THE TRANSITION FROM A NOVEL WORD TO A KNOWN WORD IN PRESCHOOL-AGE TYPICALLY DEVELOPING CHILDREN

Anna M. Ehrhorn

A Thesis
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Committee:

Tim Brackenbury, Advisor
Virginia Dubasik
Elizabeth Burroughs
ABSTRACT

Tim Brackenbury, Advisor

Numerous studies have demonstrated that young children can learn new words without direct teaching (Rice, 1990; Hollich, Hirsh-Pasek, Golinkoff, Brand, Brown, Chung, Hennon, Rocroi, & Bloom, 2000; Halberda, 2003; Brackenbury & Pye, 2005; Brackenbury, Ryan, & Messenheimer, 2006; Carey, 2010). However, very few have examined the integration of novel words into children’s lexicons (e.g., Markman & Hutchinson, 1994). The present study assessed how and when preschool-aged children acquire novel words from stories, and connect them to familiar words that are related taxonomically and thematically. Testing was conducted immediately after hearing the stories and one week later with no further exposure. The children correctly identified all three types of lexical connections (i.e., phonological form, taxonomic associates, and thematic associates) at greater than chance levels, demonstrating that each type of lexical connection was accessed during novel word learning. Performances related to the time of testing and the interaction between time and connection type were not significantly different. These results suggest that children are accessing their current lexical knowledge when acquiring novel words and that the integration of newly learned words continues after the exposing event.
Many have provided me with guidance, assistance, and support during the development of the study, execution of the study, and writing the document. I would like to thank my thesis committee members. My advisor, Dr. Tim Brackenbury, has supported my thesis project from the initial stages through the end allowing me to develop research skills. Both of my thesis committee members, Dr. Virginia Dubasik and Dr. Elizabeth Burroughs, have been available to assist with a road bumps along the way. Besides my committee members, Dr. Mark Earley provided support during the analysis of the data. Also, I would like to thank Elizabeth Witter, M.S. for her time to perform the inter-rater reliability and Dr. Alex Goberman and Jason Whitefield for their assistance with recording the stories. The study would have never been possible without the wonderful children. Thank you to the parents and teachers in supporting research to develop further understanding of children’s word learning.
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INTRODUCTION

Word learning is a quick and effortless process for most children. The earliest stages of word learning occur through repetition, exposures, interactions and explicit teaching. At a certain point, however, children acquire enough linguistic, social knowledge, and skills to expand their lexicons without explicitly being taught new words. Through implicit learning, children become active agents in their development and are able to increase their receptive and expressive vocabularies. At the same time, children are organizing their lexicons in multiple ways, based on how the words they learned relate to each other. This process continues, integrating each newly acquired word within the current organizational structure (e.g., the child’s lexicon). It is currently unclear, however, when and how new vocabulary items are integrated. Does it happen, for example, at the onset of new word learning or later? The present investigation examines this question by evaluating preschoolers’ abilities to learn new words and connect them with known lexical items. The following literature review examines how children typically learn words and how they organize their lexicons, with an emphasis on two types of lexical connections; taxonomic and thematic.
LITERATURE REVIEW

Word Learning in Children

Word learning requires children to use phonological and semantic knowledge to store a sound sequence and connect it with a meaning from linguistic input. Both types of knowledge assist children to store words in an organized fashion for effective and efficient use later (Brackenbury & Pye, 2005). This process of learning may occur explicitly or implicitly, but has been described as involving two processes, fast and slow (or extended) mapping.

The first step in implicitly learning a new word is to quickly create an understanding or rough sketch of a word meaning when given a brief exposure. The terms fast-mapping and quick incidental learning (QUIL) refer to the children’s abilities to learn new words without explicit teaching (Rice, 1990; Carey, 2010). Both emphasize the initial pairing of the phonological form with a referent, without direct teaching or many exposures. Experimentally, fast-mapping typically involves single exposures to new words whose referents are displayed in a field that also include familiar objects. QUIL, on the other hand, embeds multiple novel words within stories whose visual fields are more complex. As a result, QUIL is considered to be more representative of what children will experience with novel words in their daily lives (Rice, 1990). The ability to fast-map has been demonstrated in children as early as 18 months old (Hollich, Hirsh-Pasek, Golinkoff, Brand, Brown, Chung, Hennon, Rocroi, & Bloom, 2000; Halberda, 2003; Brackenbury, Ryan, & Messenheimer, 2006). The meanings of words learned in either context are incomplete, but are stored in long-term memory and can be recalled later. Fast-mapping and QUIL demonstrate how a child can quickly construct a meaning for a new word, but not how they transition that new word into their lexicons.
The second step in word-learning involves slow-, or extended-, mapping. Slow-mapping is the acquisition of words after the initial exposure (Carey, 2010). The research on this type of word learning has only developed in recent years (Kucker & Samuelson, 2012; Vlach & Sandhofer, 2012; Wagner, Dobkins & Barner, 2013). In slow-mapping, children build deeper understandings of fast-mapped words and increase connections with other lexical items through increased experiences and exposures within a variety of linguistic and social-pragmatic contexts. The novel word eventually is transferred to a known word in the child’s lexicon across the word learning process.

Organization of Words

Once children capture the phonological structure and meaning of new words, they need to store this knowledge. Bock and Levelt (1994) suggested that each lexical entry consists of three different levels; conceptual, lemma, and phoneme. The conceptual level contains information related to word meanings and referents. The lemma contains information represented by properties of syntax. For example, a child’s lexical representation of the word *deer* might include concepts like *animal*, *forest*, and *hunting*; while the lemma signifies *deer* as a noun that refers to both singular and plural occurrences. The phoneme level contains information related to the individual phonemes within a word and their sequence. From the example above, the child’s phoneme point for *deer* would include the phonemes /d/, /ɪ/, and /r/, presented in that particular order.

Bock and Levelt’s model (1994) is fairly straightforward with respect to single entries, but it becomes increasingly complex when considering the hundreds of words that young children know and how these words relate to each other. If, for example, the child above knows the words *animal*, *forest*, and *hunting*, then she likely has connections between these items
because their meanings are all within her conceptual level knowledge of deer. It is unclear if the information related to the lexical entry is a) stored as one unit that can be connected with other words’ units, b) made up of individual ideas that are distributed and shared amongst related words, or c) the result of a combination of individual units and distributed ideas (Dollaghan, 1992; Gupta & MacWhinney, 1997). Regardless of the underlying architecture, lexical items can be related to one another in multiple ways that span the conceptual, lemma, and phonological levels. These may include, but are not limited to hierarchical groupings, functional connections, part-whole relationships, grammatical class, initial phonemes, and rhymes.

