and were responsive to the adult frame of reference. In a different study, Tomasello and Barton (1994) also examined the social construction of word learning. An examiner pretended to be looking for a specific pre-labeled object in a mock “search” for the labeled item. The adults searched for the item with facial cues (smiling or scowling) to note the success or failure of the search. Following this presentation, children accurately labeled items that had produced examiner positive affect.

Joint focus of attention is an important contributor to children’s early word learning. This effect has been demonstrated for children as young as 19 to 20 months of age. In two studies conducted by Baldwin and colleagues (Baldwin et al., 1996) children were given novel objects and, following their attentional focus, were presented with a novel item label. In the first experiment, the examiner was seated next to the child and looking at the object as it was named; in the second experiment the examiner was not in view of the child. Results showed that the children were able to correctly label the objects from the first situation when the social cues were provided, but had difficulty labeling objects when the examiner was not present.

These studies support the social-pragmatic theories by demonstrating that children use social cues provided by the communication partner to learn novel words. In summary, social-pragmatic theories suggest that children take
advantage of information provided by expert word learners in a structured social world. When the adult’s attention is in tune with the child, and the child is able to understand the social cues of the environment, then word learning is facilitated (Hirsh-Pasek, Golinkoff, & Hollich, 2000).

This finding is strengthened by developmental research. Children with more frequent parent-child interaction opportunities and exposure to joint attention have increased vocabularies (Akhtar, Dunham, & Dunham, 1991). Children appear to learn words through the rich social context in which they are absorbed. An elaborated social context makes the likelihood of correct mapping between a word and its referent more likely to occur (Hirsh-Pasek et al., 2000).

Associationistic Theories

Another view more recently introduced in the literature on the topic of word learning is the associationistic account (Plunket, 1997; Samuelson & Smith, 1998; Smith, 1995). It is believed in this account that children learn words by using “dumb attentional mechanisms.” In other words, aspects such as perceptual saliency, association, and frequency are used to facilitate word learning. Children associate the label used most often, with the most significant object, action, or event noticed in their environment. For this reason, like the social-pragmatic theories, associationistic theories do not support the Quinean philosophy. Associationistic theories also suggest that young children use
general cognitive mechanisms to label objects and have the ability to combine labels in complex ways as their word learning matures (Golinkoff et al., 2000).

To validate associationsitic theories, it has been proposed that cognitive processes, such as memory and attention, are most highly associated with children’s word learning and that these cognitive processes interact minimally with children’s social exposure. To examine this position, Samuelson and Smith (1998) replicated a study performed by Akhtar, Carpenter, & Tomasello (1996) examining discourse pragmatics and the effect of the speaker’s point of view on novel word learning.

In the original study, performed by Akhtar et al. (1996), examiners presented three novel objects to 24-month-old children; two examiners were present for two of the objects, only one examiner was present for the third object presentation. Following the final presentation, the missing examiner returned stating, “Look! I see a gazer! A gazer! I see a gazer in there!” The children typically labeled the object unfamiliar to the returning experimenter with this new label. These data were interpreted to suggest that the children used the social construction of the interaction (the discourse) to learn new vocabulary.

This interpretation was disputed by Samuelson and Smith (1998). They modified the Akhtar et al. (1996) research design; instead of making the discourse the “salient point” Samuelson and Smith gave “special treatment” to one of the three objects. In this second study, the children tended to choose the object given special treatment. Samuelson and Smith used these results to argue
that the object was remembered by the special treatment -- not by the knowledge gained through the discourse interaction. Samuelson and Smith’s (1998) results were strengthened by a further research elaboration. They completed a control experiment in which examiners gave items “special treatment” while withholding the item label (e.g. “Look in here! There it is!”). In this situation, children rarely chose the target object (the target given special attention but not labeled). This finding was interpreted to suggest that attention and memory guide children’s word learning to a greater degree than discourse or social exposure. While not denying the influence of social learning, experts suggest that Samuelson and Smith’s research supports the critical affects of associationistic theories (Baldwin and Moses, 2001).

One of the Associationistic Theories has been called the “Connectionist Model” (Plunkett, Sinha, Moller, and Strandsby, 1992). The Connectionist Model describes the auto-associative process of connecting labels to images whereupon small and gradual changes in a child’s neural system underlie vocabulary growth. In this model there is a strong relationship between the developing neurological system and the learning process. This theoretical perspective continues to be researched and emerging data advocates that associative mechanisms have a large role in early vocabulary development.

Plunkett (1997) recognizes that more research needs to be done in this area. However, it is believed that as researchers learn more about the neural
system and their effects on linguistic behaviors, that this theory will be increasingly supported.

Emergentist Coalition Theory

The final model to be examined is the emergentist coalition model. The emergentist coalition theory is a combined approach that attempts to integrate the tactics in which children use in becoming expert word learners. Woodward and Markman (1998) proposed this theory because they felt other theories were not adequate. They wrote, “word learning depends on an ability to recruit and integrate information from a range of sources” (p. 371). As a result, the emergentist theory was proposed as a “radical middle,” combining features of the constraints/ principles, social-pragmatic, and associationistic theories (Newcombe, 1998).

Three assumptions have been developed to support the emergentist coalition theory (Hollich et al., 2000).

(1) children are sensitive to multiple cues, attentional, social, and linguistic, in word learning; (2) children differentially weigh certain cues over others in the course of word learning; (3) principles of word learning are emergent as each principle changes from an immature to a mature state. (p. 18)
Assumption One. The first assumption of the emergentist coalition theory states that the multiple cues are involved in word learning. Attentional cues are primarily considered that is, those cues that hold a child’s interest. Children’s interest between sight and sound (multimodal displays) is an aspect of attention that facilitates the connection of labels to referents.

Gogate and Bahrick (1998) investigated the ability of 7-month-olds to relate vowel sound productions to objects in three different conditions; in synchronized movement with the vowel sound, in unsynchronized movement, and in view of a stationary object. Findings proved that children were more likely to link the sound to the object if it was moving in synchronization with the vocal production, in contrast to the other two conditions. This finding suggested that attentional focus facilitates learning when there is temporal synchrony between sound production and movement.

