ADULTS' USE OF LABELS IN CATEGORIZATION

by

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ABSTRACT

Linguistic labels influence adults' placement of category boundaries, more so than numbers or symbols. In this experiment, adults were asked to categorize perceptually ambiguous stimuli, either using label, number, or symbol cues to assist them in their categorization decision. In addition, some participants were instructed to ignore the cues (Accidental condition), some were instructed to pay attention and use the cues to help them in their decision (Intentional condition), and others were not made explicitly aware of the cues (Neutral condition). We found was that participants were significantly less likely to remember the symbol cues than either the label or number cues regardless of condition. Furthermore, participants attended to linguistic labels to aid in their categorization task more so than other cues. Our findings are consistent with previous research that attests that linguistic labels are influential in aiding category formation.

Chapter 1

INTRODUCTION

Starting at a very young age, we as humans are able to create and implement categories to aid in our cognition and understanding of the world. Categories can be defined as classes, or groups, of things that share either one or a set of characteristics. As humans, we classify (or categorize) our knowledge of the world by attributing objects to particular categories (Trauble & Pauen, 2006). These attributes, used as methods of categorization, can be physical characteristics of objects (perceptual attributes) or functional characteristics (conceptual attributes). Importantly, concepts and categories affect "every aspect of cognition" (Deak, 2002).

Not only do adults actively use categories as a way of distinguishing particular things (Kelemen & Bloom, 1994), but young children do as well. Even before children are put into formal schooling they can form categories; for instance, children as young as 3 months old, are able to differentiate related categories (e.g., *dog* vs. *fish*) based on physical characteristics before they possess the ability to communicate verbally (Trauble & Pauen, 2006). Furthermore, even pre-linguistic infants use both perceptual and conceptual attributes in forming categories (Balaban & Waxman, 1997; Eimas & Quinn, 1994; Mandler & McDonough, 1998).

Of particular interest here is the use of linguistic labels as category labels. Humans' use of language, particularly in communication, is one of the aspects of our species that sets apart from even the most intelligent of animals (Suddendorf, 2013). It is not surprising then, that we use our knowledge of language to assist us in our

everyday lives, continually assessing situations and communicating our thoughts and ideas through language. It seems plausible, therefore, that categorizing based on linguistic labels (words) would be easier and more "natural" for humans than would be categorizing things based on non-linguistic cues (Balaban & Waxman, 1997).

Previous research has found that as early as 9 months, children are influenced by word phrases in object categorization, indicating that there is a connection between words and object categorization well before infants have the ability to talk (Balaban & Waxman, 1997). Nine-month-olds were presented with photo slides of exemplars of an animal category (i.e. rabbit) in a familiarization phase followed by a test phase of two trials, pairing a novel exemplar of the familiar category (i.e., a rabbit) with a novel exemplar of a different category (i.e., a pig). Subjects were either put into a Word condition or a Tone condition. In the familiarization phase for those in the Word condition, the pictures were presented in unison with the correct spoken noun phrase (i.e., "a rabbit", "a pig"). For those in the Tone condition, the familiarization phase was accompanied by tone sequences. The test trials were presented without word or tone cues. Looking time was measured for familiarization trials and duration of left-side and right-side visual fixations was measured for the test trials. Results indicated that in the test phase, infants in the Word condition attended more to the novel category than the familiar category, but those in the Tone condition preferred the familiar category. These findings suggest that words facilitate categorization in nine-month-olds compared to non-linguistic cues (Balaban & Waxman, 1997; see also Booth & Waxman, 2002).

Labels have been found to improve categorization for not only unambiguous stimuli, which might be expected, but also for ambiguous stimuli (Johanson, &

