

Winter 2010

Children's Understanding of the Semantics of Negation

Amanda Hiltz
Grand Valley State University

Follow this and additional works at: <http://scholarworks.gvsu.edu/honorsprojects>



Part of the [Psychology Commons](#)

Recommended Citation

Hiltz, Amanda, "Children's Understanding of the Semantics of Negation" (2010). *Honors Projects*. 17.
<http://scholarworks.gvsu.edu/honorsprojects/17>

This Open Access is brought to you for free and open access by the Undergraduate Research and Creative Practice at ScholarWorks@GVSU. It has been accepted for inclusion in Honors Projects by an authorized administrator of ScholarWorks@GVSU. For more information, please contact scholarworks@gvsu.edu.

Running Head: Negation

Children's Understanding of the Semantics of Negation

Grand Valley State University

Amanda Hiltz

Abstract

The central focus of this project is to discover children's understanding of the semantics, or meaning, of negation. Children's knowledge of negation develops, in part, by directing attention away from a word to something else (i.e., contrast classes), yet little is known about to what attention is directed. Two possible relations upon which contrast classes operate are taxonomic and thematic relations. For example, when looking at the concept of a "dog", a thematic relation could be a dog bone, while a taxonomic relation would be a cat. Two experiments were completed to look at children's use of thematic and taxonomic relations in negations. Experiment 1 examined thematic and non-thematic relations while Experiment two compared thematic and taxonomic relations. Results demonstrated that children did not make use of thematic relations and preferred taxonomic to thematic relations. The results suggest that initial contrast classes appear to be formed via taxonomic but not thematic relations.

Introduction

Negation

Negation, that which prescribes truth or falsity to any statement, is an important concept of children's language acquisition. In particular, there are various semantic categories for child negation, including rejection, disappearance, unfulfilled expectations, truth-functional and self-prohibition (Pea, 1980). Rejection negatives are action-based, where a child rejects an event, person, object or activity (e.g. the answer "no" to the question "do you want a cookie?"). Alternatively, disappearance negation refers to the disappearance of something which had been present, but is no longer there. Next, unfulfilled expectations are used to comment on some aspect of the child's continuing line of activity which does not occur (e.g. toys that cannot be found). Truth-functional negation is used in response to an utterance by the child that expresses a proposition that is either true or false depending on the situation. Finally, self-prohibition negation is used when a child acts in a way that has been previously prohibited and then expresses a negative. Each of these five categories contributes to the development of negation and provides a strong link to communication and reasoning. Without effective use of negation, children are unable to communicate properly with others and accurately express their thoughts. Thus, the concept of negation is important in the overall understanding of higher-order relations (Pea, 1980).

During the acquisition period of negations, many changes start occurring within the mind which can be explained by language comprehension models. Typically, children create models of meaning while still attempting to understand language. A specific type of model that is involved with language comprehension and memory retrieval is a situation model. Situation models are integrated mental representations of any described state of affairs (Zwann & Radvansky, 1998). According to this model, language is a set of processing instructions on how

to construct a mental representation of a situation, rather than information that is analyzed and then stored in memory. For example, a situation model of a restaurant visit would be a mental representation of a specific restaurant visit (e.g. Friday, June 23rd at Olive Garden with Jamie). Situation models are invaluable when explaining language processing, and can be used when analyzing comprehension of negation.

Negation is a strange phenomenon, and when developing this language skill, children tend to focus on what others are talking about instead of what is *not* being discussed. When explaining the development of negation, research has focused heavily on 3 areas including the syntax of negation, the semantics and pragmatics of negation and the role of negation in the evaluation of truth-values. Additionally, the way children interpret negatives using syntax (Klima & Bellugi, 1967) and semantic models (Johnson-Laird 1983) of the language. Syntax provides information about what is included in the scope of the negation. For example, in the statement *I don't see the car but I see John*, the placement of the negation suggests that the car is within its scope but John is not within its scope. Although the word *no* is often one of the first words produced and comprehended by children (Morris, 2003), negations can be quite complicated for children to produce and comprehend. Unlike affirmations, negations require integrating both the semantic and pragmatic information that is associated with it and an additional processing step beyond affirmations (Morris, 2003). That is, it appears as though people create models of affirmations first, and then incorporate negations into those models later (Hasson & Glucksberg, 2006). Additional evidence for this additional processing step comes from reaction time studies in which responses to negated statements are consistently slower than affirmed statements (Kaup, Lu'dtke, & Zwaan, 2006).