Object novelty also enhances attentional cues. Golinkoff, Hirsh-Pasek, Bailey, and Wenger (1992) examined this notion with young children and adults. When subjects were presented with four objects--three known object and one unknown--children, as well as adults, consistently labeled the novel object with the novel label.

Selective attention to information also is very important in word learning (Carpenter et al., 1998). Eye gaze, pointing, and speaker intention have been most closely examined in this regard. Morales, Mundy, and Rojas (1998) found that even 6-month-old children were able to follow an adult’s eye gaze. This
ability continues with older children; 2-year-old children used eye gaze and followed the intention of the speaker during novel word learning tasks (Baldwin, 1993).

Pointing begins to be paired with eye gaze at around one year of age (Leung & Rheingold, 1981). Progression of communication intent with a social partner is demonstrated as the child develops. For example, pointing is generally paired with the referential use of labeling at about 17 months of age (Baldwin & Markman, 1989).

Children also have been shown to attend to linguistic cues in word learning. They learn that every sound doesn’t label an object and is not meaningful. Even newborn infants are able to detect this difference and have been shown to differentially process linguistic versus nonlinguistic stimuli (Molfese & Molfese, 1979).

Prosody and the distributional cues of language aid children in learning to segment words from speech. Children have been found to be able to demonstrate word boundaries, along with word recognition in paragraphs at age 7 months (Jusczyk & Aslin, 1995).

Children are aided in learning the linguistic boundaries of language by the use of “motherese.” Motherese is a child-directed speech pattern that contains exaggerated intonation and pitch. These prosodic characteristics increase the child’s attention to the salient features of the communication and
increases children’s ability to learn novel words (Golinkoff, Hirch-Pasek, & Alioto, 1998).

Children develop an ability to understand the allowed syllable sequences of their native language and develop hypothesis from sound sequences by the age of 8 months (Aslin, Saffran, and Newport, 1998). These characteristics are critical for word learning and support the development of grammar. For example, children react differently to a task when articles are present or not present in object labeling (Gelman and Taylor, 1984) or how the word is used in sentence construction (e.g., if the word is used as a noun or a verb) (Echols, 1998).

Research has demonstrated these principles. Shafer, Shucard, Shucard, and Gerken (1998) provided two types of passages to children, in the first presentation all of the “the” articles were replaced by a nonsense word, in the second presentation the passage was read with the article “the” present. The 10-month-old subjects reacted differentially to the article replacement. The emergentist coalition theory interprets these findings to suggest that word learning does not operate in a vacuum--contextual language, along with other cues, must be considered in examinations of word learning processes.

Assumption 2. The second assumption of the emergentist coalition model suggests that children differentially accept cues to assist in word learning. This is demonstrated when one observes the developmental changes children use when learning to label objects in the environment.
It is hypothesized that when very young children label objects, they label objects from their own perceptual cues rather than from the speaker’s perspective. As children develop they realize that social cues are more reliable and begin to use environmental cues to aid in object labeling. Eventually, children tend to learn to label objects from the speaker’s point of view and realize that social cues greatly aid the perceptual information. This development demonstrates that the word learning foci of attention are variable. As their abilities continually develop, children evaluate and change the amount of stress placed on input sources (Hollich et al., 2000).

The emergentist coalition theory supports the mechanism of change called “guided distributional learning” (Golinkoff & Hirch-Pasek, 1995). Guided distributional learning suggests that children are “guided” to the relevant information in their environment for word learning. Developmental research supports this view. For example, children who participate in frequent adult-child interactions have larger vocabularies.

It is believed that children attend to the eye gaze cues of the mother as a strong guide for referent learning. As children mature, they become sensitive to even more cues around them and use these cues to build more sophisticated word learning systems.

Assumption 3. Initially, children have immature word learning principles. At this point children learn words through a self-centered world view. Through
development the child is able to create more mature principles. The third assumption of the emergentist coalition theory includes the emergence of successively more complex word learning principles throughout the child's development. This theory suggests that children shift from domain-general attentional factors to domain-specific language factors as they develop as mature word learners.

Children early on carry a domain-general perspective that aids learning their first words. However, children soon realize that the whole object assumption is not useful because there are labels for object parts, actions, and properties. Therefore, children begin to demonstrate a more mature learning style that reflects a domain-specific hypothesis. For example, 4-year-old children can use perceptual and grammatical cues together to label an object property or action while 2-year-old children cannot (Hall, Waxman, & Hurwitz, 1993).

The shift to the more mature word learning principles appears to trigger rapid vocabulary development. For example, in one study 18-month-old children were given labels for items in either an “attention-following” format (the adult labeled the object at the same time the child interacted with the object) or an “attention-switching” format (the adult labeled an object not being explored by the child) Tomasello & Farrar, 1986). The researchers found that children comprehended more item labels in the “attention-following” task. Since time exposure was not different in regard to the two item sets, the researchers Dunham, Dunham, and Curwin (1993) concluded that children at this young age
were not consistently able to follow the adult's eye gaze. It was concluded that children do not monitor the adult’s attentional focus to develop their word mapping skills until after 19-months-old. In sum, parent-child joint attention and a cognitive match appears to be most beneficial for rapid word learning (Adamson, 1995).

Much of this emergentist coalition model is similar to the theories forwarded by researchers such as Vygotsky (1962), Werner and Kaplan (1950) and Piaget (1926). To date, researchers still struggle to understand the rapid nature of word learning. The emergentist coalition model “offers a new look at an old question and a new way of viewing the relationship between the predominant theories of word learning” (Hollich et al., 2000, p 29).