Papafragou, 2016). Johanson and Papafragou investigated the effect of labels vs conceptual cues on categorization in 4-year-old children and college-aged adults. Participants were divided into one of four conditions: label, observable fact, unobservable fact, or no cue. Stimuli consisted of four sets of morphed objects (2 different sets of flowers, a set of birds, and a set of fish). Within each set were two standards (i.e., two perceptually distinct fish) presented next to each other and above a morphed version of the objects (the target). The target was either 10%, 30%, 50%, 70%, or 90% like one of the two standards. Each participant saw four stimuli sets, with five trials of each set. Those in the label condition heard novel labels given to each of the standards and then once the target appeared it was also given a label, either the name of the first standard or the name of the second standard. Next, the participant was asked to point to which standard the bottom picture went with and the participant's response was recorded. The procedure for the observable fact condition was the same as in the label condition except the experimenter described the standards and targets with observable facts instead of novel labels. Examples of observable facts include "This one has a short beak" and "This one has a long beak". The procedure for the unobservable fact condition was the same as the previous conditions except the standards and targets were introduced with unobservable facts like "This one drinks milk" and "This one drinks water". The last condition, no cue, was procedurally identical except the experimenter did not introduce any type of label with the stimuli and simply pointed to the stimuli. What the experimenters found was that, for the ambiguous trials (trials in which the target was perceptually equidistant from both of the standards), both adults and children used the labels, observable facts, and unobservable facts to aid in their category decisions.

In another study, labels were found to improve categorization even when they were completely redundant (Lupyan, Rakison, & McClelland, 2007). Adults, aged 18 to 24, were shown an "alien" on a screen and were told to move an "explorer" toward or away from the alien depending on the alien's category. Using arrow keys the participant moved the explorer either toward or away from the alien and received auditory feedback in the form of a buzz for an incorrect response and a bell for a correct response. There were two categories of aliens: aliens with a flatter base and ridge on their heads and a category of aliens who had rounder bases and smoother heads. Participants were randomly assigned to either a label or no-label condition. In the label condition, a printed label ("leebish" or "grecious") was displayed on the right side of the alien but in the no label condition no linguistic label was provided. Following the training phase began the testing phase in which participants were to decide if the alien being presented should be escaped from or approached. Participants in the label condition were significantly more accurate in responses than those in the no label condition. In addition, performance improved over time for those in the label condition but not so for those in the no label condition (See also Deng & Sloutsky, 2012).

Therefore, starting at around 9 months and continuing well into adulthood, we use labels (particularly linguistic labels) to help facilitate category formation, which leads to a greater distinction and stronger connection between categories. However, in much of the literature concerning labels as cues to aid in categorization, the linguistic labels were intentionally introduced by the experimenter. This way, the experimenter (as well as the participant) knew that the participant was aware of the labels and might use those labels to aid in their decision-making during the experiment. Since the labels

in these experiments were intentionally added, results showing heavy reliance on the labels might not be surprising. It is unclear from the results of these studies, however, if the participants are simply paying enhanced attention to the cues or are genuinely using the cues to aid in making category decisions.

Recently, a study has been done that addresses the role of intentionality on adult categorization using labels, numbers, and symbols (Gervits et al., 2016). The aim of this study was to see whether or not the intentional introduction of the labels (and the other cues) improved the participants' ability to correctly categorize ambiguous stimuli. Seeing how participants categorized ambiguous stimuli allowed the experimenters to see whether the cues were acting as an aid to categorization or if the participant was simply categorizing based on perceptual features. Stimuli were images of four different sets of animals. Each set consisted of two stimuli (Standards) that were morphed together to create 5 different stimuli (Targets) that appeared either 10%, 30%, 50%, 70%, or 90% similar to one of the two original stimuli. The 50% stimuli were perceptually equidistant between both of the Standards. All participants were told that they would see a series of slides each containing three images and their job was to determine which of the top two images the bottom image best went with. Some trials were accompanied by cues that acted as labels for the stimuli. Participants either saw linguistic labels ("lorp" or "pim"), numbers, or symbols (rotated numbers). The cues were meant to serve as the mechanism for categorization with particular regard to the ambiguous stimuli (50%). The study included three types of cues to see which type of cue, if any, aided the most in making category decisions. There were novel linguistic labels (e.g.; "lorp", "pim"), numbers (e.g.; "6", "3"), and novel symbols (the number cues rotated 180°). Labels were expected to be the most influential in

categorization based on previous findings (Johanson & Papafragou, 2016). The number and symbol cues were used to help measure the successfulness of the labels as aids to categorizing. Those in the Intentional condition were told to specifically look out for the cues that would sometimes appear next to the stimuli, and to pay attention to them and use them during the task. In contrast, participants assigned to the Accidental condition were told to disregard the cues because, due to a programming error, they were merged into this experiment. The Neutral condition provided no addition instructions beyond the baseline instructions of the task. The findings indicated that participants successfully categorized unambiguous stimuli independent of additional cues but for ambiguous stimuli, participants exposed to the linguistic labels performed significantly better than those exposed to either number or symbol cues. In addition, it was found that participants in the Intentional condition performed significantly better than those in the Accidental or Neutral conditions, such that intentionality of the cues impacted participants' categorization.