Taxonomic and Thematic Relations in Word-Learning

Two different types of lexical connections that have been examined in young children’s language development are taxonomic (categorical based) and thematic (time or event based) relations. In a taxonomic relation, “objects are placed together in a category” (Markman, 1989, p. 2). For example, common taxonomic relations for deer, include animal, elk, and antelope; deer are a kind of animal, elk is a specific type of deer, and antelope are another species of animal. A thematic relation is when “objects are grouped together by relational criteria [i.e., frequently located with each other]” (p. 2). Words like forest, river, and bow-and-arrow may be thematically related to deer, depending on one’s experiences with this animal.

Research has shown that children as young as 13 months old understand taxonomic and thematic relations (Dunham & Dunham, 1995). Since at least the early 1980s, researchers have tried to understand the development of these relations in preschool- and school-age children. The most consistently used method for examining taxonomic and thematic relations has been to show a picture of a familiar object and then ask the participants to identify a match from a response field that included unrelated known items and a taxonomic associate, a thematic associate, or
both (Markman & Hutchinson, 1984; Fenson, Vella, & Kennedy, 1989; Walsh, Richardson, &
Faulkner, 1993; Dunham & Dunham, 1995; Waxman & Namy, 1997; Blaye & Bonthoux, 2001;
Scheuner, Bonthoux, & Cannard, 2004).

Variations to this method have included the perceptual saliency of the pictured objects
(Fenson, Vella, & Kennedy, 1989), items from different levels within taxonomies (Dunham &
Dunham, 1995), the phrasing used to request the match (Waxman & Namy, 1997; Scheuner,
Bonthoux, & Cannard, 2004; Markman & Hutchinson, 1984), pictures vs. toy objects (Waxman
& Namy, 1997), familiarization experiences prior to testing (Waxman & Namy, 1997; Scheuner,
Bonthoux, & Cannard, 2004; Markman & Hutchinson, 1984), levels of association for each
taxonomic and thematic pair (Scheuner, Bonthoux, & Cannard, 2004), re-evaluation of learning a
week later (Scheuner, Bonthoux, & Cannard, 2004), justification made by children (Walsh,
Richardson, & Faulkner, 1993; Markman & Hutchinson, 1984), use of a picture scene to elicit
the selection (Blaye & Bonthoux, 2001), number of field response options (Scheuner, Bonthoux,
& Cannard, 2004; Blaye & Bonthoux, 2001; Markman & Hutchinson, 1984), and type of stimuli
provided (Markman & Hutchinson, 1984). The results of these experiments have consistently
demonstrated that a) children two and older demonstrate both taxonomic and thematic relations
with known words, b) younger children tend to select taxonomic over thematic relations in
forced choice situations, and c) children’s responses are influenced by each of the variations
presented above.

To date, there has been only one study that has investigated children’s taxonomic and
thematic relations for novel words. Markman and Hutchinson (1984) presented results from four
experiments with children between 2 years, 5 months and 5 years, 11 months. The methods of
these experiments were similar to those used in the known word studies, but also included novel
word label and no word label conditions. These experiments are described below, with an emphasis on the fourth experiment because it examined the associations formed immediately after first exposure to novel words and the unfamiliar referents. Table 1 presents a comparison of the methods of the four experiments and Table 2 shows their results.

Table 1

*Comparison of methods from Markman and Hutchinson (1984).*

<table>
<thead>
<tr>
<th>Experiment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
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<tbody>
<tr>
<td>Participant ages</td>
<td>2;5 – 3;11</td>
<td>4;4 – 5;3</td>
<td>4;0 – 4;10</td>
<td>4;6 – 5;11</td>
</tr>
<tr>
<td>Word condition</td>
<td>No word, Novel word</td>
<td>Known word, No word</td>
<td>Known word, Novel word</td>
<td>No word, Novel word</td>
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<tr>
<td>Pictures shown</td>
<td>Known</td>
<td>Known</td>
<td>Known</td>
<td>Unknown</td>
</tr>
<tr>
<td>Response field</td>
<td>Basic-level category, Thematic</td>
<td>Superordinate-level category, Thematic</td>
<td>Superordinate-level category, Thematic</td>
<td>Unfamiliar category, Thematic</td>
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<tr>
<td>Instruction</td>
<td>Taxonomic bias</td>
<td>Taxonomic bias</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>Justification</td>
<td>N/A</td>
<td>Thematic</td>
<td>Thematic</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 2