Between the ages of three and five, there is a tremendous change in children's understanding of negation and usage of the words "no" and "not" and by age 5, children are able to correctly identify a negated statement as true or false (Kim, 1985). It has also been

shown that when faced with an ambiguous statement containing a negation, children tend to only interpret the statement in one way, rather than considering all of the possible meanings (Gennari & MacDonald, 2005/2006). Additionally, language comprehension researchers have found that when attempting to comprehend a text, individuals tend to form a mental representation of the described situation. This is also true with negation, and it has been shown that people mentally simulate the negated situation in order to process the negation correctly (Kaup et. al., 2006). These factors greatly impact the understanding of the negated statements, and may lead to varying interpretations of the same statements. Thus, one unanswered question is how semantics influence how children interpret negations.

Contrast Classes

Once children develop knowledge of the meaning of words, they automatically form relations between concepts. In the early stages of development it seems as though thematic relations are preferred when contrasting concepts or objects, but this preference may not continue throughout all course of development. In actuality, young children and elderly adults show a preference for thematic relations, while the ages in between prefer taxonomic relations (Waxman & Namy, 1997). Although children use both thematic and taxonomic relations with affirmations, it is unclear how these relations influence models of negations. One possibility is that when these relations are paired with negations, they form contrast classes. Contrast classes are psychological concepts that are made up of the most likely or relevant members of a complement set (Oaksford & Stenning, 1992). When expressing a negated statement, people tend to make assumptions based on what is actually occurring (rather than simply what has not occurred). For instance, when stating that “John is not drinking coffee,” one would most likely assume that he must be drinking another hot beverage, such as tea or hot chocolate, rather than inferring that he is drinking a cold beverage, such as milk or beer (Oaksford, 2002). When trying to explain this concept, Apostel (1972) claims that psychological negation means only the

disjunction of a few (perhaps one) alternatives lying in some sense close to the negated sentence. This occurs because contrast classes make use of cues from the affirmed statement to determine what is truly happening in the negation (Apostel, 1972).

As stated above, preschool aged children use taxonomic and thematic relations. For example, when looking at the concept of a “dog”, a thematic relation could be a dog bone, while a taxonomic relation would be a cat. Within the field of cognitive development, there is a strong belief that pre-school age children have a conceptual preference for thematic over taxonomic relations (Waxman and Namy, 1997). Waxman and Namy (1997) used three experiments to examine the strong assumption that early cognitive development is best characterized by thematic preference for preschool children that later gives way to taxonomic preference as the child gets older. The results of the experiments show that this assumption may in fact be incorrect, and there could be another possible explanation. According to the data, the findings suggest a more continuous developmental function with no distinct shift from one conceptual mode to another (Waxman & Namy, 1997).

Research Question

Although a large amount of research with young children has focused on preferences of thematic and taxonomic relations with affirmations, little research has been conducted with negations. The current study looks at whether children prefer thematic over taxonomic relations when paired with negation. Specifically, we investigated how taxonomic and thematic information may be used to form contrast classes used to interpret negations. Studying how children develop different dimensions of language, such as negation, is not only interesting, but is also a necessary step in the complex understanding of the human mind.

Methods

Participants

The participants include 34 preschool aged children between the ages of 3 and 5 ($M = 4.1$, range 2.9-5.8). There were 18 females and 16 males. The majority of participants were Caucasian (23 Caucasians, 3 Asian, 1 Indian, 7 n/a). Subjects involved in the study were selected for participation based on a signed parental permission form.

Materials

Materials included a variety of different toys, which represented both thematic and taxonomic objects, and a basket in which the toys were placed in by the participants. A complete list of all materials can be found in the Appendix.

Procedure

The procedure of the current study can be defined as a selection task framed as a modified “I spy” game. Before beginning each of the experiments, the child completed a warm-up, or practice, phase to ensure that they understood what would be asked of them (detailed below). If a child seemed unsure about what to do, the experimenter would continue practicing until the participant demonstrated an accurate understanding of the activity by correctly identifying an object. At any time during the experiment, a child who was uncomfortable and wanted to cease participation in the activity, was able to opt out and leave the study. Each child was tested individually in a quiet area and the entire procedure lasted for approximately 20 minutes or so. In order to reward the participants for taking part in the study, each of the children was given a small prize of negligible value (less than one dollar), such as a sticker or choice of a toy, once the experiment was over.

Warm-up Phase

During the warm-up phase, the experimenter first placed a basket and an object on the table (e.g. a dog), and said “What I spy is a dog. Now what should you put in the basket?” Upon

receiving the correct answer, the experimenter moved on to a more complex test, by adding another object (e.g. a car) and said “What I spy is NOT the dog. Now what should you put in the basket?” Once the child answered this question, the experimenter moved on to Experiment 1.