In the above-mentioned experiment it is unclear how the nature of the cue is driving the results. It might be that participants exposed to the labels actually used them to form categories because they paid more attention to them while those in the other two conditions simply failed to pay attention to the cues. From the experiment, it is unclear whether people were simply paying heightened attention to the cues or if they were really using the cues to make category decisions. Perhaps instead of understanding the importance and role of the labels, it was simply that participants attended more to labels compared to other cues. Therefore, it would be helpful if this experiment could be repeated with a better method for assessing participants' attention to different cues.

This paper aims at disentangling intention from attention by using the same procedure as the main experiment in the Gervits et al. study but adding a memory task at the end of the experiment to assess participants' memory of the cues seen during the experiment. By asking participants to recall the cues they saw throughout the course of the experiment we hope to better ensure that they actually attended to the cues. Thus, any observed advantage of labels in categorization could not be just due to the fact that people attended to labels more than other cues.

The following experiment asked adults (current college student) to make category decisions for novel exemplars that were either 10%, 30%, 50%, 70% or 90% similar to one of two Standards (the same stimuli used in Gervits et al., 2016) using label, number, or symbol cues to help in their category formation. The memory task at the end of the categorization task was used to assess the strength of participants' representation of the cues. There were two goals of this experiment: the first was to see whether a shared label would be more likely to influence participants to group perceptually ambiguous stimuli with one of the two Standards compared to a shared number or symbol, the second was to see whether or not the participants' memory of the cues seen during the experiment could be used to explain any label advantage in the categorization task.

Chapter 2

METHODS

2.1 Subjects

A total of 180 monolingual English speakers participated in this study; 135 female participants and 65 male participants. The participants were taken from an introductory-level, undergraduate psychology class at the University of Delaware and received class credit for participation in the study. Each participant filled out a consent form approved by the University of Delaware Institutional Review Board prior to the start of the experiment.

2.2 Materials

Stimuli used in this experiment are the same stimuli used in Gervits et al. (2016). There was a total of four different sets of stimuli used in this experiment; one set of birds, two sets of different flowers, and one set of fish. Each set included two stimuli (the two Standards) that were then morphed into 5 additional stimuli that varied in similarity to the originals. These morphed versions of the Standards are called the Targets and each one was either 10%, 30%, 50%, 70%, or 90% similar to Standard 2. That is, the Targets that were 10% and 30% similar to the Standards were always more perceptually similar to the Standard 1 and the Targets that were 70% and 90% similar to the Standards were always more perceptually similar to the Standard 2. The Target that was 50% similar to the Standards was an even split between each of the Standards and unlike the other (unambiguous) trials, this one was ambiguous (See Figure 1).