*Results of the four experiments from Markman and Hutchinson (1984).*

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Known Word</th>
<th>No Word</th>
<th>Novel Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>Chance</td>
<td>Categorical &gt; Thematic</td>
</tr>
<tr>
<td>2</td>
<td>Chance</td>
<td>Chance</td>
<td>Categorical &gt; Thematic</td>
</tr>
<tr>
<td>3</td>
<td>Categorical &gt; Thematic</td>
<td>Thematic &gt; Categorical</td>
<td>Categorical &gt; Thematic</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>Thematic &gt; Categorical</td>
<td>Categorical &gt; Thematic</td>
</tr>
</tbody>
</table>
In experiments one through three, Markman and Hutchison (1984) were interested in children’s responses to known pictures. The first experiment established that two- and three-year-old children select basic-level taxonomic relations over thematic relations when a novel phonological form is presented with a familiar object (e.g., using the label “dax” to refer to a picture of a poodle.). In contrast, the children did not select one type of relation over another when no word was presented along with the target object; meaning taxonomic and thematic relations were made with similar frequency. The second experiment yielded the same results, but included superordinate-level taxonomic relations response in place of basic-level taxonomic relations and a known word condition. Both of these experiments used taxonomically biased instructions (e.g., “Find a kind of dax.”). To determine if this affected the participants’ responses, the third experiment adjusted the instruction to be more neutral (e.g., “Find another dax.”). The neutral instruction yielded the same results as the first two experiments; children selected the taxonomic related picture instead of the thematic relation picture. In addition to these receptive tasks, the second and third experiments asked children to justify their responses, by explaining why they made the choices that they did. Although the children typically selected the taxonomically related picture, they described their responses with thematically-based explanations (e.g. Children selected the novel word “dax” and the dog bone using a taxonomic relation, but thematically justified their selection by explaining that both are white). Markman and Hutchinson suggested that children are not simply translating the novel word based on taxonomic knowledge, but also apply thematic knowledge (p. 22). This suggests that children are accessing the taxonomic information during the picture-pointing task, but explaining themselves with thematic relations.
Markman and Hutchison’s (1984) fourth experiment offered a direct examination of how children associated new words with potential taxonomic and thematic relations. Prior to each novel word exposure and trial, the participants were trained on taxonomic and thematic relations for the target unfamiliar object. The first training trial presented pictures of the referent of the target novel word and another unfamiliar object, along with taxonomic information about them (e.g., “These both swim in the water.” p. 18). The second training trial showed the target object and another unfamiliar object that demonstrated a thematic relationship (e.g., “This catches this.”). The participants were then shown the target unfamiliar object by itself, which was either labeled with a novel phonological form or shown without a spoken label. Children in the novel word condition, for example, were told, “I’m going to show you a kind of dax. Then I want you to think carefully, and find another dax. See this dax? Can you say dax?” (p. 19). They were then shown the two unlabeled taxonomic and thematic items from the training trials and asked, “Can you find another of dax?” As with experiments one through three, children in the novel word condition selected the taxonomically related item more often than the thematic one. The results were reversed in the no word condition, reflecting the results of experiment three. Although Markman and Hutchison did not assess the participants’ acquisition of the novel words, they interpreted their results as demonstrating children’s use of “abstract constraints” (p. 20), taxonomic and thematic associations, when interpreting objects’ meanings.

Present Study

Children’s interpretations of a novel word become categorized into the established lexicon during semantic development. The process starts by children developing interpretations of novel words following brief, incidental exposures. Over time, the children appear to use slow-mapping to gain a more complete understanding of word. During their early semantic
development, children are using both taxonomic and thematic relations (i.e., lexical connections) to organize known object words (Fenson, Vella, & Kennedy, 1989; Markman & Hutchinson, 1984; Dunham & Dunham, 1995; Waxman & Namy, 1997; Scheuner, Bonthoux, & Cannard, 2004; Walsh, Richardson, & Faulkner, 1993; Blaye & Bonthoux, 2001). The literature on novel word learning suggests that when presented with an unknown referent and unfamiliar phonological form, children create interpretations of taxonomic over thematic connections (Markman & Hutchinson, 1984).

The current study’s primary goal was to determine how and when children with typical language development connect newly learned words with the words previously established in their lexicon. The participants will be indirectly exposed to novel words, their referents, and taxonomically and thematically related familiar words embedded in stories. They will then be tested for their comprehension of all three types of lexical connections, both immediately after the exposure and one week later. The specific research questions that were addressed were:

1. When first exposed to novel words and referents, do preschool-aged children make connections between the novel words and related, familiar taxonomic and thematic items? Is one type of lexical relationship more robust than the other?
2. Do the connections that preschool-age children make between novel words and familiar taxonomic and thematic relations change over time, without additional exposure?
3. Do preschool-age children use interactions between the type of lexical connection and change in time during word learning?

The current investigation will borrow the methods framework from the QUIL studies and Markman and Hutchinson’s (1984) study. The QUIL studies provide the underlying foundation
on the context for development of novel word learning in children. The Markman and Hutchinson study provided the ages of participants, the use of novel stimuli, and the type of instruction. But, the present study differs in at least three important ways. The first is the context in which the novel words are presented. Markman and Hutchinson exposed the children to the novel words via direct teaching (e.g., “I’m going to show you a dax. Then I want you to think carefully and find another dax.” p. 19). By interspersing the target words within stories, the present investigation will present them within a more natural, indirect framework. A second difference was the method of assessing the lexical connections. Markman and Hutchinson provided a forced two-choice task between taxonomic or thematic choices, so limiting the children’s selection. In this study, the children will be allowed to demonstrate their knowledge of the lexical connections (i.e., phonological form, and taxonomic and thematic connection) independently of each other. Lastly, Markman and Hutchinson asked their children to connect novel words thematically and taxonomically to other novel objects, which is not attempted in the present study.
METHODS

Participants

The primary participant group consisted of twenty-nine 4- and 5-year old monolingual, typically developing children from the greater Toledo, OH area. Their mean age was 4-years, 8-months and 16 of them were female. All of the children were of typical language development per parent reports on a brief questionnaire, had hearing within normal limits as determined by a standard audiometric screening (ASHA, 2007), and performed within normal limits on the Clinical Evaluation of Language Fundamentals-Preschool-2 (CELF:P-2) (Wiig, Secord, & Semel, 2004). The standard audiometric screening used 25dB level at 1000 Hz, 2000 Hz, and 4000 Hz. The CELF:P-2 is a standardized test of preschool language skills for children between the ages of 3 years through 6 years. A standard score of 85 was the minimum for a child to be considered to have language skills within normal limits. The children in the study had mean standard score of 103 ranging from 86 to 143. Five of the children’s parents expressed concern for their child’s language development and one of the children had been previously diagnosed with a “developmental disability of apraxia”. These concerns were ruled out by the children’s within normal limits performance on of the CELF:P-2.

An additional group of ten children also participated. They served as a “control group” because they completed the comprehension testing without having viewed the exposure stories. This group was included to verify that the target words were a) unfamiliar, b) not directly related visually to their thematically associate words, and c) of no higher perceptual saliency than the foils in the comprehension testing. They were also included to determine if taxonomic connections could be made between the familiar superordinate labels (animal, clothes, furniture, food, instrument, tool, toy, and vehicle) and the target words’ images. The children in this
group’s mean age was 4-years, 9-months and 6 of them were female. They met all of the developmental, hearing, and language criteria as the experimental group. Demographic information for both groups of participants is presented in Table 3.
Table 3

Demographic characteristics of the children exposed and not exposed to the computerized stories.