Fast Mapping

After considering the influential theories in stimulating early vocabulary growth, it is important to examine the nature of children’s rapid vocabulary acquisition after even brief exposures to an object or concept. Many researchers have attempted to explain this phenomenon. Carey and Bartlett (1978) speculated that word learning and rapid preschool vocabulary growth may be inherent; they were the first to use the term they named “fast-mapping.” Fast mapping refers to a “quick, initial, partial understanding of a [new] word’s meaning” resulting from the background of the word use and after only a few exposures to the word (Rice, 1989, p 152).
The process of fast mapping in children begins as a new word is introduced. Information is quickly gathered regarding the word from the environment or context in which it is introduced. This is even done if a complete explanation of the word is not provided. It is hypothesized that information gathered about the word is stored in long-term memory and is elaborated with access to additional information. In one study on fast mapping, an examiner asked a child to perform a task (Carey & Bartlett, 1978). The task directions contained a novel word presented in a string of known words. For example, the child was asked to “Bring a chromium tray” while a “blue tray” (considered a familiar object) was also present. Although the children had not previously known the word “chromium,” in a week subsequent to the experiment, the children were able to give accurate meanings to the newly learned words. This finding was interpreted to support the theory of fast mapping.

As children obtain new information, it is thought a more complete understanding of the word and its meaning is acquired. Initially, children use and manipulate words for social language use and may not know the complete meanings of words they use (Hulit and Howard, 1997).

Heilbeck and Markman (1987) used three tasks (production, hyponym, and comprehension) to evaluate the children’s performance after brief exposure to labels using the domains of color, shape, and texture. In the production task the children were asked to describe the items presented. The hyponym task was used to evaluate the child’s understanding of the domain to which the word
belonged. An example of this task was when the examiner stated, “This is not chartreuse because it is...” It was hypothesized that if the child was aware that chartreuse was a color, then he or she would give a color label. For the comprehension task the child was asked to identify items from a group of items using the different domains of color, shape, and texture. Results indicated that the task of production was the most difficult and the hyponym task was the easiest for the majority of the children. Performance across domains indicated that color and texture were more difficult to label than shape. The theory of fast mapping was supported in that even young children were able to label objects in regard to these different domains with only minimal presentations of the novel words.

It is important to understand the age effects of fast mapping, as it is thought to be a developmental process. Wilkinson, Ross, and Diamond (2003) compared two groups of children, those younger and older than 42 months of age. Children were exposed to either a successive presentation, during which a novel object was asked for three times before requesting a different object, or a concurrent presentation during which items were requested randomly. Overall and within the two conditions separately, the older children preformed better than the younger children. There were several interpretations to these data. The first conclusion was that concurrent presentation may help children formulate theories about word meaning. Second, it was forwarded that fast mapping ability improves as children mature. These findings, as well as the findings from
other researchers (Dickinson, 1984; Mervis, Golinkoff, & Bertrand, 1994), suggest that children's fast mapping ability and documented periods of particularly rapid vocabulary growth appear to coincide.

Fast-mapping theory holds a great deal of promise in uncovering how children encode new information and the ability to develop vocabulary at such a rapid pace in such a short period of time.

The Effects of Modality Presentation and Its Effects on Vocabulary Learning

It is particularly important, for this project, to consider both verbal word presentation and sign language presentation in regard to vocabulary learning. Verbal presentation or speech is the method of vocabulary presentation for most children developing typically. For other children, many of whom are hearing impaired, first exposure to object-symbol association is through sign language.

Sign language has evolved in situations throughout the world in which spoken language is not possible (Daniels, 2001). These situations not only include the Deaf communities but monastic communities and, most recently, with infants developing typically in order to facilitate language development (Acredolo, Goodwyn, & Abrams 2002; Daniels, 2001). The most commonly used form of sign language and the third most common language in the United States is American Sign Language (ASL). It has only been since 1960 when William Stokoe completed his work on Sign Language Structures, that ASL has been
recognized as a language by linguists instead of an inferior manual form of English or a system of gestures. Now it is acknowledged that ASL is a complete language that exists in a visual-gestural modality and that it contains all the properties of other world languages. Symbols are combined in a rule-based manner to express meaning. ASL develops with regional variations and infants appear to acquire the language in the same sequential learning pattern as with other native languages (Daniels, 2001).

Structures of American Sign Language make them unique from the spoken and written English language. ASL uses hand movements that are significant in the visual system, these movements have been compared to spoken phonological systems. To better understand American Sign Language's phonology, linguists traditionally have described the four phonological features (location, handshape(s), movement, and orientation) of ASL. There are about twenty distinct locations or places for a sign to be produced in relationship to the articulator's body, about forty distinct handshapes used to form the signs, about ten distinct orientations of the hands and palms, and multiple movements of the hands in the signing space.

ASL has some differences in morphological structure. ASL does not use a sequential way of changing word form, but rather a simultaneous or pre-stated morphological marking. For simultaneous marking, a word stem is ingrained in the sign motion. For example, whereas a single verb may be signed with a single slow movement, when the “ment” suffix is added, a swifter more dynamic
movement is used. For pre-stated marking, the communication partner is alerted to the tense or time period before the word is signed.

In ASL the subject-verb-object syntax pattern does not dominate sentence structure, as it does in spoken English. ASL uses facial expressions, spatial syntax, and other nonmanual features to enhance syntactic structure. For example, facial expressions are used at the beginning of sentences to denote a question or negation. The beginning of signed sentence may include the most important information. This practice allows for the central idea of the sentence to receive initial focus.

A very unique aspect of the structure of ASL is its use of space around the communicators. Space is used for indexing and indicating various verb tenses. The concept of indexing refers to the placement of a person or object in space; this space is then referred to by pointing or glancing in the direction of the space. Verb tenses can be indicated by the placement of the hands in space during conversation. If the signer uses the space in front of the body they are indicating the future, close to the body the present tense, and indication of behind the body indicates past events.

Other characteristics, such as nonmanual cues are used in ASL to denote punctuation or intonation. These cues can be demonstrated through movements of the facial features, hands, or body postures. The meanings of the movements or specific cues are a predetermined part of the language.
Since sign language provides an opportunity for referent assimilation and the ability to provide visible pictures in the air, sign language can aid in identifying word meaning. Some signs describe what the referent looks like, what it does, or what can be done with it. Other signs are made to represent a concrete icon for abstractness. Sign language is the only language that is able to visually conceptualize an abstract word’s meaning.

