

Testing the Use of Whole-part Juxtaposition and Mutual Exclusivity in Preschool Children with Familiar and Non-familiar Objects

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1. Summary of the theory and issues

Young children's rapid acquisition of words and language suggests that they use word learning rules and tools to aid in their fast learning. Recent studies about word learning have proposed that specific principles or tools may be utilized in children's language learning including the mutual exclusivity principle and the whole-part juxtaposition principle. The theory of mutual exclusivity is the tendency for children to assume that an object can only have one label. For example, a child's tendency to think that an object such as a soda can is only a can and cannot have any other label. When the tab on the can is pointed to, the child will assume it is a part of the can because the can already has a separate label. This assumption may help children assign meanings to novel words by considering only those meanings and referents for which they do not already have a label. However, the mutual exclusivity assumption serves as just an assumption because it may not always be followed. Some objects do have more than one label.

In addition, whole-part juxtaposing enables children to address novel part terms with familiar object labels. For example, if a researcher points to a bird and says 'that is a bird' (familiar object), the research can then say 'a bird with a beak' (unfamiliar object) and the child will become familiar with the beak, the unfamiliar object, by recognizing the familiar object and coming to conclusions about each separate part. Juxtaposing novel part terms with familiar whole-object labels provides possible cues to children that refer to something other than the whole object.

Markman and Wachtel (1988) conducted a classic study in which they investigated children's use of mutual exclusivity in deciphering part labels. The phenomenon of interest was their specific interest in children's use of mutual exclusivity in deciphering novel parts of given objects. Markman and Wachtel believed that if children adhere to the mutual exclusivity assumption when a familiar whole object term is juxtaposed with a novel part term children will be cued to assume that the novel term is referring to something other than the whole object and must be referring to an alternative part of the whole object. Alternately, Markman and Wachtel thought that the mere juxtaposition between familiar and novel terms may assist in part term acquisition, not only mutual exclusivity. Throughout the study sample, colored pictures were presented to children where the whole object was one color and a distinguished part was a separate color. Children were asked to identify certain parts of the whole object depending on the aim of the question. The independent variables, which

subjects were tested under, were age and specific condition of exposure to whole object label. One condition included a group of children's exposure to the whole object label before being tested. For example, before being shown a picture of a lung in the testing sequence they were taught the whole object label for a lung before a novel part was introduced, such as a trachea. The second condition children experienced was hearing the whole object label for lung at the same time as they were introduced to the novel part of the lung. Markman and Wachtel measured the dependent variable as whether or not the child gave a correct color, part term response indicating if they adhered to the mutual exclusivity assumption to help them decipher word meaning.

A similar study which expanded on Markman and Wachtel's alternative hypothesis was conducted by Saylor, Sabbagh, and Baldwin (2002). The phenomenon of interest for Saylor, Sabbagh, and Baldwin was the occurrence that young children can learn new parts of an object through whole-part juxtaposition. These authors were interested in testing whether whole-part juxtaposition better informs children of novel part terms than general cognitive skills and mutual exclusivity alone. The linking hypothesis suggested in the studies of Saylor, Sabbagh, and Baldwin is that whole-part juxtaposition simply enhances children's retrieval for the name of a whole object and triggers the use of mutual exclusivity in deciphering the part referent for the novel part label. One alternative to the linking hypothesis is that if it is true that whole-part juxtaposition facilitates retrieval, strategies that help lexical access such as delaying the time between the introduction of the whole object term and the novel part term should be just as effective. Another alternative to the Saylor, Sabbagh, and Baldwin hypothesis is that children used structure information to infer a part meaning for the novel term. Upon repeated exposure to whole part juxtaposition and its use for part meaning, children may come to take the grammatical frame itself for part meaning. The independent variables in this experiment were age of subject, condition tested under and animacy/inanimacy of the picture presented. The four conditions used in the study conducted by Saylor, Sabbagh, and Baldwin were the juxtaposition condition, no juxtaposition, delay control, and frame control. In the juxtaposition condition, the child heard a whole object term juxtaposed with a novel part term e.g. 'See this butterfly? What color is the thorax?' In the no juxtaposition condition a whole object label was not given prior to the part term e.g. 'See this object? What color is the thorax?' The delay and frame conditions were variations of the no juxtaposition and juxtaposition conditions. In the delay condition, the questions were heard as 'See this? (delay) See it? (delay) What color is the thorax?' The frame condition posed the question to the child as 'See this thing? What color is the thorax?' The dependent variable measured in these tasks was the child's ability to produce correct color terms for which novel labels were presented. The results of the study conducted by Saylor, Sabbagh and Baldwin give clear evidence that children readily utilize whole-part juxtaposition to interpret novel part terms. Children were better able to interpret a novel label as referring to a part when the novel part label was juxtaposed with a familiar whole-object label than when no juxtaposition was provided.