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<th>Not exposed to stories (n = 10)</th>
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<tr>
<td>Heritage</td>
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<tr>
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</table>
Procedures

Once determined to be of typical development, the children in the experimental group were individually presented with two computerized, audio-recorded stories that provided indirect visual and verbal exemplars of 8, one to two syllable novel words with CVC or CVCVC construction (See Appendix A). Each novel noun was labeled a total of eight times with a novel phonological form, and connected with a taxonomically familiar word (e.g., The *togud* was an *instrument*.) and thematically with another familiar word (e.g., The *togud* used *water*.) The target words are presented in Table 4 with their phonological forms and lexically connected familiar words. Both computerized stories were similarly structured in the presentation of the novel words, overall length, and grammatical complexity.

Table 4

Target novel words presented in the stories with related fast mapped phonological form, and lexical connections.

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Phonological Form</th>
<th>Taxonomic Connection</th>
<th>Thematic Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>bave</em></td>
<td><em>barv</em></td>
<td>Vehicle</td>
<td>Dirt</td>
</tr>
<tr>
<td><em>paydil</em></td>
<td><em>paɪdɪl</em></td>
<td>Animal</td>
<td>Cracker</td>
</tr>
<tr>
<td><em>puth</em></td>
<td><em>puθ</em></td>
<td>Typy</td>
<td>Stick</td>
</tr>
<tr>
<td><em>togud</em></td>
<td><em>tʊɡʊd</em></td>
<td>Inturment</td>
<td>Water</td>
</tr>
<tr>
<td><em>daivik</em></td>
<td><em>daɪvɪk</em></td>
<td>Clothing</td>
<td>Ball</td>
</tr>
<tr>
<td><em>kibe</em></td>
<td><em>kɑɪb</em></td>
<td>Food</td>
<td>Toast</td>
</tr>
<tr>
<td><em>golave</em></td>
<td><em>ɡʊlɑɪvɛ</em></td>
<td>Furniture</td>
<td>Box</td>
</tr>
<tr>
<td><em>faus</em></td>
<td><em>faʊs</em></td>
<td>Tool</td>
<td>Nail</td>
</tr>
</tbody>
</table>

After both stories were presented, the children’s comprehension of the lexical connections was measured using a computerized picture-pointing task. They were asked to identify each of the target objects based on their phonological form (i.e., fast-mapping),
taxonomic associate (e.g., “Where is the instrument?”), and thematic associate (e.g., “Which one goes with water?”). For both groups, the fast mapping, taxonomic, and thematic tasks were presented in the same fashion, by showing the child a page that had four pictures; the target object, a second target object from the story, a novel object not in the story, and a familiar object not in the story. The participants were asked to identify each target object by its phonological form during the fast mapping trials (e.g., “Show me the kibe.”), superordinate category label in the taxonomic trials (e.g., “Show me the food.”), and related object label in the thematic (e.g., “Which one goes with toast?”). All of the fast mapping trials were conducted before the taxonomic items and then the thematic items. Each group of trials also included three items that were requests for the familiar objects, to ensure that the participants were maintaining their attention to the task and considering all of the potential response items. The dependent variable in this investigation were the children’s raw scores, which consisted of 24 possible correct responses to the comprehension questions (8 target objects x 3 lexical association types). A general script was used to present the activities to the children. Before the stories were presented, the children were provided with instructions stating “Now, you will listen and view two stories on the computer”. If needed, children were provided with short breaks between the stories. When the comprehension tasks were presented, children were told “Now, we are going to play a computer pointing game. You will hear some words you know, and some you don’t know. The computer will ask you to point to one picture. Point directly in the center of the one picture you heard the computer say. Do you best.” If the children would ask for assistance in their selection, children were told “I don’t know. You’re the expert.”

To examine the children’s retention and integration over time, each participant in the story exposure group was tested again one week later, using the same tasks, without a second
exposure to the stories. The children that were not exposed to the stories completed the same computerized picture-pointing task as their peers, but were not tested a second time.
RESULTS

The response frequencies of the children who were exposed to the computerized stories (n = 29) are analyzed at two times by overall accuracy and each individual computerized comprehension task (i.e., fast mapping, taxonomic, and thematic).

Reliability of Scoring

The children’s performances during the computerized lexical tasks were videotaped, for inter- and intra-examiner reliability measures. Ten-percent of the comprehension tasks were selected at random and checked for reliability by a second examiner. The inter-examiner reliability was 97%. Intra-examiner reliability for another ten-percent of the comprehension task data was at 95% agreement.

Primary Analyses

In the experimental group, the children’s mean accuracy of eight trials for each lexical connection (i.e., fast mapping connection, taxonomic connection, and thematic connection) was examined over two periods in time (i.e., time 1 and 2). The children’s mean accuracy on each lexical connection over the two periods in time are presented in Figure 1 below. The children fast mapped the developed phonological form an average of 3.86 of the 8 target words at time 1 and 3.97 at time 2. Taxonomic connections were accessed with an average of 5.14 out of 8 target words at time 1 and 5.03 at time 2. The children created thematic connections with novel words an average of 2.79 of the 8 target words at time 1 and 3.21 at time 2.
Three sets of pairwise t-tests, one for each type of lexical connection, were used to determine if the experimental participants correctly identified the novel words at greater than chance rates following their initial exposure. The children were found to fast map the novel words at significantly greater than chance levels \( t(28) = 6.054, p = 0.01 \). Similar significant results were also found for correct taxonomic associates \( t(28) = 17.067, p = 0.01 \) and thematic associates \( t(28) = 2.310, p = 0.03 \). Therefore, children were making all types of lexical connections at greater than chance levels when initially exposed to novel words.

A repeated measures 3 x 2 ANOVA was conducted to determine whether comprehension of one type of lexical connection (i.e., phonological form, taxonomic associate, thematic associate) was more robust than another, if performance changed across time (i.e., time 1 and 2), and if there were any interactions between lexical connection and time. An overall significant main effect was found for type of lexical connection \( F(2, 27) = 26.033, p = 0.01 \), partial \( \eta^2 = \).
0.659], meaning that there was a difference in performance across the lexical tasks. No overall significant main effect was found for time \( F(1, 28) = 0.237, p = 0.63, \text{partial } \eta^2 = 0.008 \), meaning the children did not significantly increase or decrease their accuracy over two points in time without additional exposure to the novel words. No significant main effects interactions between lexical connection and time were found \( F(2, 27) = 1.299, p = 0.29, \text{partial } \eta^2 = 0.088 \), meaning the pattern of performance across the three lexical connections did not change over time.