Varieties of ASL have been developed but are not considered to be languages as is ASL. The term “pidgin” sign language has been given to these systems to denote that they are not true American Sign Language. They are used to teach hearing people to communicate with Deaf or as teaching aids in the Deaf community for learning written languages. The specific names of the systems usually indicate their focus. These include: Pidgin Signed English (PSE), Conceptually Accurate Signed English (CASE), English Sign Language (ESL), Signing Exact English (SEE), the Rochester method, Baby Sign, and Visual English. Due to the wider recent acceptance of ASL it is more commonly taught in schools for hearing individuals.

The acquisition of sign language in young children is much like that of the spoken language acquisition. The visual-spatial feature in sign language is the greatest difference. The iconic nature of sign language can help children understand the word meaning. The visual modality also encodes more information by showing function, size and shape, or other information about the word. Many children especially those with special needs are visual learners.
Perception of this language is strongly involved with the right hemisphere due to the visualization component as the left hemisphere is relied on for processing the information. This difference of the using both hemispheres to communicate makes sign languages unique from all spoken languages (Daniels, 2001).

Facilitating Word Learning

Current research has been initiated to examine different ways to facilitate early vocabulary growth. One technique for vocabulary facilitation has been the use of sign language or gesture with all young children—even those with normal hearing.

The signed systems that have been used in these vocabulary facilitation approaches are modifications of ASL. The signs are used to bridge early word presentation with a visual gesture; in general the signs are not combined into sentence length productions. Many signs are developed by the infant or parents; for this reason, they are usually referred to as “natural sign language.”

Examples of natural sign language are shown when babies learn to wave a hand for bye-bye, shake or nod their heads for “yes” and “no.” Children also adopt their own signs from experience in their environment, such as “panting” for dog or “flapping arms” for bird (Acredolo et al., 2002).

It has been suggested that this type of sign language is easier for most children at a very early age than verbalizing the labels of these words or actions. Motor abilities are developed in children well before the ability to speak.
Children learn to crawl, sit up, push buttons, and wave bye generally before they say their first correctly articulated intelligible words (Acredolo et al., 2002). There have been reports that children as early as 6- to 8-months of age can express simple wants, needs, emotions, and object naming through gestural use. This has been noted by a student who has studied families using ASL:

... deaf children of deaf parents using sign language... make their first signs when they are about six months old and have considerable sign-fluency by the age of fifteen months. This is intriguingly earlier than the “normal” acquisition of speech, suggesting that our linguistic development is, so to speak, retarded by speech, by the complexity of neuromuscular control required. If we are to communicate with babies, we may find that the way to do so is by sign. (Sacks, 1986, p32)

The learning process is reported to benefit from movements. Piaget (1976) claimed that thinking and learning are often set by movement. For example, adults’ write notes to remember information but for young children that is an insufficient modality. Producing sign language allows may help children encode thought and induce word meaning.

Memory plays an important part in the storage and retrieval of vocabulary learning. It has been suggested that visual imagery is stored in the right hemisphere, while spoken symbols are stored in the left hemisphere. Hoemeann (1978) postulated that sign language and spoken language aids
children’s memory of new vocabulary by storing information in two
independent areas of the brain.

Social aspects are also strengthened by sign language’s visual imagery,
especially eye contact and joint attention. Therefore, the early word learning
research on social interactions shows great support in using sign language to
facilitate word learning.

Spencer and Deyo (1993) reported underlying pervasive symbolic deficits
seen in the children labeled as language delayed or language-disordered.
Supplementing or increasing hearing children’s understanding and use of
symbols through sign language increases their capacity for play activity. Lev
Vygotsky (1962, 1978), a well-known psychologist, studied language learning
and the facilitating aspects play aids in the development of cognition. Play is
very important activity for young children’s language development, social
growth, and cognition. The skills obtained through play carry over to different
environmental contexts. Children ultimately learn from play as it aids in their
growth of language skills (Daniels, 2001).

Increased early language skills through sign language have been reported
by many daycare centers as well as other adults to significantly reduce
frustration because children are able to express information more easily. For
example “ba” can mean anything from ball to bottle but with gesture the
meaning becomes clearer. The parent-child bond is also strengthened with the
increased interactions that are possible with sign language use.
These findings have encouraged teachers, parents, and therapists to try to use sign language as an intervention strategy to facilitate verbal communication. It has been proposed that use of signs is natural, as humans naturally use hand gestures to communicate meanings until they are introduced to the appropriate verbalization. “As babies grow older their horizons expand and their needs change. And with these changes comes a strong desire for more sophisticated ways of communicating. … It is simply a natural step along the way.” (Acredolo et al., 2002, p. 130) William Stokoe talks about signed language developed into speech in the evolution of humans. Stokoe (2001) stated the following:

Communication gestures would have enhanced the social and individual lives of early humans. But, with this enhancement their hands, arms, and eyes would have become more and more occupied with communication. If we suppose that as they were using these gestures they made vocal noises as well, they might have discovered that a particular noise associated with a gesture could be used to represent the gesture and its naturally and conventionally related meaning. The next stage would have been the gradual or occasional disappearance of the gesture, leaving the sound pattern by itself to represent the meaning...It seems reasonable to suppose that both the benefit of human manual activity and the need for supplementing and eventually almost entirely replacing manual with vocal representation contributed to the evolutionary pressure causing the physical changes in the vocal tract. (p. 246)
Many research articles on this topic of sign language/ gestures used to facilitate language acquisition in hearing children suggest that further studies are needed. Few researchers however dispute that any form of nonverbal communication goes a long way toward helping babies develop. Daniels (1996) suggests “an educational benefit occurs when sign language is used with educationally challenged hearing children.” Most commonly this type of sign has been used with children with Down syndrome, Autism, and communicative impairments. Learning two languages has also proven to give children intellectual skills that extend into other areas (Brady, 2000). These findings support the need to explore the facilitative effects of sign language use to promote early word learning.