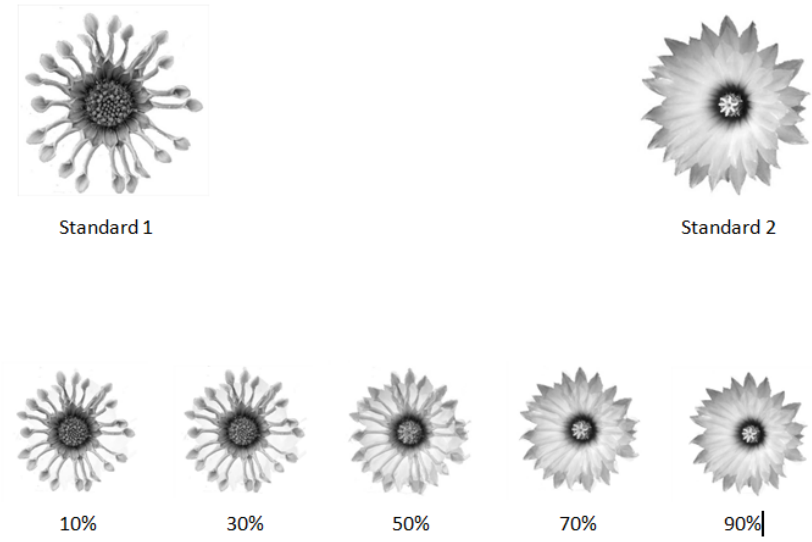

Figure 1: An example of Standard and Target stimuli used in the experiment

2.3 Design

There were five trials for each of the four stimuli sets, for a total of 20 trials. In each trial two Standards were displayed next to each other, above a Target image, separated by a solid black line. The Target image was either the 10%, 30%, 50%, 70%, or 90% Target. This display was shown for 8 seconds. This phase of the trial is the study phase, where the participant was to study the display. After the 8 seconds, the Standards and Targets disappeared for 500ms while the solid black line stayed on the screen. Next, the objects were displayed again for 7 seconds, this time with a red border around all the stimuli. This phase of the trial is known as the test phase. For trials that included visual cues, those cues were displayed 4 seconds into the study phase of the ambiguous trial (the trial in which the Target was 50% ambiguous). The visual cue was also displayed in one random trial before the ambiguous Target. For trials where the visual cue appeared, a cue appeared next to each of the stimuli (the

two Standards and the Target) where the cue for the Target matched one of the Standards. The cues appeared to the right of the stimuli, disappeared for a moment, then reappeared for 2 seconds until the study phase of the trial was completed. The assignment of cues to Standards and Target was counterbalanced across participants. (See Figure 2 for example).

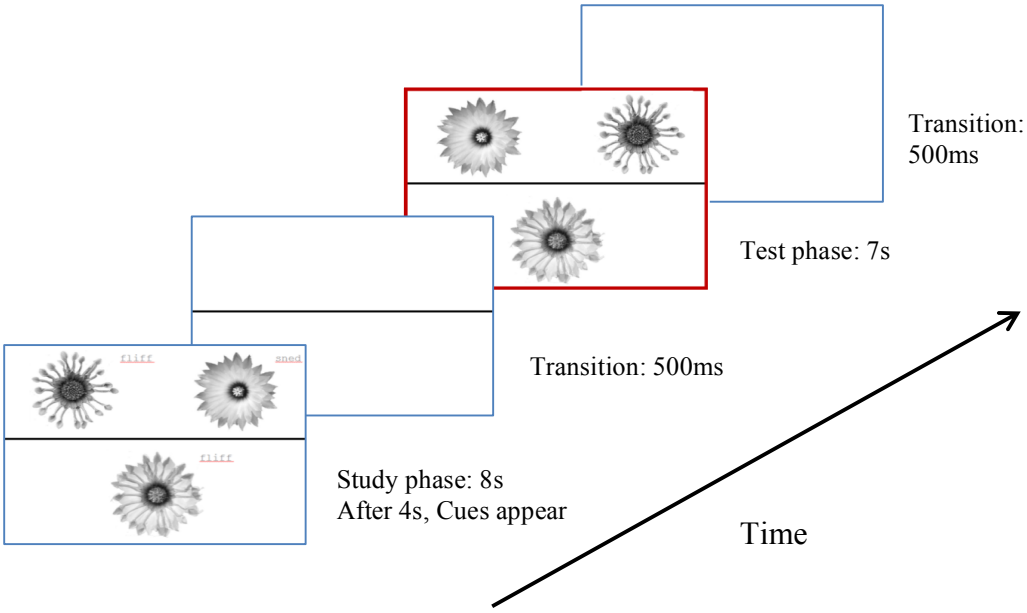

Figure 2: A visual representation of an ambiguous trial

The experiment had three versions, each with a different type of cue. The cue types were Labels, Numbers, and Symbols. The labels used were “lorp” and “pim”, “fliff” and “sned”, “blick” and “dax”, and “hep” and “moof”. The number cues used were 6 and 3, 1 and 5, 2 and 7, and 8 and 4. The symbol cues were the same as the

number cues except the numbers had been rotated clockwise 90 degrees (See Table 1 for cue examples).