The significant main effect for lexical connection type was further explored via three post hoc pairwise t-tests. These tests revealed that the children correctly identified the taxonomic associates significantly more accurately than the phonological forms \( t(28) = -4.766, p = 0.01 \) and thematic associates \( t(28) = 7.298, p = 0.01 \). Further, they identified the phonological forms significantly more accurately than the thematic associates \( t(28) = 3.872, p = 0.01 \).

**Additional Analyses**

**Control Group Analysis.** The ten children in control group completed the same comprehension trials as their peers, only without exposure to the stories containing the target words. These children’s mean group performances on the three types of lexical connections were 2.00 for fast mapping, 5.40 for taxonomic associates, and 0.80 for thematic associates. The mean scores of the children in the control group were lower for fast mapping and thematic associates compared to the children in the experimental group, but similar for the taxonomic associates (Figure 1). As with their peers’ data, three sets of pairwise t-tests were conducted to determine if these responses occurred at greater than chance rates. The children did not identify the novel words or thematically associated words at significantly greater than chance levels \( [t(9) = 0.000, p = 1.00 \) for novel word and \( t(9) = -6.000, p = 0.01 \) for thematic associates\] (It is important to
note that the significant result for the thematic associates was in a negative direction, meaning that their performance was below the set the maximum chance level.). These results suggest that the target words were unfamiliar, of no higher perceptual saliency than the foils in the testing, and not directly related visually to their thematically associate words. The taxonomic associates, on the other hand, were selected at significantly greater than chance level \( t(9) = 11.129, p = 0.01 \]. The children appear to have been accessing their taxonomic knowledge of known words to make connections between the familiar superordinate labels with the target words’ images.

**Individual Novel Word Analyses.** Additional descriptive analyses were conducted to answer the questions regarding performance differences within the 8 novel words. Were any of the words learned more or less often than the others? Were their taxonomic and thematic associates identified more or less often than the others? The results of these analyses are presented in Table 5 and Figures 2a-2h.

After being exposed to the computerized stories, the children connected a novel word to a phonological form with 60% or more accuracy for half of the words. The four novel words that did not follow the same pattern of fast mapping were *bave, daivik, faus, and kibe*. The most drastic difference in accuracy was with the novel word *kibe*, which was only correctly identified with 17% accuracy. Over time, the connections between the phonological form and novel words were the same or increased in accuracy, except for the words *paydil* and *faus*.

At first, the taxonomic connections with the novel word appeared to be highly accurate compared to the other lexical connections with one exception, the novel word *kibe*, which may be associated with the poor fast mapping. Over time, the connections with the taxonomic connections decreased, which was the most dramatic for the novel word *daivik*. The pattern was not followed for the novel word *faus*, which measured over a 15 % increase in accuracy. The
novel word *bave* did not follow the observed pattern either because its accuracy was the same over time.

When initially exposed to the novel words, the children were found to make thematic connections with the novel words at a 20% accuracy or higher level, except for the novel word daivik, which was at 10% and below. Over the two testing times for thematic connections, the children’s accuracy was generally stable or increased in accuracy. The only novel words that did not follow this pattern were *bave* and *kibe*, words that also had poor fast mapping accuracy.

Table 5. *Percent accuracy of lexical connections by novel word over time* (n = 29).

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Fast Mapping</th>
<th></th>
<th>Taxonomic</th>
<th></th>
<th>Thematic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 1</td>
<td>Time 2</td>
</tr>
<tr>
<td>bave</td>
<td>27.6</td>
<td>41.4</td>
<td>75.9</td>
<td>75.9</td>
<td>34.5</td>
<td>31.0</td>
</tr>
<tr>
<td>paydil</td>
<td>62.1</td>
<td>58.6</td>
<td>100.0</td>
<td>96.6</td>
<td>41.4</td>
<td>55.2</td>
</tr>
<tr>
<td>puth</td>
<td>65.5</td>
<td>69.0</td>
<td>86.2</td>
<td>69.0</td>
<td>37.9</td>
<td>41.4</td>
</tr>
<tr>
<td>toguD</td>
<td>69.0</td>
<td>72.4</td>
<td>96.6</td>
<td>86.2</td>
<td>34.5</td>
<td>41.4</td>
</tr>
<tr>
<td>daivik</td>
<td>24.1</td>
<td>24.1</td>
<td>100.0</td>
<td>10.3</td>
<td>6.9</td>
<td>10.3</td>
</tr>
<tr>
<td>kibe</td>
<td>17.2</td>
<td>17.2</td>
<td>27.6</td>
<td>20.7</td>
<td>41.4</td>
<td>37.9</td>
</tr>
<tr>
<td>faus</td>
<td>41.4</td>
<td>31.0</td>
<td>65.5</td>
<td>82.8</td>
<td>20.7</td>
<td>31.0</td>
</tr>
<tr>
<td>golave</td>
<td>79.3</td>
<td>82.8</td>
<td>96.6</td>
<td>62.1</td>
<td>55.2</td>
<td>55.2</td>
</tr>
</tbody>
</table>
Figure 2. Accuracy of lexical connections by novel word over time (n = 29).

(a) Accuracy on the Novel Word *bave* over Time

(b) Accuracy on the Novel Word *paydil* over Time

(c) Accuracy on the Novel Word *puth* over Time
(d) Accuracy on the Novel Word *togud* over Time

(e) Accuracy on the Novel Word *daivik* over Time

(f) Accuracy on the Novel Word *kibe* over Time
(g) Accuracy on the Novel Word *fau* over Time

<table>
<thead>
<tr>
<th>Percent Correct (%)</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
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<tbody>
<tr>
<td>100%</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fast Mapping: □
Taxonomic: ■
Thematic: △

(h) Accuracy on the Novel Word *golave* over Time

<table>
<thead>
<tr>
<th>Percent Correct (%)</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td></td>
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<td>20%</td>
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<tr>
<td>0%</td>
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</tr>
</tbody>
</table>

Fast Mapping: □
Taxonomic: ■
Thematic: △
DISCUSSION

Previous research on lexical development has separately investigated how children a) learn novel words without direct teaching and b) associate those words either taxonomically or thematically. The present study combined this literature by investigating if and how preschoolers associate newly learned words with familiar taxonomically and thematically related words. The participants were exposed to two stories containing 8 novel words. Testing of the three different lexical connections was conducted immediately after exposure to the stories and one week later with no additional exposure.

