

The Effects of Joint Reference and Mutual Exclusivity on the Application of Whole-Object Assumption in Filipino Preschoolers

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Abstract

Several studies have been done to analyze language acquisition among young children and have shown that children initially ascribe new words to mean whole objects. However, when familiar objects are presented with novel labels, young children seem take these labels to mean salient parts or attributes instead of as alternative names (Markman, 1992; Maher 2004). This study's focus is on how the whole object assumption is superseded by mutual exclusivity, along with Baldwin's (1989, cited in Markman, 1992) observation of the value of a joint reference between adult speaker and child in word learning. Adapting Markman's (1992) test procedure, five male and five female Filipino preschoolers aged 3-4 years were randomly selected and individually presented with three sets of materials that each tested the validity and occurrences of the whole object assumption, mutual exclusivity, and joint reference. Using a different set of instruments originally adapted from Markman's (1992), the study yielded unexpected results slightly deviant of Markman's claims. Firstly, striking colors and brightly colored patterns are shown to influence young children's perception of whole objects in a more significant manner than initially assumed. Secondly, it seems that mutual exclusivity is only applied to novel word learning upon reaching a certain cognitive maturity, which was observed to come earlier to females than males. Lastly, joint reference might play a less significant role in word learning as children grow to become more verbally communicative and less dependent on social cues.

Keywords: whole object assumption, mutual exclusivity, joint reference, preschoolers, word learning

Introduction

For young children, the acquisition of words and the identification of their meanings do not happen at once. The volume of stimuli from the environment which children are exposed to further complicates their acquisition of words. Understanding the meaning of words and using these words in adult fashion is a slow process. This process is called semantic development where “children’s strategies for learning word meanings and relating them to one another change as their internal representation of language constantly grows and become reorganized” (Gleason, 1998, p. 116).

In their preschool years, children manifest remarkable facility and efficiency in learning new words. The rate of learning new words is at a staggering rate of 5 to 9 words per day between 18 months to 6 years of age (Pinker, 1994, cited in Avram, 2002). Given this rapid rate of vocabulary development or “word spurt” (Markman, 1992), children employ certain cognitive and linguistic operating principles to help them focus and form a hypothesis about the meaning of new words (Gleason, 1998). Bloom posited that children learn new word meaning only after they have developed “enough of an understanding of referential intent to figure out what people are talking about when they use words” (2000, cited in Avram, 2002). However, since children of preschool age have as yet a limited capacity to process information, finding out how they learn the meaning of new words makes an interesting study.

One of the long-time conundrums in the field of language acquisition research is how words are learned. Quine’s (1960) hypothesis on the indeterminacy of translation states that when presented with a word previously unheard of, one could never entirely ascertain the exact meaning of that word, as it could pertain to an infinite number of possible definitions. Quine also referred to this as the problem of induction which stipulates that there is a wide range of possible meanings that can be applied to a set of data. It can even refer to a thing or idea we cannot comprehend (Markman, 1992). Given that this notion is true, how then, does one decide what a novel term means?

Several studies have shown that young children initially

perceive new words to always be referring to whole objects. A label for an unfamiliar object will be accepted and attached as its name, whereas a new label for a recognized object will be assigned to a part or an attribute (Markman, 1987; Markman & Wachtel, 1988, cited in Markman, 1992). Markman labels this principle as the “whole object principle” which posits that children have the proclivity to assume that a word label refers to a whole object rather than to a part or attribute of an object. This theory helps explain the rapid rate of vocabulary acquisition in children since, as Markman noted, in learning new words children most likely focus on the whole object rather than its parts. Soja, Carey & Spelke (1991, cited in Rabagliati, 2007) carried out an experiment in which an object made of a distinctive substance was first shown, labeled, and removed in front of 2 ½ year-old children. Four new objects were subsequently presented: one having the same shape but consisting of a different substance, and the other three sharing the same material as the first but bearing different shapes. The item that shared a similar shape to the first object presented was overwhelmingly chosen, proving the existence of the whole-object principle as a word learning constraint among children.