Summary

This literature review began by reviewing the important domains that are considered to be important in vocabulary learning. The fast-mapping research has increased understanding of children’s abilities to label novel objects. Finally this literature review concluded by discussing aspects of signed or gestural communication that facilitates early vocabulary growth. Interestingly, sign language appears to enhance many of the domains that are important for language development. Specifically, sign language is thought to enhance perceptual features of words by increasing memory through use of multiple senses, improve the child’s attention to word learning by the necessity of
continued partner focus, increase social skills demonstrated through improvements in play by increased expressions, and enhance linguistic abilities by using the modality to add novel vocabulary. Thus, sign language may have beneficial effects on children’s word knowledge and its use may increase early receptive and expressive vocabularies.
CHAPTER III.

METHOD

Subjects

Following granted approval from the Human Research Review committee and parental consent (see Appendix A) two twenty-two month old twin females (S1 and S2) participated in this study. Twins were chosen because they are the same age and their life experiences are relatively equivalent. Twenty-two month olds were chosen because children at this age are absorbing language quickly, are able to communicate well, and demonstrate observable vocabulary growth. Since both subjects are female, the experiment did not consider gender differences. The subjects were reported to be within normal limits for all developmental milestones. Both children had received hearing screening evaluations by their pediatrician and had been found to have normal hearing acuity. Motor development was reported as being within normal limits.
Stimuli

Stimuli consisted of eight household objects, similar in size (e.g., size of a fist). Per the mother’s report, all the items were unfamiliar to the subjects prior to their research exposure (see Appendix E).

Objects were selected to fit the following criteria: (a) all objects contained early developing sounds appropriate for the age of the subjects according to Templin (1957) and (b) four of the eight objects were deemed “difficult” and four were deemed to be “easy” as determined by the number of syllables or gesture sequences needed to produce each object label i.e., easy word consisted of only one syllable or one hand gesture, while difficult words consisted of two- to-three syllables or a combinatorial hand gesture sequence (see Appendix B).

Trial Procedures

Prior to the experimental procedure a trial procedure was completed. The trial procedure was used to familiarize the subjects to the procedure and evaluate the subjects’ sound production and fine motor skills. During the trial procedure the examiner used multiple cues to obtain the desired response. The subjects were observed to produce the early developing sounds necessary for the experimental procedure and to have the fine motor skills to make simple gestures. The trial was videotaped, this video taping served as the “training tape” for the raters.
Experimental Procedure

The eight objects (different than those that were used for the trial presentation) were presented to the children during the experimental procedure. Order of presentation was determined by random numbers generated by a computer (see Appendix C and D). This procedure was used to randomize order of presentation with consideration for both modality presentation (verbal versus signed) and vocabulary level (easy versus difficult). The order of subject participation (first versus second) each day was alternated.

Presentation of modality was counterbalanced. That is to say, each subject was presented with (a) two easy words presented via sign (b) two easy words presented verbally, (c) two difficult words via sign, and (d) two difficult words via verbal presentation. The “sign versus verbal” and “easy versus difficult” presentation was alternated for the two subjects.

The subjects were seen individually, with the sibling not present. Subjects were seated facing the examiner at eye level during the presentation of all objects; objects were hidden from sight (in a bag placed next to the examiner).

During the presentation, the examiner removed one object from the bag and held it for one second behind a piece of cardboard. After this momentary pause, the cardboard wall was removed and the object was revealed. At this time the examiner asked, “What is this?”. A two to three second delay was allowed for the child to attempt the modality. Following the child’s production, the examiner stated, “It is a (object name in verbal or sign modality).” Then the
child was asked “What is this?” a second time. A two to three second delay was again allowed for the child’s production. The child’s second production was subsequently rated from the videotape. A sticker reward system was used to promote the subjects’ interest and task focus. A verbal reinforcement, (“Good job!”) was also provided after each production. The subjects were rewarded after each presentation; “correct” production per se was not reinforced.

The word learning task was presented to the subjects every other day for a total of four sessions in the subjects’ home. The presentations took place at the same time each day. The total data collection period occurred over a seven day period. The entire procedure of every session was video and audio recorded in order to rate the subjects’ word production.

Reliability

The data obtained was subjected to analyses to confirm inter rater reliability. Two students majoring in Speech Language Pathology were trained to rate each subject using the “trial” video tapes. A 4-point rating scale (Appendix F) ranging from a score of 0 (no production) to a score of 3 (accurate sign or verbal production) was used by all judges. After all judges independently evaluated the subjects’ productions, comparisons were made between the examiner and the two judges. Intra rater reliability was computed by comparing the investigator’s initial scoring and a second independent scoring gathered two weeks apart.
CHAPTER IV.

RESULTS

The purpose of this thesis is to determine the preferred modality (verbalized or signed) of young children during a novel word learning task. The dependent variable used in this experimental protocol was the child's ability to spontaneously label objects, rated across four visits on a 4-point scale (Appendix F). The independent variables included modality of presentation (“verbal” versus “signed”) and vocabulary difficulty (“difficult” versus “easy”). Easy vocabulary contained one syllable or one gesture, whereas the difficult vocabulary contained more than one syllable or combinatorial hand position.

Inter-rater reliability of the rating protocol was determined by comparing the item labeling ratings of the examiner (R1) with two other trained judges (R2 and R3). Interjudge agreement between R1 and R2 were computed to be 0.97 for both subjects (agreement/disagreement + agreement). The agreement between R1 and R3 was 0.88 and 0.94 (Subject 1; Subject 2). The ratings were considered to indicate sufficient reliability of the rating measure (Schiavetti & Metz, 1997).
Intra-experimenter reliability was evaluated by comparing two separate ratings by R1. Intrajudge agreement was 0.94 for Subject one and 0.91 for Subject two (Schiavetti & Metz, 1997).

The first set of comparisons were completed to descriptively examine the children’s productive ability to produce vocabulary at two levels of difficulty (easy vs. difficult). For all analyses Subject 1 and Subject 2 were examined independently of each other. The subjects’ productions in response to the examiner’s final questioning, “What is this?”, were the data source for all calculated means in this experiment and are displayed in Table 1.