The main finding of this study was that the children were making all three lexical connections upon / after initial exposure through stories. This suggests that children are accessing multiple lexical resources when acquiring novel words. Based on the incidental word learning literature (e.g., Rice, 1990; Carey, 2010), the participants were expected to make phonological connections with the novel words presented in the stories. It was unclear, however, how they would perform on with the other two lexical connection types. This is because the literature on children’s understanding and use of taxonomic and thematic connections has emphasized forced-choice comprehension tests, where children select one type over another (Markman & Hutchinson, 1984; Walsh, et al., 1993; Dunham & Dunham, 1995; Waxman & Namy, 1997; Blaye & Bonthoux, 2001; Scheuner, et al., 2004).

The participants correctly identified the taxonomically associated words at significantly higher rates than the novel words, which were significantly above the thematic associates. There are a number of possible explanations for these results. The fourth experiment conducted by Markman and Hutchison (1984) assessed the lexical connections used when exposed to a novel word. The study found that children make taxonomic connections over thematic connections
when presented with a novel word, but the findings were opposite when the target object received no label. In the present study, the children heard novel labels for each object, which may have primed them towards making taxonomic connections more than thematic ones. The data from the control group may provide a second explanation. These children, without any prior exposure to the target words, were able to correctly make taxonomic but not thematic associations with the target images. In doing so, they appear to have been applying general knowledge of the categories to the identification task. They may have, for example, selected the image of the paydil as an animal because it contained common animal features such as eyes, legs, and a tail. It is possible, therefore, that the primary group of participants were doing the same thing during the exposure task and comprehension testing.

By retesting the preschool-age children approximately a week later, the study evaluated any changes in use of lexical connections. The children were not found to significantly change their connections between novel words and lexical connections over about a week’s period of time, without additional exposure. This suggests that even though the children’s knowledge of the target words was not complete, what they had learned was stable within their memory.

**Future Directions**

With the present study’s results, there are many different directions that would further develop knowledge of children’s word learning. The current study found that children are accessing the different lexical connections simultaneously when presented with a novel word, but not whether children are using these different types of lexical connections during novel word learning. The study’s methods limit this type of interpretation. To investigate this, the study could be repeated without including the taxonomically and thematically related familiar words in the stories. Therefore, the children would not have the direct support of the taxonomic and
thematic connections when being exposed to the novel words. A reduction in the overall number of target words fast mapped would suggest that children in the present study were using the associated familiar words to assist their word learning.

The present study may also be conducted with populations of children, such as children with language impairments (LI), to provide evidence of how and when these children are learning novel words compared to typically developing children. Children with LI have been found to have limited semantic and/or phonological connections with words. The limited lexical connections with known words may affect these children’s abilities to further successfully access the lexical connections necessary to support novel word learning situations. To examine novel word learning in children with LI, the methods would stay the same with adjustment made in the criteria to qualify. The evidence would further our knowledge and provide particular areas to focus on during intervention to increase efficacy and effectiveness of word learning for children with LI.
CONCLUSION

The present study assessed preschool-age children’s novel word learning skills. Three different lexical connections were evaluated after being exposed to stories: a phonological form, taxonomic connections, and thematic connections. The methods of testing the lexical connections differed from the previous studies by testing each lexical connection separately, to allow for the children’s full knowledge to be demonstrated. The results revealed that preschool-age children are making all three lexical connections after initial exposure to novel words through stories, suggesting they access multiple lexical resources from known words when presented with novel words. Without additional exposure, the use of these lexical connections did not change over two time periods.
REFERENCES


“Today is going to be a great day.” thought Suzie. She ran through the house to pick up her backpack. Suzie had been waiting all week for a family picnic. The picnic would be in the town’s park. The day was finally here. She loved all the fun things to do at the park.

Suzie’s mom opened the door. Her mom said with a smile, “Let’s get going. We want to get a good spot at the park!”
Scene 2

They rode their bikes down the road. Suzie parents let her ride her bike ahead of them. She enjoyed leading them to the park. Suzie’s father said, “Make sure you stop when you reach the BAVE.”

Suzie couldn’t wait to get to the park and see the PAYDIL. It lives near the pond. She saw the PAYDIL once before. It was jumping in the mud with other animals.

Suzie reached the corner. She saw the BAVE and another vehicle. These were sitting next to a large dirt pile. She knew that she had to stop and wait for her parents here.
Soon her parents reached the dirt pile and the BAVE. Suzie inched forward to cross the road. She forgot to check and see if there was any traffic.

“Make sure you look on the other side of the BAVE before you start out.” her mom said. Suzie moved to the front of the BAVE. She looked left, then right, then left again.

“Nothing’s coming from either way,” said Suzie. She slowly rolled past the BAVE.

“Way to go, Suzie!” said her dad. “You did a great job at looking both ways for vehicles!” Suzie pedaled across the road.
Suzie and her family passed the BAVE. Her parents crossed the street behind her.

Suzie’s Mom was excited to see the new pool being built by their house. “I guess the BAVE and other vehicles have cleared out a hole. They made that dirt pile. It won’t be long before the new city pool is ready.”

Suzie couldn’t wait to play at the new pool with her toy. She wanted to bring her PUTH to the pool. She could see if it worked when wet. She’s been playing with the PUTH and sticks all summer. She had never tried it in a pool.
They arrived at the park. Dad laid out a big blanket. This was a little difficult. There was a strong breeze blowing. Suzie’s dad continued unpacking the basket. Suzie and her mom decided to walk down the pathway to the big pond. That was Suzie’s favorite place in the park. That was where she saw the PAYDIL and other animals before.

Suzie and her mom saw the PAYDIL. It was behind some tall grass. Suzie took a cracker from her backpack. She tossed it into the air. The PAYDIL did a spinning jump. It caught the cracker before hitting the ground. It was amazing! Suzie was so excited! She threw another one. The PAYDIL did it again!
Suzie grabbed a third cracker to toss. She was stopped by a loud squeaking sound. The PAYDIL heard the sound too. It stood at attention. Did the sound come from another animal? Suzie looked around. She couldn’t tell what the sound was. She asked her mom what it was. Her mom said, “I think that must be your father setting up his TOGUD with water. You know how he loves to play that thing at the park.” Suzie loved the TOGUD too.