In a study done by Woodward (1992) on 18-month old female children, their labeling ability was tested using unfamiliar “boring” items against interesting novel items. The results showed that children preferred looking at the interesting items but when an unfamiliar “boring” item was assigned a name or label, the child’s attention shifted to it. This attention shift was interpreted as an assumption of the child that the label referred to the whole object rather than a salient part of the object.

Still, many words cannot be learned by simply using the whole object limitation. Markman (1987, cited in Markman, 1992) suggests that children “override” constraints such as this by using mutual exclusivity, an assumption stating that there is only one label for each object, and that a second label would be assumed to pertain to object parts or attributes. As demonstrated by a study completed by Markman and Wachtel (1988, cited in Markman, 1992), children employ mutual exclusivity to acquire labels for parts, and other attributes such as size and color.

The research done by Markman & Wachtel (1988, cited in Markman, 1992) presented novel objects to three-year old children.

The novel objects contained salient parts and a selected few of these objects were assigned new labels. During the presentation of these objects to the children, some of the objects were given two different names. The result was the 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” (Maher, 2004, p. 14).

In her thesis, Maher (2004) also cited that mutual exclusivity was an “assumption that has been demonstrated in 16-month olds by their rejection of second labels for familiar objects” (p.15). The second label was rejected because the learner assumes that there can only be one label for an object. The child, at this point, still does not have the ability to learn multiple names for an object.

Another proposition by Baldwin (1989, cited in Markman, 1992) states that young children observe social cues such as eye gazing or pointing when there is no salient object around at the time of labeling. Likewise, in her thesis Maher mentioned that “joint focus of attention is an important contributor to children’s early word learning” (2004, p.18). She cited the studies conducted by Baldwin, et al, (1996) where children, 19 to 20 months of age, were given novel objects and - following their attentional focus - were presented with a novel item label. In the first experiment, the examiner sat next to the child and looked at the object as it was named. In the second experiment, the child could not see the examiner. The results showed that the children correctly labeled the objects in the first experiment. The children had difficulty labeling objects when the examiner was absent. In his study, Baldwin concludes that the whole-object assumption could be superseded by the lack of joint focus of attention.

Maher also mentioned that these studies are consistent with the social pragmatic theories as they demonstrate that children make use of the “social cues provided by the communication partner to learn novel words” (2004, p.18). A child’s word learning is facilitated when the adult and the child’s attention are in tune (Hirsh-Pasek, Golinkoff, & Hollich, 2000, cited in Maher, 2004). Research shows that children who have more frequent parent-child interaction and joint attention exposures have increased vocabularies (Akhtar, Dunham, & Dunham, 1991). 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, cited in Maher, 2004).

This study aims to analyze the effects of joint reference and mutual exclusivity on the application of whole-object assumption in Filipino preschoolers aged 3-4 years. The specific objectives of this study were:

1. Is the whole-object assumption the primary factor for children in learning new words?
2. Does mutual exclusivity override the whole-object assumption in learning new labels for familiar objects?
3. Does joint reference override the whole-object assumption in learning new word labels?

Markman's (1992) claim - that constraints on hypotheses are needed to help children solve the inductive problem that word-learning poses - serves as the main theoretical framework of this study. Her claim further posits that word-learning constraints such as whole-object assumption, mutual exclusivity and joint reference could be necessary for language acquisition.

The whole object principle posits that children have the proclivity to assume that a word labels or refers to a whole object rather than to a part or attribute of an object. This assumption could then be "a direct reflection of the non-linguistic status of objects" (Markman, 1992) Objects are more easily referred to because they are salient and concrete. Labels assigned to objects are therefore easily taken to mean or refer to the whole object. This theory helps explain the rapid rate of vocabulary acquisition in children since, as Markman noted, in learning new words children most likely focus on the whole object rather its parts.

Mutual exclusivity is an assumption that an object can only have one meaning or have only one name. This assumption can override the whole-object assumption because children can likewise employ this hypothesis as they learn a new word. As demonstrated by a study completed by Markman and Wachtel (1988, cited in Markman, 1992), children employ mutual exclusivity to acquire labels for parts, and other attributes such as size and color. Interpretation of this principle suggests because of their as-yet limited capacity to process information, children are likewise initially limited in their ability to learn multiple names for an object.