Means were obtained by averaging the rating for the four easy objects and four difficult objects across the four visits. The easy word ratings (M = Mean; SD = Standard Deviation) for Subject 1 for visit (V) 1 through V4 are as follows: V1 (M = 0.25, SD = 0.5), V2 (M = 0.75, SD = 0.96), V3 (M = 0.75, SD = 0.96), and V4 (M = 1.75, SD = 1.26). Ratings for Subject 1 production of difficult words was V1 (M = 0.75, SD = 1.5), V2 (M = 1.5, SD = 1.29), V3 (M = 1.75, SD = 0.96), and V4 (M = 2, SD = 0.82). The easy word ratings for Subject 2 for V1 through V4 were found to be as follows: V1 (M = 0.5, SD = 1.0), V2 (M = 3, SD = 0), V3 (M = 2.5, SD = 0.58), and V4 (M = 2.75, SD = 0.5). Subject 2’s ability to produce the difficult words was found to be: V1 (M = 1.5, SD = 1.29), V2 (M = 1.75, SD = 1.26), V3 (M = 2, SD = 0), and V4 (M = 1.75, SD = 0.5). Figure 1 descriptively demonstrates these results.
Table 1. Item label rating means of easy (E) and difficult (D) words in response to signed and verbal presentations for Subject 1 (S1) and Subject 2 (S2) across four visits.

<table>
<thead>
<tr>
<th></th>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
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</thead>
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<tr>
<td></td>
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<td>Signed</td>
<td>Verbal</td>
</tr>
<tr>
<td>E</td>
<td>D</td>
<td>E</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
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<td>0</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>S2</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Figure 1. Level of Difficulty: Comparison of mean ratings of subjects’ spontaneous labeling of easy or difficult words across four home visits
The second set of comparisons was computed to descriptively consider modality (signed versus verbal) of the presentation across the four visits. Subject 1 obtained the following means (M) and standard deviations (SD) for visit (V) 1 through V4: V1 (M = 0, SD = 0), V2 (M = 0.25, SD = 0.50), V3 (M = 0.50, SD = 0.58), and V4 (M = 2, SD = 0.82) for signed words versus V1 (M = 1, SD = 1.41), V2 (M = 2, SD = 0.82), V3 (M = 2, SD = 0.82), and V4 (M = 1.75, SD = 1.26) for the verbal words. Subject 2 obtained the following means and standard deviations for V1 through V4: V1 (M = 0.25, SD = 0.50), V2 (M = 2.5, SD = 0.58), V3 (M = 2.25, SD = 0.50), and V4 (M = 2.5, SD = 0.58) for signed words versus V1 (M = 1.75, SD = 1.26), V2 (M = 2.25, SD = 1.50), V3 (M = 2.25, SD = 0.50), and V4 (M = 2, SD = 0.82) for the verbal words. Figure 2 descriptively demonstrates these results.

The third comparison evaluated the interaction effects of the two independent variables, vocabulary difficulty and modality of presentation as shown in Figure 3. The subjects' mean ratings were compared for the fourth visit only. The fourth visit reflected the subjects' ability to learn the vocabulary after repeated exposure. Subject 1 demonstrated an interaction effect. She was able to produce difficult verbally presented words (M = 2.5, SD = 0.71) better than easy verbally presented words (M = 1.0, SD = 1.41). However, she produced easy signed words (M = 2.5, SD = 0.71) better than she was able to produce difficult signed words (M = 1.5 SD = 0.71).

In contrast, in both signed and verbal production, Subject 2 obtained a higher ranking for the easy words as compared to the difficult vocabulary. She
also demonstrated a better ability to produce the vocabulary presented to her via sign language as compared to the vocabulary presented verbally. Subject 2 obtained the following means and standard deviations: easy signed presentations, $M = 3$, $SD = 0$; difficult signed presentations, $M = 2$, $SD = 0$; easy verbal presentations, $M = 2.5$, $SD = 0.71$; and difficult verbal presentations $M = 1.5$, $SD = 0.71$. 
Figure 2. Modality: Comparison of mean ratings of subjects' spontaneous labeling in response to signed or verbal presentation across four home visits
Figure 3. Modality and Level of Difficulty: Comparison of mean ratings of subjects’ spontaneous labeling during fourth home visit

Subject 1

Subject 2
CHAPTER V.
DISCUSSION

In this study, 22-month-old twin females who were typically developing produced novel words for presented objects. Findings were interpreted to highlight each child’s preferred modality (sign versus verbal) and the degree to which level of difficulty (easy versus difficult) implicated word learning.

This study attempted to explore the benefit of sign language on the early word learning of young children. The completed data analyses also highlighted the issue of word difficulty - on object naming. In the current investigation, the two subjects were presented with a predetermined set of labeled objects that had been deemed to be either “easy” or “difficult.” The objects were assigned to one of the categories based on (a) single versus multiple syllables or (b) single versus combinatorial hand gestures.

The predicted hypothesis was that “easy” words would be learned faster than “difficult” words. The hypothesis was not consistently demonstrated in this research project in that the two subjects did not both show this learning pattern. Whereas, Subject 2 consistently performed better in her attempts to name or sign
the easy words, Subject 1 did not follow this pattern. Instead, Subject 1 demonstrated better naming or signing ability when labeling difficult words. These data can be interpreted to suggest that classification of words as being “easy” or “difficult” is a multi-faceted process. Difficulty level does not appear to be clearly linked to mere word length or the fact that a series of hand movements is required. Instead, children appear to be attending to a variety of aspects of the word presentation that differentially affect word learning ability. These results support the emergentist coalition theory (Hollich et al., 2000) that states that children are sensitive to multiple cues, along with attentional, social, and linguistic variables in word learning.