2. Summary of the observational methods

A similar study to the Saylor, Sabbagh, and Baldwin study was conducted on April 3, 2006 at Vanderbilt University Child Care Center in the Stallworth Building on Vanderbilt University Campus in Nashville, Tennessee. Subjects included two 4-year-old males (one Caucasian and one Asian), a 3-year-old Caucasian female and a 4-year-old Caucasian female attending the preschool. The preschool included indoor and outdoor play and learning facilities with teachers and student help. The whole-part juxtaposition and mutual exclusivity study was conducted in the corner of a small classroom. One partner held up pictures while the other one recorded results.

Upon arrival to the child care center I explained our project to the supervising teacher and asked to administer our test to four of the children (preferably 3 and 4-year-olds). Once the teacher had selected four willing and eager students, I played and conversed with each child to familiarize myself with each child. After becoming familiar with the child my partner and I led them to a corner in the classroom to “play a game using colored pictures” and subsequently conducted our whole-part juxtaposition and mutual exclusivity experiment on each child.

To test our interest of the use of whole-part juxtaposition and mutual exclusivity in determining parts of familiar and unfamiliar objects in children, my partner and I assigned each child to a specific condition. We tested whole-part juxtaposition and mutual exclusivity as a tool for part term and whole term meaning. To test this, we recreated tests from Markman and Wachtel in testing mutual exclusivity and from Saylor, Sabbagh, and Baldwin to decipher use of whole-part juxtaposition. No pretest, posttest, or training was administered prior to the experiment. My partner and I utilized four different conditions which dealt with the particular order of what the child was being tested on. In each condition, a child was shown different sets of three separate colored pictures in which the whole object was one color and a singular part of the object was another. Colors used in the pictures were intended to be familiar: red, blue, green, yellow, orange, and purple (one picture included silver). Children were asked to identify the color of the part being referred to. In the primary condition in the mutual exclusivity task child was shown a familiar whole object with an unfamiliar part and asked to identify the color of the unfamiliar part e.g. When shown a picture of a cow asked, ‘What color is the muzzle?’ The second condition involved unfamiliar whole objects with unfamiliar parts. The child was shown a new set of pictures and questioned the same way as in the previous condition. The unfamiliar whole objects with unfamiliar parts were neuron and nucleus, padlock and dial, lung and trachea. The following two conditions dealt with the whole-part juxtaposition theories of our study. The third condition assigned to subjects utilized whole-part juxtaposition in questioning the child about part term labels. The child was shown a new set of pictures and questioned in a manner where the whole object part was given and a novel part was introduced shortly after e.g. ‘See this fish? What color is the dorsal?’ The final condition employed did not use whole part juxtaposition and a whole object label was not introduced before the novel part term was heard e.g. ‘See this? What color is the dorsal?’ Four sets of pictures were used in this study:

- Set 1. Cow and muzzle, sailboat and mast, truck and plough.
 Set 2. Neuron and nucleus, padlock and dial, lung and trachea.
 Set 3. Fish and dorsal, flower and stamen, elephant and tusks.
 Set 4. Butterfly and thorax, shoe and tread, train and coupler.

In order to control for order-effects we altered the order of mutual exclusivity and whole-part juxtaposition tasks and also the order of pictures sets were shown for each task.

In recording and measuring our responses for each condition a child was given a score of 0 if he or she did not correctly identify the color part and a score of 1 was given for correct color part identification. A correct response is defined as providing the correct color in response to the part referent.