Another proposition (Baldwin, 1989, cited in Markman, 1992) suggests that young children observe social cues such as eye gazing or pointing when there is no salient object around at the time of labeling. Joint reference of attention is an important contributor to children's early word learning. Parents' and children's coordinated attention to each other and to a third object or event – is claimed by many researchers to play a critical role in early word learning. Indeed, several studies have shown positive correlations between the amount of joint attention in which parent-child dyads engage and the size of children's early vocabularies (Akhtar and Gernsbacher, 2007).

Given the fact that by 2 years of age, children undergo a spurt in their vocabulary, it would truly be interesting to find out how they are able to cope with such a fast and voluminous onslaught of words. This study's significance in the area of language learning is it seeks to find out in what manner children learn new words. The findings may prove to be useful in the conduct of future research in the same area which could help develop new strategies to facilitate language learning in children. Likewise, this study may be of help to the children's caregivers to become effective guides to the children in their linguistic development at the point where their internal representation of language constantly grows and becomes reorganized.

Methodology

Research Design

This study is basically experimental albeit small-scale in nature. A controlling age variable, along with the requisition for an equal representation of both genders, was set to achieve a greater control of validity. Pilot testing was conducted with children outside of the experimental group to gauge the appropriateness of the procedures and materials to the target participant age, and no prior training was given to any of the participants in order avoid the possibility of multiple treatment interference in the data. Maturation effects like tedium or habituation, if any, were also noted per participant along with individual responses to the materials.

Participants

A total of ten Filipino preschool children from middle to upper-middle class families of Metro Manila were requested to take part in the experiments. The target age of three to four years was initially set as the only criterion for selection. However, due to time constraints and the limited number of willing participants, this age criterion was agreed to be allowably extended to children who were from two and a half years to four and a half years of age.

Five boys and five girls who then met this condition were selected for participation with the prior approval of their parents. The youngest participant, a female, was at two years and ten months of age, while the oldest, a male, was four years and seven months old. The participants' collective mean age was at three years and eight months, with the separate mean age of the female participants resulting in three years and four months, and the male participants' mean age falling at three years and eleven months. It is important to note that this equal representation of both genders was persistently maintained for this study to determine whether gender factors in the application of any word learning constraint among young learners.

Setting

Pilot testing of the materials and procedures were conducted on March 18, 2009 at Merville Subdivision in Paranaque City with two children – a boy and a girl – both within the 3-4 year old bracket. Three days later, on March 21st, the first official test was conducted with the first female participant at her grandmother's house in Caloocan City. The selection and testing of the nine other participants was completed the following day, March 22nd, within the premises of Play Box, a children's play facility situated on the third floor of the Robinson's Place Mall in Malate City. Permission was secured after presenting the Play Box proprietor with a letter of intent weeks before the intended testing date.

Materials and Instruments

Three sets of materials were prepared in order to test the respective theories on word learning constraints. The first set, meant to test the whole object assumption, was comprised of three colored abstract geometric figures which were presented to the participants on 4½ by 6-inch cards. Each abstract geometric figure had two variants – with one exhibiting a part of the original object but carrying all the same attributes like color and texture, while the other showing the same whole figure but with a different attribute like color, size, or pattern. Two more black-and-white figures, along with their corresponding variants, were added to the set for further data verification after pilot testing results indicated the possibilities of color having an overriding effect on the whole object theory. A total of fifteen card illustrations were prepared and used for this particular experiment (See Appendix 1: I).

The second set, made to examine the application of mutual exclusivity, featured three illustrations of familiar-looking objects: a flower, an apple, and a cat. Slight modifications were made on the illustrations after pilot testing to highlight the saliency of some of the parts (See Appendix 1: II).

The third set initially involved a bucket-like container and two sets of toys to test the hypothesis on joint reference. After pilot testing, an additional set of three colored illustrations were added (See Appendix 1: III).

Each participant's name, exact age, and gender – along with their responses – were recorded on a checklist. Behavioral and other observations were noted as well.