The second set of data analyses highlights the effects of the modality of the presentation, signed versus verbal, on object naming. Because of the recent research in this area on the beneficial effects of early sign language exposure, it was predicted that the children would more easily learn words presented via sign language. Again, these subjects responded differentially to the modality of presentation. Both Subjects initially appeared to prefer the verbal modality presentation (Session 1). This may be due to the novel aspects of sign language for these subjects, and the children’s unfamiliarity with the task requirements (i.e., the examiner was asking for a response requiring a hand movement). Subject 2 quickly acclimated to the task demands, however, and preformed relatively equivalent in both modalities throughout Sessions 2-4. In contrast,
Subject 1 demonstrated a different pattern of growth. She produced verbal word attempts with a greater degree of accuracy in Sessions 1-3 as compared to her signed attempts at object labeling. However, by Session 4, her sign and verbal productions were relatively equivalent.

The findings were not expected, but the literature on early word learning offers insight that helps in interpreting the data. Early word learning has clear developmental trends that are supported by early neurological growth and the child’s ability to use fast mapping. Although the children were young language users (22 months) they can be considered, in many respects, to be mature word learners. It is possible that children by the age of 22 months have clearly developed word learning strategies that are consistently reinforced by their caretakers. It may be that introduction of sign language at age 22 months may be too late to show a consistent impact on word learning.

The other important aspect of these findings is to underscore the importance of sustained interaction to facilitate word learning. It may be that four visits (with only a brief presentation of each word during each visit) was an insufficient amount of exposure to stimulate measurable vocabulary change.

The final set of data analyses evaluated the interaction effects of modality and level of difficulty. Again, the two subjects showed different learning trends. In this analysis, Subject 1 showed an interaction effect. She performed better when producing the easy words with sign language, but was more proficient in her production of difficult words with verbal labeling. Subject 2 presented a
slight trend to improved performance when using sign language for both easy and difficult word production.

These data suggest that word learning preferences are highly variable and individualistic. Different children may respond better to some presentation modes than others. It is critical for a child’s communication partner to be sensitive to his or her child’s interests and level of attentional focus in response to varying presentation effects. This sensitivity to a child’s preference in word learning, and the “match” between a caretaker and a child’s preferred learning style, is likely to maximize a child’s word learning potential.

These data, to some extent, are in contrast to the publicity that has focused on the potential benefits of early sign language exposure. For example, Acredolo and Goodwyn (1990) compared 103 families by dividing them into three groups; one group where both adult caretakers used sign, another group in which parents used frequent verbal labels, and a third group that served as the “control group” (received no special instructions). The children were followed to age seven. At this age (second grade), the children who had learned to sign had a higher intelligence quotient than the control group. Acredolo stated, “The signing babies were ahead of the pack at almost every measure at every age. They were learning to comprehend language faster, they were learning to talk faster, they were putting words together faster and they were doing better on the infant IQ tests at two years” (Walters, 1998, p. 12). She continued by stating, “Intelligence throughout life has a very large language component. So if you get
a jump start on language and that continues, it’s natural it would show a gain’” (The Toledo Blade, 2001, p. 4).

Acredolo and Goodwyn’s (1990) study described above was not a scientifically controlled study, but instead was more observational and antidotal in nature. Antidotal studies often are highly publicized and can dramatically alter educational practices. The current study was much less clear in its outcome; however the results underscore the variation that can occur across even two same-age siblings. This current study is informative in that it demonstrates the complex and multi-faceted nature of early word learning and the combination of factors that affect individual word learning abilities.
CHAPTER VI.

CONCLUSIONS

Analyzing data with attention to modality (sign versus verbal) and level of difficulty (easy versus difficult) increases understanding of children’s preferred modality for object labeling and the affect word difficulty on word learning. Three comparisons were performed to examine these issues. Descriptive analyses included (a) examination of the level of word difficulty and it’s effects on object naming ability, (b) consideration of the mode of presentation and it’s effects on object naming ability, and (c) evaluation of the interaction effects when considering both word difficulty and presentation mode. In the first comparison, it was concluded that the level of difficulty did not consistently affect word learning for the two subjects. It may be hypothesized that at this stage children learn words as labels and word length alone does not necessarily make a word more or less difficult.

The second comparison was interpreted to suggest that although the children had initial modality preference, by the fourth visit the children’s verbal and signed object labeling were generally equivalent. The children may have already developed a “word learning preference” and that the hypothesized
advantage of signed presentation (i.e., enhanced visual stimulation) was not useful to children already well on their way in their vocabulary development.

Finally, the third comparison reveals that children show differences in the combined effects of easy and difficult word leaning across modalities. It appeared that the modality of presentation differentially affected an individual’s word learning ability. A child may react or respond to visual information for one word, but may attend to auditory information for a different word. This affect was interesting and demonstrated the complex and multifaceted nature of early word learning.

This research project had limitations in that it was conducted with only two subjects, presented the stimuli across only 4 visits, and used a predetermined hypothesis regarding word difficulty (e.g., that shorter “easy” object labels would be easier than longer [or combinatorial] “difficult” object labels). Further research needs to be done in this area to evaluate word learning across modality and to explore the variables that influence word difficulty. Age, gender, and the effects of socioeconomic factors on word learning are also important variables that may influence word learning potential and are aspects of word acquisition that should be explored in future projects.
REFERENCES


APPENDIX A.

PARENTAL CONSENT FORM
PARENTAL CONSENT FORM

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Project:
Sign Language as a Means to Improve Early Word Learning

Project Description:
There are many different ways to teach new words and early language to young children. Some research suggests that very young children learn simple signs or gestures earlier than they can speak new words. This study was designed to expose young children to some simple sign language to see if this helps them learn new words. During 3 home visits (approx. 30-40mins. each), with a parent present, the investigator will show your child some words with sign language and some with a verbal (spoken) model. On a fourth home visit the child will be asked to “tell me what this is.” We will be looking to see if more of the spoken words or signed words are learned in this short time. The interactions with the investigator will be videotaped so that we can look at the number of attempts your child makes to sign or say the words.

All information about participants in the program will be strictly confidential. Other than The University of Toledo researchers, no one will know the names or any personal information about anyone who participates in this project.