Experiment 1

In the first experiment, the objects used included a target object (e.g., a dog), one thematically related object (e.g. a bone) and one thematically unrelated object (e.g. a book). The child was then told, “What I spy is NOT a (target item)”, and was then asked to place their choice in the basket. When showing the objects to the child and asking the questions, the experimenter avoided eye contact with both the participant and materials in order to minimize nonverbal cues. The placement of the thematically related objects and the unrelated objects were systematically varied. Responses were then coded as either thematically related or non-thematically related. This experiment consisted of 10 trials and took about ten minutes to complete.

Experiment 2

The procedure of Experiment 2 was identical to the procedure used in Experiment 1, the only difference being the materials used in the study. For the Experiment 2, the objects included a target item (e.g. a cat), a taxonomically related object (e.g. a dog) and a thematically related object (e.g. a cat toy). This experiment consisted of 12 trials and took approximately ten minutes to complete.

Coding

Previous research (Morris, 2003; Waxman & Namy, 1997) has suggested that individual consistency in performance is a measure of understanding. If a child consistently provides the same type of response, this suggests a stable understanding of the concept. We used coding

criteria similar to Waxman & Namy (1997) in that providing the same response on at least 75% of trials was considered consistent (e.g., for Experiment 1 this was 7/10 and for Experiment 2 this was 9/12. This sets up a stringent decision rule because the conditional probability of selecting a thematic option is .5 on a single trial but is .007 on 7 of 10 trials in Experiment 1. In Experiment 1, children could be coded as using a consistent thematic response pattern, a consistent non-thematic pattern, or no consistent pattern. In Experiment 2, children could be coded as using a consistent thematic pattern, a consistent taxonomic pattern, or no consistent pattern.

Results

The following results are based on a comparison of the number of children coded as using a consistent response pattern. In Experiment 1, when given the choice between a thematic and a non-thematic object, children did not select thematically related items at levels above chance $\chi^2(2, N = 34) = 14.3, p > .01$. As indicated below in Figure 1, only 30% of the participants chose the thematically related object consistently (i.e. at least 75% of the time). In fact, the only value that was higher than chance was the number of kids that showed no consistent pattern. It appears that when paired with the word “not” (i.e. negating the phrase), the selection patterns for both types were at chance levels.

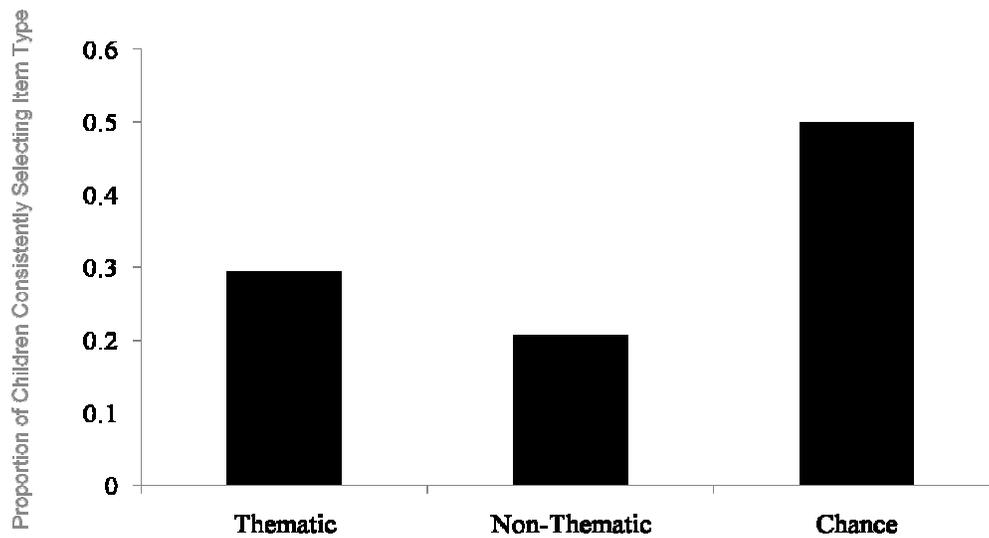


Figure 1: Demonstrates that children showed no preference of thematic items over non-thematic items.