Table 1: Example of cues used in the experiment

Cue	Example
Label	lorp pim
Number	
Symbol	

2.4 Procedure

Prior to participating in the experiment, participants were required to read over and fill out a consent form. After participants signed the consent form they were led into a conference room where the stimuli were presented on a projection screen. When participants came into the room, the projection screen was set to a display that said "Welcome to the study!". The number of participants run at one time consisted of no more than 8 people. Once all the participants had been seated, the screen displayed the instructions on the projector as follows: "In this experiment you will be presented with a series of slides, each containing 3 images. Your task is to determine as best you can which of the top two images the bottom image best goes with. Each slide will be presented twice. The first time, you will have some time to simply inspect the images. Then, a test slide will appear, denoted by a RED border. At this time you will mark on your answer sheet which of the top 2 images the bottom image best goes with. Mark

'L' if it goes with the top left image or mark 'R' if it goes with the top right image. Pay close attention to the test slide, as the position of the images may have changed". Participants were to read the instructions silently to themselves and were able to ask any questions they made of had prior to the start of the experiment.

Participants were randomly assigned to one of the three versions of the study depending on cue type and to one of three conditions within each cue type: Neutral, Accidental, or Intentional. All of the participants, regardless of condition, read initial instructions on the projection screen as described above. What varied between the conditions was what the experimenter told the participants about the cues after these initial instructions. In the Accidental condition, participants were told: "As you inspect the items, you will see things that look like messages displayed next to some of the items. These were designed for a different experiment that used them to measure how people process nonsensical information. Because of a programming error, they were merged with this experiment, so please disregard them for purposes of your task". In the Intentional condition, participants were told: "As you inspect the items, you will see things that look like messages displayed next to some of the items. These were intentionally generated for this experiment so please pay attention to them as they will be helpful in your task". In the Neutral condition, participants were given no information about the cues they would be seeing. In all conditions, participants recorded their responses on provided response sheets.

After the end of the experiment, each participant was given a surprise memory task to complete. The memory task instructions were written on the paper as follows: "Please circle all the messages that you saw during the course of the experiment." Below the instructions were all of the Label, Number, and Symbol cues ('targets'), as

well as an additional group of distractors that were not in the experiment. There were 8 hits and 8 distractors for each cue type, for a total of 48 possible cues; because of a slight error, there were 9 distractors for the labels and 7 targets for the numbers instead of 8 of each type. The memory display was given to each of the participants on an 8.5 x 11-inch piece of paper. The display for the memory task appeared as in Figure 3.

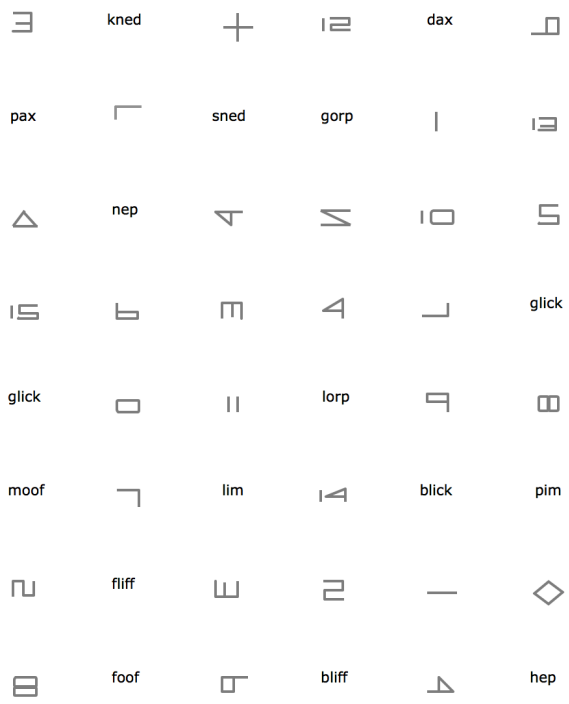

Figure 3: The memory task display

2.5 Data Analysis

The responses of the participants from the main task were averaged to determine participant accuracy regarding the main task of the experiment, the categorization task. Participants received a 1 if they picked the correct Standard or a 0 if they chose the incorrect Standard.

Total error on the memory task was calculated by adding the number of correct targets the participant failed to circle (misses) to the number of close false alarms (distractors) and the number of false alarms outside of the cue category that the participant circled. This number was then divided by 48, the total number of cues on the memory task display, to create a percent total error.