3. Results

	Child #1 Response	Child #2 Response	Child #3 Response	Child #4 Response
Mutual Exclusivity Familiar				
cow with a <i>muzzle</i>	orange-0	red-0	red-0	blue-1
truck with a <i>plough</i>	green-0	green-0	green-0	yellow-1
sailboat with a <i>mast</i>	red-0	red-0	red-0	red-1
Mutual Exclusivity Unfamiliar				
neuron with a <i>nucleus</i>	green-0	green-0	green-0	orange-1
padlock with a <i>dial</i>	blue-1	blue-1	silver-0	blue-1
lungs with a <i>trachea</i>	red-0	red-0	red-0	red-0
Whole-Part Juxtaposition				
fish with a <i>dorsal</i>	green-1	yellow-0	green-1	green-1
flower with a <i>stamen</i>	green-0	green-0	green-0	yellow-1
elephant with <i>tusks</i>	purple-0	purple-0	red-1	red-1
Without Whole-Part Juxt.				
butterfly with a thorax	purple-0	pink-0	black-0	purple-0
shoe with tread	green-1	purple-0	purple-0	green-0
trains with a coupler	red-0	red-0	red-0	red-0

correct response=1
 incorrect response=0

4. Evaluation

Our observations included many findings of particular interest. In analyzing the results of the tasks, we first focused on the tasks of mutual exclusivity and whole-part juxtaposition in isolation from one another. In the task of mutual exclusivity with familiar whole objects, there were three total correct responses. In the unfamiliar condition there were four total correct responses. These findings do not give a clear indication of whether or not children

use the principles of mutual exclusivity in identifying objects because similar number were gathered (3 and 4) for the mutual exclusivity and non-mutual exclusivity conditions. A higher number in the familiar condition would indicate that children use mutual exclusivity in using part term labels. Also, the correct responses in both the familiar and unfamiliar conditions were practically equal.

Our results do not fit with the results achieved in the classic study by Markman and Wachtel since they concluded that children do use the principle of mutual exclusivity in learning part term objects. Markman and Wachtel concluded that children do use mutual exclusivity because children were more likely to respond if the familiar object label was given before the novel part was given. More specifically, our results may have been skewed and further do not fit with the classic study of Markman and Wachtel because we did not teach the children the word meanings prior to the experiment as Markman and Wachtel did. We may have gathered more consistent results if we had ensured exposure to these whole object labels by doing a previous teaching of the labels before the experiment. The children probably did not understand some of the objects being presented and were therefore confused by the questions and procedure. Our results may have also been skewed because children may have had a bias towards a certain color or object, such as the color 'red' or the object 'cow.' This may have manipulated the way that the experimenter's questions were answered due to certain preferences or inclinations held by the children. Children may have preferred a certain color or had a previous experience with a certain color that created biases within their thinking.

Our results did, however, fit with the whole-part juxtaposition linking hypothesis of Saylor, Sabbagh, and Baldwin. More specifically, there were six correct responses in the whole-part juxtaposition condition verses only one correct response in the without whole-part juxtaposition condition. This indicates that children learn part term labels better when presented with the whole object label and the novel part term are juxtaposed (placed side by side). Children were more likely to respond correctly when whole object labels are presently juxtaposed to novel part terms.

As an interesting spin which was not included in the classic or contemporary study, we decided to combine both studies and compared children's ability to learn part term labels using mutual exclusivity verses uses whole-part juxtaposition. We found that children had more correct responses in whole-part juxtaposition task than in the mutual exclusivity task. We recorded only three correct responses in the familiar mutual exclusivity task verses six correct responses in the whole-part juxtaposition task, which indicates that children are more likely to respond correctly when whole-part juxtaposition is used. These results may further indicate that children use pragmatics as opposed to using constraints when learning part term labels in language since mutual exclusivity is a tool of constraints and whole-part juxtaposition utilizes pragmatics. However, our results may have been skewed due to a child's affinity for or knowledge of certain pictures. The children tested may have had an affinity for certain pictures or colors due to past experiences and practices during upbringing. For example, one child may have had a certain bias towards cows and had existing knowledge of the term 'muzzle' if he or she was raised on a farm.

In conclusion, our results were not consistent with Markman and Wachtel but were coherent with the linking hypothesis presented in the study by Saylor, Sabbagh, and Baldwin. We successfully demonstrated in our study that pragmatics play a crucial role in the development of children's language, as they may use whole-part juxtaposition more often than mutual exclusivity to learn part term labels with and without novel objects. These findings provide testament to children's ability to go beyond the obvious to draw inferences about speakers' referential intentions, which greatly aid in language learning. Future studies may explore the advantages of using these two tools of constraints and pragmatics with familiar and unfamiliar objects in children's language development and learning.

References

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