If you would like to ask questions, please contact one of the investigators listed above.

Consent to Participate

I have been informed about, and understand, the purpose of the study and my child’s participation in it. I understand that my child can discontinue participation in this study at any time. I also understand that if we decide we do not want to participate, this decision will not affect my relationship the investigators or with The University of Toledo. I give my consent for my child to participate in this study and agree to have the interactions videotaped. I understand that granting permission on this consent form means that these videos will be used for research
purposes. The videos will be secured in a locked file cabinet in the research advisor’s office. Please initial one of the following:

☐ YES  ☐ NO

_______________________  _____________________
Name of Child            Parent or Legal Guardian

_______________________  ______________
Witness                  Date
APPENDIX B.

LIST OF STIMULUS ITEMS
## LIST OF STIMULUS ITEMS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Stimulus Item</th>
<th>Difficulty Level (1= “easy”, 2= “difficult”)</th>
<th>Phonetic Description of Verbal Language Presentation</th>
<th>Description of Signed Language Presentation</th>
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<tbody>
<tr>
<td>1</td>
<td>Knob</td>
<td>1</td>
<td>/nab/</td>
<td>open claw, twist slight right</td>
</tr>
<tr>
<td>2</td>
<td>Dot</td>
<td>1</td>
<td>/dat/</td>
<td>Index finger hooked down toward fist and sharply extended outward</td>
</tr>
<tr>
<td>3</td>
<td>Top</td>
<td>1</td>
<td>/tap/</td>
<td>All finger tips together pointing downward and slide over thumb to the right</td>
</tr>
<tr>
<td>4</td>
<td>Gnome</td>
<td>1</td>
<td>/nom/</td>
<td>Index finger starts on chin moving smoothly in a half circle to tip of nose</td>
</tr>
<tr>
<td>5</td>
<td>Pocket</td>
<td>2</td>
<td>/pakIt/</td>
<td>Left hand positioned in an “and hand” hand shape inserting right four fingers into opening</td>
</tr>
<tr>
<td>6</td>
<td>Compass</td>
<td>2</td>
<td>/kmpIs/</td>
<td>Left hand positioned in an “flat hand” hand shape as right hand points up then down with index finger</td>
</tr>
<tr>
<td>7</td>
<td>Pentagon</td>
<td>2</td>
<td>/pEntgan/</td>
<td>Left hand positioned in a “clawed hand” hand shape as right hand index finger moves from one digit to the next</td>
</tr>
<tr>
<td>8</td>
<td>Domino</td>
<td>2</td>
<td>/damIno/</td>
<td>Thumbs and Index fingers of both hands extend from fists and meet together in front of body</td>
</tr>
</tbody>
</table>
APPENDIX C.

ORDER OF PRESENTATION FOR SUBJECT 1
ORDER OF PRESENTATION FOR SUBJECT 1

<table>
<thead>
<tr>
<th>Visit 1</th>
<th>Object</th>
<th>Modality (V= verbal, S= signed)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Top</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Compass</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Gnome</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Knob</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Dot</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Pocket</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Pentagon</td>
<td>V</td>
</tr>
<tr>
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<td></td>
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<td>V</td>
</tr>
<tr>
<td></td>
<td>Domino</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Pentagon</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Dot</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Knob</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Compass</td>
<td>S</td>
</tr>
<tr>
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<td>Gnome</td>
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<tr>
<td></td>
<td>Dot</td>
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<tr>
<td></td>
<td>Knob</td>
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</tr>
<tr>
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<td>Pocket</td>
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<tr>
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<td>Gnome</td>
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<td></td>
<td>Pentagon</td>
<td>V</td>
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<tr>
<td></td>
<td>Top</td>
<td>V</td>
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<tr>
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<td>V</td>
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<td>Domino</td>
<td>V</td>
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APPENDIX D.

ORDER OF PRESENTATION FOR SUBJECT 2
## ORDER OF PRESENTATION FOR SUBJECT 2

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<thead>
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<tr>
<td>Pocket V</td>
<td></td>
</tr>
<tr>
<td>Domino S</td>
<td></td>
</tr>
<tr>
<td>Pentagon S</td>
<td></td>
</tr>
<tr>
<td>gnome V</td>
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<td>Top S</td>
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<tr>
<td>Knob S</td>
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</tr>
<tr>
<td>Top S</td>
<td></td>
</tr>
<tr>
<td>Compass V</td>
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<td>Pentagon S</td>
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<td>Domino S</td>
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<tr>
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<td>Compass V</td>
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<td>Pentagon S</td>
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<tr>
<td>Domino S</td>
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<tr>
<td>Dot V</td>
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<tr>
<td>gnome V</td>
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<tr>
<td>Pocket V</td>
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<table>
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<td>Gnome V</td>
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<td>Dot V</td>
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</tr>
<tr>
<td>Top S</td>
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<td>Knob S</td>
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<td>Pocket V</td>
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<td>Domino S</td>
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</tr>
<tr>
<td>Compass V</td>
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</tr>
</tbody>
</table>
APPENDIX E.

STIMULUS PICTURES
STIMULUS PICTURES

DOT

GNOME

TOP

KNOB
STIMULUS PICTURES CONT.

DOMINO

PENTAGON

POCKET

COMPASS
APPENDIX F.

RATING SCALE FOR SIGNED AND VERBAL RESPONSES
### RATING SCALE FOR SIGNED AND VERBAL RESPONSES

<table>
<thead>
<tr>
<th>Signed language</th>
<th>Verbal language</th>
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</thead>
<tbody>
<tr>
<td>0 no hand movement intended for object naming</td>
<td>no verbal output intended to name object</td>
</tr>
<tr>
<td>1 hand movement, but not sure what to do</td>
<td>verbal output, no relation to object, not sure what to say</td>
</tr>
<tr>
<td>2 hand/sign approximation, almost understandable</td>
<td>attempted verbal output to name, but not correctly articulated</td>
</tr>
<tr>
<td>3 signed exactly</td>
<td>perfectly articulated</td>
</tr>
</tbody>
</table>