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Chapter 3

RESULTS

3.1 Categorization Data

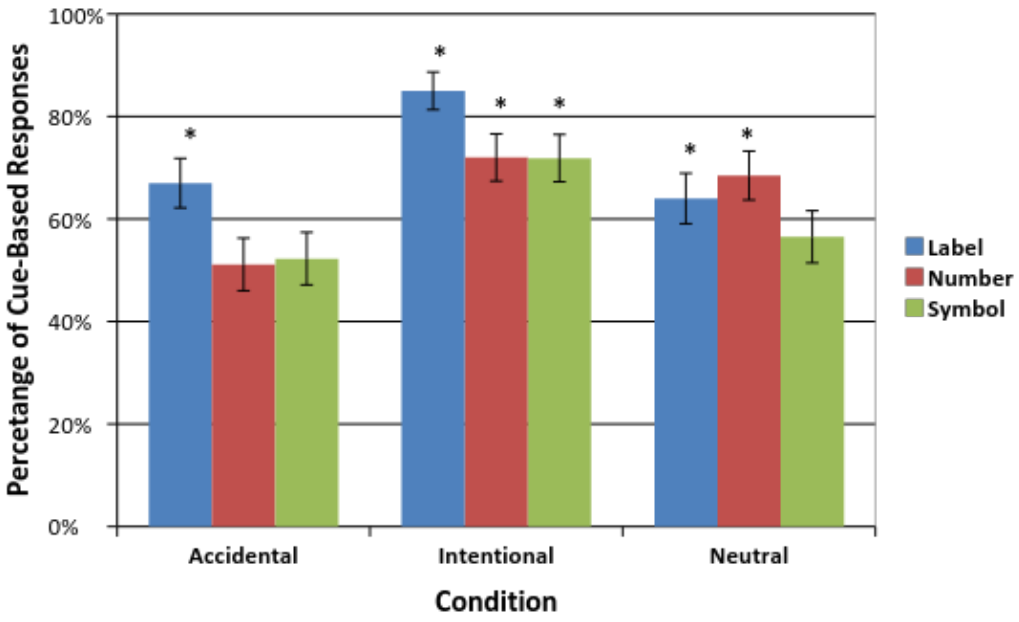

Figure 4: Percentage of cue-based responses as a function of categorization for each condition and cue combination. Asterisks indicate that performance is significantly different from chance ($p < .05$).

A two-way ANOVA was carried out using the percentage of cue-based responses on the 50% morph trials as the dependent variable and Cue (Label, Number, Symbol) and Condition (Accidental, Intentional, Neutral) as between-subject factors. The ANOVA revealed a significant main effect of Cue, $F(2, 179) = 5.05$, $p = 0.007$. Planned comparisons with Bonferroni corrections showed that Labels and Numbers were not statistically significant ($p = 0.06$) but both cue showed better performance

compared to Symbols ($p = 0.008$). There was no significant difference between Numbers and Symbols ($p = 1.00$).

The analysis also returned a significant main effect of Condition, $F(2, 179) = 7.09$, $p = 0.001$. Planned comparisons with Bonferroni corrections showed that performance in the Intentional condition was significantly higher than the Accidental ($p = 0.001$) but not the Neutral condition ($p = 0.328$). Moreover, performance in the Neutral condition was similar compared to the Intentional condition ($p = 0.1$). Interaction effects between Cue and Condition were not statistically significant. See Figure 4 for a graph of categorization results.

3.2 Memory Accuracy Data

See Figure 5 for a graph showing the memory accuracy for each cue and condition combination. A three by three factorial ANOVA was performed with Memory Accuracy as the dependent variable and Cue and Condition as between subject factors. The ANOVA revealed a significant main effect of Cue, $F(2, 179) = 52.44$, $p < .001$. Memory Accuracy for Labels and Numbers did not differ significantly from one another, $p > 0.1$, but differed significantly from Memory Accuracy for Symbols (both p's $< .001$). The main effect of Condition and the Cue by Condition interaction both failed to reach significance (both p's > 0.1). This shows that memory for Labels and Numbers were similar but memory for Symbols was significantly less than both Labels and Numbers. In addition, Condition did not seem to have an effect on memory accuracy for any of the cues.