Data Gathering Procedure

Each participant was tested individually by the two researchers. While one researcher administered the test, the other recorded the observed responses using a checklist. An adult caregiver was allowed to accompany each child for the duration of the test with the condition that the companion does not interfere or interrupt in any way with the proceedings.

Each child was initially tested for the application of the whole object assumption. An illustration of a whole abstract figure was first presented to the child and given a label using the statement form "This is ___" in the child's first language. The two variant

illustrations of the whole object were then shown, and the participant was asked to point out which of the two subsequent pictures can share the same label as the first. This was repeated for different illustrations four more times.

Following this was the procedure for testing the mutual exclusivity hypothesis. An illustration of a familiar-looking object was presented along with a term which referred to a part of that object. For example, the label *stamen* or *petal* was presented with the picture of a flower. The children were expected to connect the novel label with a part or an attribute to demonstrate that the mutual exclusivity assumption can override the whole object theory. Two more pictures were presented following the same process to check for consistency of the responses.

Lastly, to test the theory on joint reference, the participants were first shown a colored picture of an object labeled as a *toma*. The experimenter handles and gazes at the illustration while labeling before allowing the child to handle the illustration. Each participant was asked to repeat the label *toma* before the picture was taken away from immediate sight. A second picture was quickly set in place of the *toma*. This time, the experimenter turned her attention away from the picture on display and instead looked inside a bucket-like container as the second label *gaver* was being given. A third picture was then pulled out from the same bucket the researcher was peering into, along with the first object. With three pictures on the table, each participant was asked to identify the *toma* and the *gaver*. It was anticipated that a 3-4 year old would recognize the third picture as the second-labeled object to support the Joint Reference theory. After the first set, the materials switched from the use of card illustrations to actual toys, with the same procedure being carried out while the toys were now labeled with proper names. A total of three card illustrations and six toys were used for this part of the experiment.

Data Analysis

The results gathered were analyzed according to the claims made by Markman (1992) on the word learning assumptions of whole object, mutual exclusivity, and joint reference. Simple frequencies and percentages were employed to quantitatively express the data gathered. All results gathered from the whole object experiment were

analyzed for occurring patterns and inconsistencies, and were compared to previous studies for similarities and possible deviations. The same procedure was followed for the analysis of the mutual exclusivity and joint reference tests.

This study, however, does not reflect or identify the learning acquisition patterns of all three year olds. The sample used in this study is too small in quantity to be representative of the population. Also, there are many other types of new word acquisition hypotheses – aside from whole object, mutual exclusivity, and joint reference – which were not discussed in this paper. In addition, the materials used were prepared and devised by the researchers and cannot be deemed as standard materials for measuring the hypotheses being investigated, as Markman (1988; 1989; 1992) never made mention of the exact kind and type of materials used in her experiments, or whether the test materials she used were brightly colored or not. Lastly, because this is a simple and small-scale experiment, the setting itself is not as one could expect from a laboratory set-up with sophisticated measuring devices.

Results and Discussion

Whole Object Assumption

Figure 1

Whole Object Assumption Experiment. Comparison of results on how well each gender applied the whole object assumption in word learning

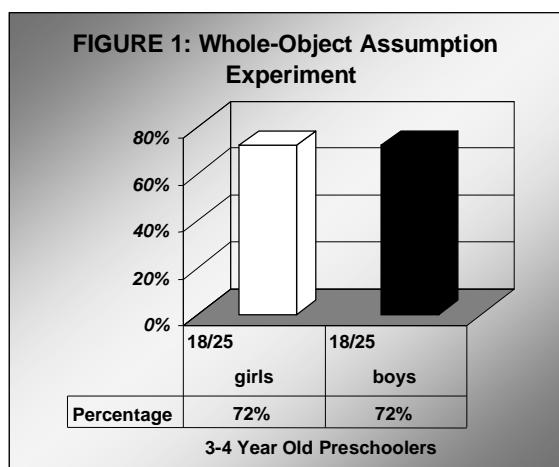


Figure 1 illustrates how well preschool boys and girls both employed the Whole-Object assumption within the experiment. This equal percentage shows that both genders acquire new words by referring to the whole object, which is consistent with Markman's (1988; 1989, in 1992) claims that young children have the tendency to refer to a whole object rather than to a part or an attribute when associating new labels with new objects.