Suzie’s mom said that it would be a while before her father was ready to play his instrument. Suzie’s mom thought they should to do something else first. They said goodbye to the PAYDIL. It was still looking around the pond. Then, it walked away.
Scene 7

Suzie thought this would be a good time to get out her PUTH. She quickly pulled the toy out of her backpack. “Mom, do you want to play with it too?” asked Suzie.

“No thanks, I think I’ll just watch you.” Suzie’s mom said.

“Oh, but it’s really fun!” said Suzie, smiling. Suzie found a stick on the ground. She used it to send the PUTH high into the air. The PUTH came down really quickly. She was able to catch it, though. Suzie did this a few more times. The last time, the wind pushed the PUTH off course. It came zooming down right on her mom’s head. It didn’t hurt Suzie’s mom much. It did leave a small bump on her mom’s forehead. Suzie and her mom decided that it was time to see how Dad was doing.
They arrived where Suzie’s dad was. He was almost finished getting the **TOGUD** ready to play. Suzie ran over. She asked if she could help. Dad said that he still needed to pour the water into the **TOGUD**. Suzie could do that.

Suzie brought the water over to the instrument. She poured it into each side of the **TOGUD**. “Now it’s ready to play.” Dad said. “Would you like to do the honors first, Suzie?”

“You bet I do!” Suzie replied. She went up to the **TOGUD**. She blew into the top. It made such a loud sound. Her mom and dad both jumped into the air.

“Maybe you should play, Dad.” Suzie said.
Suzie’s dad prepared to play a song on the TOGUD. He stopped when he saw the bump on Mom’s head. He put the instrument down. “What happened to you,” he asked Suzie’s mom. “I got knocked in the head by Suzie’s PUTH.” “Suzie!” Dad scolded. “I thought I told you to be careful with your toys. The PUTH and stick are especially dangerous on a windy day like today!”

“It wasn’t her fault, dear,” Suzie’s Mom said. “She didn’t do it on purpose.”

Dad apologized to Suzie. He made it up to her by playing the TOGUD. Suzie danced around with her mom. They stopped when they were too tired to dance anymore.
“Good morning, Timmy,” said his mom. Timmy rolled over and rubbed his eyes.

“Happy Birthday Mom,” he said, “I don’t want to get out of bed yet. Can I sleep for 10 more minutes?”

Mom gave Timmy a hug. “Thank you for the birthday wishes, Timmy. Guess what? Your school is closed today. Your dad has the day off of work. Now the three of us can spend the whole day together. We can celebrate my birthday!”

“Yea!” cried Timmy. Timmy was instantly more awake now. He gets to spend the day with his mom and dad.
"What kind of food would you like for breakfast?" Timmy’s mom asked him.

Timmy put on his DAIVIK. Timmy wore his DAIVIK every day. He kept his favorite super bouncy ball in its pocket.

“I just want toast and KIBE!” cried Timmy.

“How about some scrambled eggs with that?”

“Okay Mom,” said Timmy, “but make sure there’s lots of KIBE too!”

Timmy’s mom agreed. She went downstairs to start breakfast. Timmy finished putting on his clothes and brushed his teeth.
Scene 3

Timmy went downstairs. His mom handed him scrambled eggs, toast, orange juice and lots of KIBE. It was just how he liked it. “I made some extra KIBE for your dad too,” she said, “but he isn’t home yet.”

“Thanks Mom,” said Timmy. He picked up his fork. He began to eat his food. Timmy ate all of the eggs first. He saved the KIBE for last. Timmy’s dad walked in the door. Timmy was almost finished with his KIBE.
Timmy’s dad walked over to Timmy. He whispered in his ear, “Do you want to help me with a surprise for Mom? I am making a piece of furniture.” His mom didn’t hear. She had already gone upstairs. Timmy’s dad showed him a picture of a brand new GOLAVE. He agreed to help. “It’s in a box in the car. We have to put it together.”

Timmy knew last week that dad was going to get a GOLAVE for Mom’s birthday. He didn’t know that he would get to put it together.

Timmy got up to help. His dad saw that he had leftover KIBE and toast crumbs on his face. “We’d better clean that food off of you first.” Dad said, “I don’t think Mom would be too happy if you got KIBE all over her surprise.”
Dad and Timmy went to the garage to get the present. They each grabbed a side and lifted it up. Something happened when they set it down in the family room. Timmy’s DAIVIK got caught on a corner. It ripped a hole through the pocket! His ball went bouncing all over the room. “Dad!” cried Timmy, “my DAIVIK is ripped! It’s ruined!”

“Don’t worry Timmy. Go upstairs. Find your mom. Ask her if she can fix it. Mom patched some of my clothes last week. I’m sure she can patch that hole in your DAIVIK. You keep her distracted. I’ll start unloading the present.”

Sniffling, Timmy agreed. He searched around the room. Then, he walked upstairs. He sure hoped Mom could fix the hole in the DAIVIK. The hole was big. He could fit three fingers right through it!
“Mom,” said Timmy, still sniffling, “I ripped a hole in my **DAIVIK**. Can you fix it?”

Mom took a look at the hole. She said it would be easy to do. She told Timmy to take it off. “How did that hole get there?” Mom asked.

“Ummm…well…” said Timmy, “I can’t really tell you. It’s a secret.” As Timmy said this, he heard Dad downstairs. His dad was bringing the **FAUS** and nails in from the garage.

“A secret, huh?” asked Mom, “Alright, I won’t ask any more questions then. Just promise me you’ll be careful with your clothes during this secret.” She handed him his **DAIVIK**, all fixed.

“Yea! Thanks Mom!”, said Timmy. Timmy put it back on. He put the super bouncy ball back in the pocket. He raced downstairs. He could hear his Dad testing the **FAUS** and some other tools.
Timmy got downstairs. He saw that Dad had taken the GOLAVE out. His dad was starting to put it together. “Hey Dad, I wanted to help too!” yelled Timmy.

“Don’t worry,” his dad said, “We’re not done yet. Be very careful. The pieces of the GOLAVE still need to be secured together.”

Timmy touched the GOLAVE very gently. It wobbled. “You’re right Dad. This thing could fall over at any second. Just like the old piece of furniture in the corner.”

“Right, Timmy. We need some more space to work.” Dad said. “Help me move the box away from the GOLAVE.” They put it on the sofa and got back to work.
“Will you hand me the **FAUS**?” asked Dad.