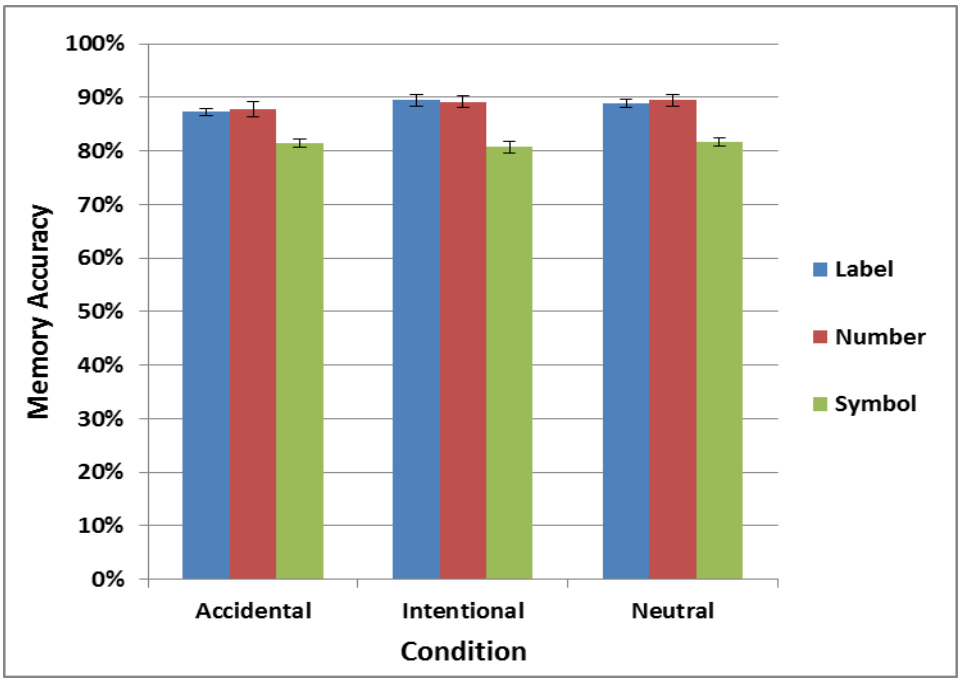

Figure 5: Memory accuracy for ambiguous trials for each condition and cue combination. Error bars represent standard error of the mean.

Chapter 4

DISCUSSION

In this experiment, we confirmed that linguistic labels are more helpful than either symbol or number cues in aiding in the categorization of perceptually ambiguous exemplars of animals (fish, birds, and flowers). Furthermore, intentionality matters; when the participants are told to pay attention to the cues (Intentional condition), they follow them more compared to when they are told to ignore the cues (Accidental condition), with performance when given no instructions indistinguishable from the other two conditions. In this broad sense, our results replicate Gervits et al. (2016).

The main point of this experiment was to see if a particular cue and/or condition would increase the participants' memory for the cues seen during the categorization task. We hoped that participants' memory of the cues would shed light on how they used the cues, especially in the ambiguous trials, to make category decisions for the Target. If participants were accurate in remembering the cues they saw during the categorization task, there is a greater likelihood that they used these cues to make categorization decisions compared to if they did a poor job in remembering the cues. We found that participants who were exposed to the label and number cues remembered those cues to a greater degree than those who saw the symbol cues. Labels and numbers were remembered equally well. Furthermore, participants in the Intentional condition remembered cues as well as those in the Accidental or Neutral condition even though only those in the Intentional condition were explicitly told to use the cues to help make category decisions. These novel findings support the notion that cues act as aid to categorization independent of

intentionality, thus emphasizing the potency of cues, whether they be linguistic labels, numbers, or symbols.

We conclude that the label advantage in categorization, especially with respect to numbers, cannot be due to differences in how strongly people attend to/represented the cues. Since the Label and Number cues were remembered to a similar degree, and labels aided in categorization of ambiguous stimuli more so than numbers or symbols, we take this as evidence that labels facilitate categorization more so than numbers or symbols. Similarly, effects of intentionality cannot be due to differences in attending to the cues in different conditions. That is, people used labels more than numbers (at least) in categorization, even though they remembered them equally. Similarly, people used the cues more in the Intentional condition even though they attended to them across the board.

While the present experiment focused on adult memory of cues to help explain their relevance in categorization of ambiguous stimuli, other methods might be just useful as a memory task. Another method that could be used is eye-tracking. By tracking participants' eye movements, we could see if gazes on the cues reveal a label advantage, as in this experiment. In addition, the method and materials of the present experiment can be used in subsequent experiments on bilinguals or speakers of different languages to see if the label advantage persists for these types of people.