Unlike Experiment 1, the results of Experiment 2 show a clear preference for taxonomic relations. The number of kids coded as consistently selecting taxonomic choices was significantly higher than chance $\chi^2(2, N = 34) = 64, p > .01$. Thus, given the choice between a taxonomic and thematic object, children selected taxonomically related objects more often than thematically related objects.

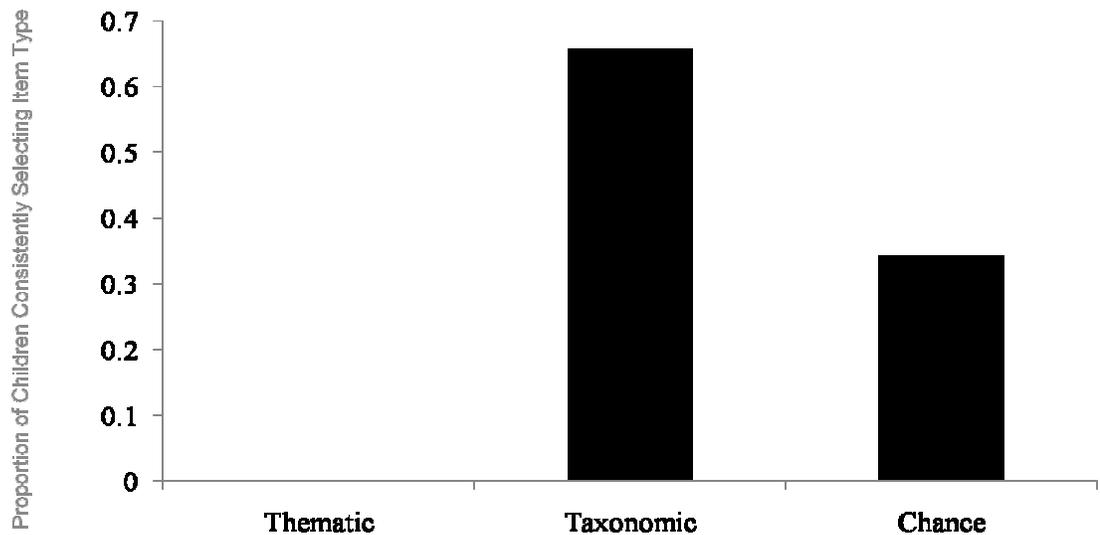


Figure 2: Demonstrates that in Experiment 2, children clearly preferred taxonomic items to thematic items.

Discussion

The results of the study show that initial contrast classes appear to make use of taxonomic relations, but not thematic relations. The results of Experiment 1 demonstrated that children did not make use of thematic relations when interpreting negations. The results of Experiment 2 demonstrated a strong preference of taxonomic relations over thematic relations when given a choice between the two during a selection task. These findings suggest that by 3-5 years old, children's semantic knowledge of negations rely on knowledge of taxonomic relations between objects, rather than thematic relations.

When relating these findings to previous research conducted with thematic and taxonomic relations in affirmations, it is apparent that negations are represented differently than affirmations. Most research supports the claim that preschool age children prefer thematic over taxonomic relations in affirmations (Waxman & Namy, 1997). In affirmations both relations are informative in that they increase the amount of information conveyed to the listener. However,

negations appear to be somewhat different in that taxonomic relations appear to increase information but not thematic relations. For example, stating that *I do not have a dog* might convey that this person has no dog, has no pets or has a pet but this pet is not a dog. This set of options is limited to taxonomic relations rather than thematic relations. Following Oaskford (2003) taxonomic relations have some possibility of being true. Thematic relations are highly unlikely to be true and add little information to negated statements.

For further research and replications of the current study, several limitations should be addressed. Primarily, the choice of items used in both experiments 1 and 2 should be closely considered and perhaps more gender neutral. For example, in trial 7 of experiment 2, the negated target item is a coin, while the thematic option is a purse and the taxonomic item is a dollar bill. Consequently, more female participants may have chosen the purse because it was more appealing to them, and male participants would be more reluctant to choose the purse because it was more feminine. Another limitation is the sample size of the participants. Upon further replication of these experiments, it would be beneficial to have a larger sample size with a wider variety of ethnic groups. Overall, negation is a truly unique phenomenon that is currently not fully understood. More research needs to be completed in order to determine how negation is developed and how contrast classes affect relations between objects in the world.