However, a new finding has emerged that slightly deviates from previous study claims when the participants were presented with the first illustration. The first figure was an abstract blue geometric shape labeled as a *Wug*, as seen in Table 1 below. One of the *Wug*'s variants, *Wug A*, shared the exact same shape but carried a different color – red. The other illustration, *Wug B*, was just a salient part of the original *Wug* but shared the same blue color.

Table 1

Whole Object Assumption Experiment Object 1, WUG with object variants A and B

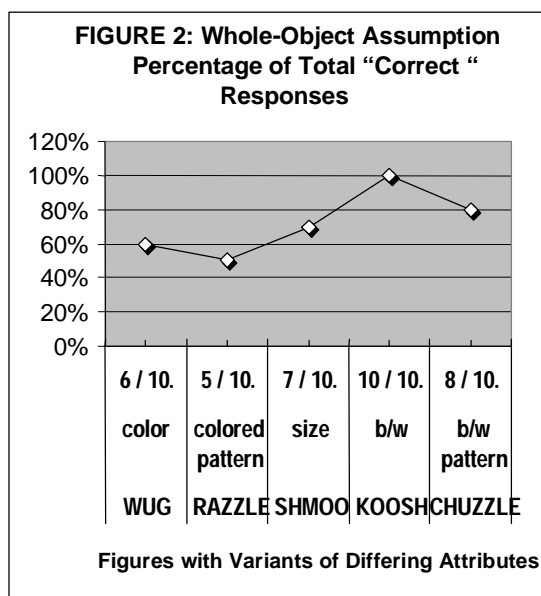
Object 1 WUG	Object Variant WUG A	Object Variant WUG B
		

Following Markman's (1988; 1989, in 1992) theories, the participants were expected to be inclined towards the red variant, *Wug A*, to validate the whole object assumption. During pilot testing, however, both participants surprisingly exhibited a consistent natural gravitation towards the card bearing the blue salient part – *Wug B* – and totally disregarded the whole object shape. The same occurrence was consistently observed with another figure that had colored patterns. As this opposed Markman's (1988; 1989, in 1992) whole object assumption claims, the researchers were led to believe that

perhaps color plays a more important factor to word learning than initially assumed by previous studies.

Figure 2

Whole Object Assumption Experiment. Collective percentage of total "correct" responses deemed in line with the whole object theory

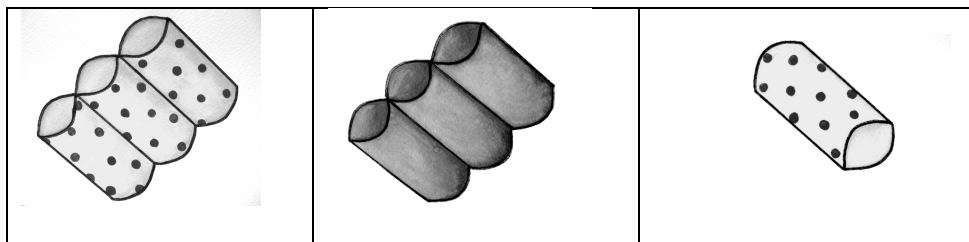


As can be seen in Figure 2, only slightly more than half of the total responses from the actual experiment were correct for the *Wug*. Of the ten participants, two girls with a mean age of 3.25 and two boys with a mean age of 4.25 chose *Wug B* because of its color. This was similar in result with the second object shown, a yellow geometric figure with purple dots labeled as the *Razzle* (see Table 2).

Table 2

Whole Object Assumption Experiment Object 2, RAZZLE with object variants A and B

Object 2: RAZZLE	Object Variant RAZZLE A	Object Variant RAZZLE B
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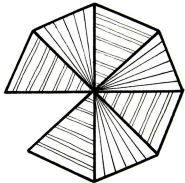
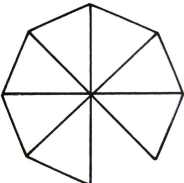
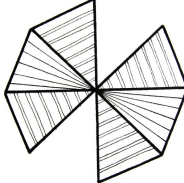


Five of the children – three girls and two boys, once again with respective mean ages of 3.25 and 4.25 – consistently pointed to the object variant *Razzle B*, which was just a third of the original *Razzle* figure. Again, it seemed that the children were distracted by *Razzle B*'s similarly colored pattern, and ignored *Razzle A* – the whole object counterpart without a pattern – half of the time.