Timmy did. He watched as dad placed some nails into the **FAUS**. “Alright,” said his dad, “Stand back. Cover your ears. This thing makes a lot of noise.” His dad let Timmy flip the switch to turn the **FAUS** on. It sounded like a train was coming through the house. It was the loudest tool Timmy had heard before. His dad fastened the pieces of wood together. Timmy covered his ears. Dad turned off the **FAUS** when he was done. Timmy’s dad said, “Gee, I hope your mom didn’t hear that upstairs.” Timmy laughed.
Just then, they heard Mom coming down the stairs. “Quick,” said Dad, “we’ve got to clean this stuff up!” Dad grabbed the FAUS, leftover nails, and other tools. He put them over by the back wall. Timmy saw that the FAUS was still plugged in. He pulled the plug from the wall.

Then, Timmy wiped off the GOLAVE. That made it shine. He put the box in another room. Mom’s footsteps were getting closer. Dad ran back into the room with a blanket. He threw the blanket over the GOLAVE just in time. Timmy hid behind another piece of furniture.

When Mom came in, Timmy jumped out and yelled, “SURPRISE!” They lifted the blanket up. Mom was so happy. She clapped her hands and jumped up and down.

Word Count: 1052
Flesch Reading Ease: 94.9
Flesch-Kincaid Grade Level: 1.8
Mean Length of Sentence: 6.94
APPENDIX B

Comprehension Task Pictures and Text

*Fast Mapping Comprehension Questions*

1. Show me the hand.

2. Point to the sun.

3. Where’s the bave?

4. Show me the paydil.
5. Point to the puth.

7. Where’s the puzzle?

6. Find the togud.

8. Find the daivik.
9. Show me the kibe.

10. Point to the faus.

11. Where’s the golave?

Answer format:

A  B

C  D
1. Point to the drink.

2. Where’s the machine?

3. Find the animal.

4. Show me the instrument.
5. Point to the vehicle.

6. Show me the toy.

7. Find the vegetable.

8. Where’s the furniture?
9. Point to the clothes.

10. Show me the food.

11. Find the tool.

Answer format:

A  B
C  D
Thematic Association Questions

1. Which one goes with rain?

2. Which would you find with paper?

3. Show me what belongs with a stick.

4. Which one goes with dirt?
5. Show me what belongs with water.

6. Which would you find with a cracker?

7. Which one belongs with eyes.

8. Which would you find with a nail?
9. Show me what goes with a ball.

10. Which one belongs with a box?

11. Which one goes with toast?

Answer format:

A  B

C  D
APPENDIX C

Record Form and Answer Key

<table>
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**Taxonomic / Thematic Word Learning**

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<th>RIGHT</th>
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<tr>
<td></td>
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<tr>
<td></td>
<td>____ ____ 4000 Hz</td>
<td>____ ____ 4000 Hz</td>
</tr>
</tbody>
</table>
Fast Mapping Trials

1. Show me the hand.
   - A  B
   - C  D

2. Point to the sun.
   - A  B
   - C  D

3. Where's the bave?
   - A  B
   - C  D

4. Show me the paydil.
   - A  B
   - C  D

5. Point to the puth.
   - A  B
   - C  D

6. Find the togud.
   - A  B
   - C  D

7. Where's the puzzle?
   - A  B
   - C  D

8. Find the daivik.
   - A  B
   - C  D

9. Show me the kibe.
   - A  B
   - C  D

10. Point to the faus.
    - A  B
    - C  D

11. Where's the golave?
    - A  B
    - C  D
Taxonomic Trials

1. Point to the drink.
   - A
   - B
   - C
   - D

2. Where’s the machine?
   - A
   - B
   - C
   - D

3. Find the animal.
   - A
   - B
   - C
   - D

4. Show me the instrument.
   - A
   - B
   - C
   - D

5. Point to the vehicle.
   - A
   - B
   - C
   - D

6. Show me the toy.
   - A
   - B
   - C
   - D

7. Find the vegetable.
   - A
   - B
   - C
   - D

8. Where’s the furniture?
   - A
   - B
   - C
   - D

9. Point to the clothes.
   - A
   - B
   - C
   - D

10. Show me the food.
    - A
    - B
    - C
    - D

11. Find the tool.
    - A
    - B
    - C
    - D
Thematic Trials

1. Which one goes with rain?
   A B
   C D

2. Which would you find with paper?
   A B
   C D

3. Show me what belongs with a stick.
   A B
   C D

4. Which one goes with dirt?
   A B
   C D

5. Show me what belongs with water.
   A B
   C D

6. Which would you find with a cracker?
   A B
   C D

7. Which one belongs with eyes?
   A B
   C D

8. Which would you find with a nail?
   A B
   C D

9. Show me what goes with a ball.
   A B
   C D

10. Which one belongs with a box?
    A B
    C D

11. Which one goes with toast?
    A B
    C D

ID #:_________

Date Seen:__________
APPENDIX D

HSRB Letter

DATE: December 31, 2013
TO: Anna Ehrhorn, B.A.
FROM: Bowling Green State University Human Subjects Review Board
PROJECT TITLE: [494402-4] The Transition from a Novel Word to a Known Word in Preschool-Age Typically Developing Children
SUBMISSION TYPE: Amendment/Modification
ACTION: APPROVED
APPROVAL DATE: December 31, 2013
EXPIRATION DATE: August 15, 2014
REVIEW TYPE: Expedited Review
REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of Amendment/Modification materials for this project. The Bowling Green State University Human Subjects Review Board has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

Modifications Approved:
Run 13 children (parents/guardians have already signed permission forms) using a shortened protocol (removed the Computerized Story Time and the second administration of the Picture Pointing Task a week later), without obtaining a second consent signature from parents.

Please note that you are responsible to conduct the study as approved by the HSRB. If you seek to make any changes in your project activities or procedures, those modifications must be approved by this committee prior to initiation. Please use the modification request form for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. All NON-COMPLIANCE issues or COMPLAINTS regarding this project must also be reported promptly to this office.

This approval expires on August 15, 2014. You will receive a continuing review notice before your project expires. If you wish to continue your work after the expiration date, your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date.

Good luck with your work. If you have any questions, please contact the Office of Research Compliance at 419-372-7716 or hsrb@bgsu.edu. Please include your project title and reference number in all correspondence regarding this project.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Bowling Green State University Human Subjects Review Board's records.