References

- Apostel, L. (1972). The relation between negation in linguistics, logic and psychology. *Logique et Analyse*, 15, 333–401.
- Dale, P. S. & Fenson, L. (1996). Lexical development norms for young children. *Behavioral Research Methods, Instruments & Computers* 28, 125–27.
- Evans, J.St.B.T., & Handley, S.J. (1999). The role of negation in conditional inference. *Quarterly Journal of Experimental Psychology*, 52, 739–770.
- Gennari, S. P., & MacDonald, M. C. (2005/2006). Acquisition of Negation and Quantification: Insights from Adult Production and Comprehension. *Language Acquisition*, 13 (2), 125-168.
- Hall, G. & Waxman, S. R. (1993). Assumptions about Word Meaning: Individuation and Basic-Level Kinds. *Child Development*, 64, 1550-1570.
- Hasson, U., & Glucksberg, S. (2006). Does understanding negation entail affirmation? An examination of negated metaphors. *Journal of Pragmatics*, 38, 1015–1032.
- Johnson-Laird, P. N. (1983). *Mental models*. Cambridge, MA: Harvard University Press.
- Kim, K. (1985). Development of the Concept of Truth-Functional Negation. *Developmental Psychology*, 21 (3), 462-472.
- Klima, E. S. & Bellugi, U. (1967). Syntactic regularities in the speech of children. In J. Lyons & R. J. Wales (eds), *Psycholinguistics papers: the proceedings of the 1966 Edinburgh conference*. Edinburgh, UK: Edinburgh University Press.
- Morris, B. J. (2003). Opposites Attract: The Role of Predicate Dimensionality in Preschool Children's Processing of Negations. *Journal of Child Language*, 30, 419-440.
- Oaksford, M., & Stenning, K. (1992). Reasoning with conditionals containing negated constituents. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 18, 835–854.
- Oaksford, M. (2002). Contrast classes and matching bias as explanations of the effects of negation on conditional reasoning. *Thinking and Reasoning*, 8 (2), 135-151.
- Pea, R. D. (1980). The development of negation in early child language. In D. Olson (ed.), *The social foundations of language and thought*. New York: Norton.
- Waxman, S. R., & Namy, L. (1997). Challenging the Notion of a Thematic Preference in Young Children. *Developmental Psychology*, 33 (3), 555-567.

Zwann, R. A. & Radvansky, G. A. (1998). Situation Models in Language Comprehension and Memory. *Psychological Bulletin*, 123 (2), 162-185.

Appendix A

Response Sheet

Name _____ Gender M F Ethnicity _____

Age _____ Birthdate _____

Experiment 1

Trial	Target	Thematic	Non-Thematic
1	Backpack	Book	Shoe
2	Golf Club	Golf Ball	Clock
3	Cat	Cat Toy	Breadstick
4	Dog	Bone	Milk
5	Nurse	Band-aid	Butter
6	Bike	Helmet	Purse
7	Boat	Anchor	Watch
8	Flashlight	Battery	Dog Bone
9	House	Mailbox	Bottle
10	Window	Curtain	Cow

Experiment 2

Trial	Target	Taxonomic	Thematic
1	Boat	Airplane	Anchor
2	Car	Boat	Tire
3	Flower	Tree	Vase
4	Crayon	Marker	Paper
5	Rain boots	Shoe	Umbrella
6	Baseball	Soccer Ball	Baseball Glove
7	Coin	Dollar Bill	Purse
8	Cow	Horse	Milk
9	Watch	Clock	Wrist
10	Breadstick	Roll	Butter
11	Baby	Doll	Bottle
12	Finger	Toe	Ring

Appendix B

Negation Script

Seat child near researcher at table. It is best if the child is seated directly across from the researcher. **We are going to play a game today with these toys. You may have played a game like it before called "I Spy". In our game, I will give you a hint and you will try to guess what I Spy by putting something into the basket. Let's try one.** Place dog on the table. **What I Spy is a dog. Now what should you put in the basket?** (Correct if necessary). **Let's try it again. Place dog and car on the table. What I Spy is NOT the dog. Now what should you put in the basket?** (correct if necessary).

If child gets this question wrong: **Let's try another one.** Place cat and boat on table. **What I Spy is NOT the boat. Now what should you put in the basket?** (correct if necessary)

Now we are going to play the first game. After you are done playing the game, you can pick out a prize and a sticker, OK? Remember, I will give you a hint about what I Spy and you guess by putting things in the basket. After I give my hint, I will close my eyes so I can't see what you put in the basket. Then you can tell me to open my eyes.

Are you ready? Good, let's get started.

Place first set of objects on table. On each trial target object should be closer to researcher and options should be equally close to child. Place basket near child.

What I Spy is NOT the _____. Now, I will close me eyes. **After you place something in the basket, you can tell me to open my eyes.** Mark option on response sheet.