To verify the veracity of this new finding, two more geometric shapes were added prior to the actual experimentation to test the individual influences of color and pattern. This time, the additional figures, together with their two variants, were presented as illustrations devoid of color. If pattern without color was still chosen over a whole-object shape, then pattern could be claimed as another attribute that affects whole object assumption.

Table 3

Whole Object Assumption Experiment Object 5, CHUZZLE with object variants A and B

Object 5: CHUZZLE	Object Variant CHUZZLE A	Object Variant CHUZZLE B
		

However, when a black-and-white geometric shape with lined patterns called the *Chuzzle* was presented (see Table 3), most of the participants had no trouble in choosing object variant *Chuzzle A*, which had no patterns on it but had the same whole-object shape. Only one girl at four years of age and one boy at four years and seven months of age chose *Chuzzle B*, using the pattern as the main determinant for influencing their decision. It is also notable that these

two participants were the oldest in each of the gender groups.

Mutual Exclusivity

Figure 3

Mutual Exclusivity Assumption Experiment. Comparison of results on how well each gender applied mutual exclusivity in word learning

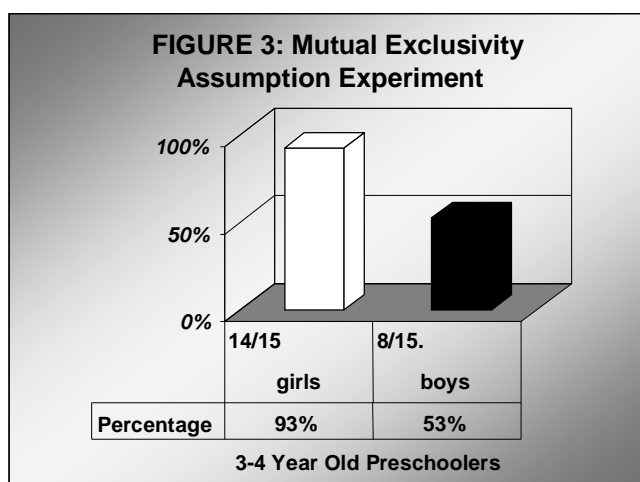


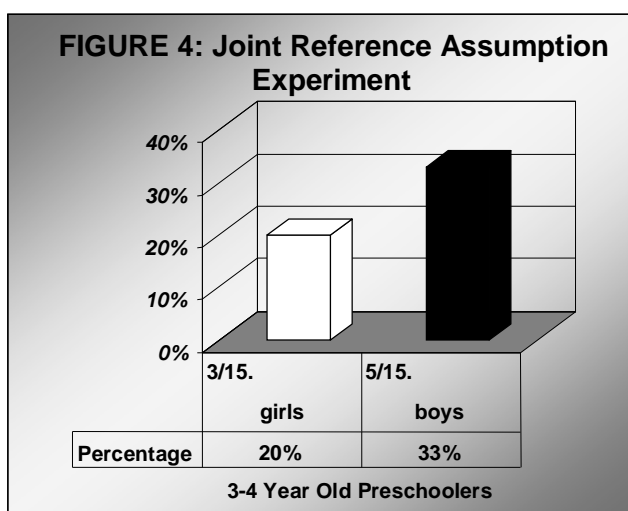
Figure 3 indicates how mutual exclusivity can override the whole object assumption. As shown above, both genders were able to make use of mutual exclusivity when an unfamiliar label is given to a familiar object. This supports Markman and Wachtel's (1988, in Markman, 1992) assertion that young children still have a limited ability to learn multiple names for one object, and therefore suppose that a second label pertains to a part or an attribute.