Our results support the findings by Gervits et al. that adult participants use the cues for categorization more so when they are explicitly told to compared to when they are told to ignore them or are not given any information regarding the cues. Additionally, our results support the notion that labels improve categorization for ambiguous stimuli (Johanson & Papafragou, 2016) and that humans' use of linguistic

labels to facilitate category formation leads to a stronger connection between categories. More broadly, our findings support extensive research on categorization that attests that labels help facilitate category formation (Lupyan, Rakison, & McClelland, 2007; Balaban & Waxman, 1997). Labels lead to a greater distinction and stronger connection between categories. In this experiment, we found that adults use linguistic labels to help form categories more so than numbers or symbols because participants remembered the different cues to similar degrees but the labels were the cue used most accurately in forming correct category decisions.

REFERENCES

Balaban, M. T., & Waxman, S. R. (1997). Do Words Facilitate Object Categorization in 9-Month-Old Infants? *Journal of Experimental Child Psychology,64*(1), 3-26. doi:10.1006/jecp.1996.2332

Booth, A. E., & Waxman, S. (2002). Object names and object functions serve as cues to categories for infants. *Developmental Psychology ,38*, 948-957.

Deák, G. O., Ray, S. D., & Pick, A. D. (2002). Matching and naming objects by shape or function: Age and context effects in preschool children. *Developmental Psychology,38*(4), 503-518. doi:10.1037//0012-1649.38.4.503

Deng, W., & Sloutsky, V. M. (2012). Carrot Eaters or Moving Heads: Inductive Inference Is Better Supported by Salient Features Than by Category Labels. *Psychological Science,23*(2), 178-186. doi:10.1177/0956797611429133

Dessalegn, B., & Landau, B. (2008). More than meets the eye: the role of language in binding and maintaining feature conjunctions. *Psychological Science,19*(2), 189-195. doi:10.1111/j.1467-9280.2008.02066.x

Eimas, P. D., & Quinn, P. C. (1994). Studies on the Formation of Perceptually Based Basic-Level Categories in Young Infants. *Child Development,65*(3), 903-917. doi:10.2307/1131427

Fulkerson, A. L., & Haaf, R. A. (2003). The Influence of Labels, Non-Labeling Sounds, and Source of Auditory Input on 9- and 15-Month-Olds' Object Categorization. *Infancy,4*(3), 349-369. doi:10.1207/s15327078in0403_03

Gervits, F., Johanson, M., & Papafragou, A. (2016). Intentionality and the Role of Labels in Categorization. Unpublished paper, University of Delaware, Newark, DE.

Johanson, M., & Papafragou, A. (2011). Effects of labels on children's category boundaries. *Proceedings from the 35th Annual Boston University Conference on Language Development.* Somerville, MA: Cascadilla Press.

Johanson, M., & Papafragou, A. (2016). The influence of labels and facts on children's and adults' categorization. *Journal of Experimental Child Psychology,* 130-151.

Kelemen, D., & Bloom, P. (1994). Domain-specific knowledge in simple categorization tasks. *Psychonomic Bulletin & Review,* 390-395.

Lupyan, G., Rakison, D. H., & McClelland, J. L. (2007). Language is not Just for Talking: Redundant Labels Facilitate Learning of Novel Categories. *Psychological Science,18*(12), 1077-1083. doi:10.1111/j.1467-9280.2007.02028.x

Mandler, J. M., & Mcdonough, L. (1998). Studies in Inductive Inference in Infancy. *Cognitive Psychology,37*(1), 60-96. doi:10.1006/cogp.1998.0691

Mcdonough, L., & Mandler, J. M. (1998). Inductive generalization in 9- and 11-month-olds. *Developmental Science,1*(2), 227-232. doi:10.1111/1467-7687.00035

Suddendorf, T. (2013). *The gap: the science of what separates us from other animals*. New York: Basic Books, a member of Perseus Books Group.

Träuble, B., & Pauen, S. (2007). The role of functional information for infant categorization. *Cognition,105*(2), 362-379. doi:10.1016/j.cognition.2006.10.003

Waxman, S. R. (2003). Links between object categorization and naming: Origins and emergence in human infants. In D. Rakison & L. M. Oakes (eds.), *Early category and concept development: Making sense of the blooming, buzzing confusion* (pp. 213–241). New York: Oxford University Press.

Yamauchi, T., & Yu, N. -. (2008). Category labels versus feature labels: Category labels polarize inferential predictions. *Memory & Cognition,36*(3), 544-553. doi:10.3758/mc.36.3.544