However, it is notable that girls were able to apply the constraint more successfully than boys of the same age, which indicates a possible gender bias in the application of this word learning constraint among preschool children.

Joint Reference

Figure 4

Joint Reference Assumption Experiment. Comparison of results on how well each gender applied joint reference in word learning



As can be seen from Figure 4, both boys and girls performed equally poor in the joint reference assumption experiment. It is interesting to note that other previous studies like Baldwin's (1996) utilized 19 to 20 month old toddlers who rely heavily on non-verbal cues to understand what goes on around them as participants to check the importance of joint attention in word learning. This study's participants, however, are from the ages of three to four years. The resulting low rate of application could indicate that the participants' age and linguistic abilities played a major factor in the use of joint referencing when learning new words, as three and four year old children are comparatively more verbal and communicative.

Conclusion

The results of this study show that whole object theory is the primary cognitive assumption applied by preschool children when learning new word meanings. However, it is also evident from this study that colors and colored patterns can distract young children from applying the whole object hypothesis. The presence of striking colors in the objects easily influenced and diverted attention away from the whole object, while contrastive black-and-white patterns hardly affected three-year-old children's perception of the whole object regardless of the complexities of the markings. This runs on a slightly contradictory note from Markman's (1988; 1989, in 1992) claim that children learn by generally focusing on the totality of an object's shape.

What could perhaps be gleaned from this study is that bright colors may have a bearing on how young children perceive objects, and thereby acquire word learning. It seems that the younger the learners are, the more attracted to colors and colored patterns they appear to be, rather than to the wholeness of an object. Also, beginning at four years of age, children start to manifest an employment of more complex cognitive processes, where they can perhaps go beyond colors and consider other aspects when identifying objects, which is in adherence to Quine's (1960, in Markman, 1992) indeterminacy of translation theory.

This study also shows that the mutual exclusivity hypothesis can clearly override the whole object assumption as far as the female respondents are concerned. Girls are better than boys at identifying salient parts of an object and are more advanced at processing information, as also mentioned in the study of Markman and Wachtel (1988, in Markman, 1992). This also supports the research on a difference between the language use between boys and girls, which can be attributed to functional differences in their brains. According to Gurian, Henley & Trueman (2001), "the resting female brain is as active as the activated male brain" (p. 29), which indicates that although not necessarily superior, the female brain is at work more quickly and more often than it has a learning advantage over the male brain. The female brain is activated in more places, resulting in more complex responses and greater memory and sensory intake, which consequently give females a greater edge over relationship and communication tasks.

Finally, this study asserts that joint reference has a lesser significance as compared with the importance of the whole object and mutual exclusivity assumptions when learning new words for three to four-year-old preschoolers. Aside from their inclination towards the use of verbal communication and less dependence on social cues such as eye gazing, children of this age have a very short attention span. Also, the results of the study on joint referencing could also have been influenced by the participants' habituation to the use of card illustrations. When the objects being shown shifted from two-dimensional illustrations to three-dimensional toys, the children became distracted by the tactile attributes of the toys. However, this is not to say that the presence of joint attention to an object does not contribute to a child's learning. Social cues such as eye gazing and body movement are still important for children to confidently affirm their understanding of word meanings. As was noted during the study, a lot more confusion was observed of the children when they were asked to identify the second object labeled than for when they were asked to point out the first.

Recommendations

This study shows much promise for future research in developing effective teaching strategies for preschool children aimed at higher vocabulary retention and comprehension. Further research can also be made on the value of using different types of visual aids and its impact on preschool word learning. Also, related studies can be made on similar constraints but expanded in terms of the size of the sample population to yield more conclusive results. It may also be necessary to standardize materials and the testing environment, for that matter.

On a more ambitious note, this study could be duplicated with an older sample of children to see if these constraints are still universal to new word acquisition despite age and prior knowledge. In addition, a separate investigation on how color affects word learning could be made, as well as an exploration on how gender affects the application of mutual exclusivity.

Finally, a more controlled environment is recommended for future investigations especially on the joint reference assumption. As was observed, three to four year olds are easily distracted by external

factors like noise and other people in their immediate surroundings, which could have influenced this study's resulting low rate of successful responses.

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