

1-1-1986

Size and complexity as stimulus characteristics effecting choice behaviors on a learning task in young children

Kristia A. Stout

Follow this and additional works at: <https://huskiecommons.lib.niu.edu/studentengagement-honorscapstones>

Recommended Citation

Stout, Kristia A., "Size and complexity as stimulus characteristics effecting choice behaviors on a learning task in young children" (1986). *Honors Capstones*. 1019.
<https://huskiecommons.lib.niu.edu/studentengagement-honorscapstones/1019>

This Dissertation/Thesis is brought to you for free and open access by the Undergraduate Research & Artistry at Huskie Commons. It has been accepted for inclusion in Honors Capstones by an authorized administrator of Huskie Commons. For more information, please contact jschumacher@niu.edu.

Rec
5/27/86

Size, Complexity, and Choice
1

Size and Complexity as Stimulus Characteristics effecting
Choice Behaviors on a Learning Task in Young Children
Northern Illinois University
Kristia A. Stout

Running Head: SIZE AND COMPLEXITY AS THEY EFFECT CHOICE

Professor Valenti in Psych has the
appendices

Abstract

The study examines the effects of the qualitative factors size and complexity of stimulus objects on preschool and first grade children on a learning task. Choice behavior is looked at with regards to initial choice (with the eyes) and final choice (with the hands). Other variables included in the analysis are long-term novelty and proportion of looks towards the rewarded object as a function of positive (choosing the rewarded object) and negative (choosing the unrewarded) choice outcomes. The results showed that first grade children are better at utilizing stimulus characteristics to aid their choice behavior, and further, that the specific levels of the characteristics studied that are attended to are high complexity and large size, as well as high long-term novelty.

Size and Complexity as Stimulus Characteristics effecting
Choice Behaviors on a Learning Task in Young Children

The major goal of this study was to examine the effects of qualitative stimulus characteristics of objects on children's attention, and therefore performance. According to the **one look model** in attention theory, discriminative learning requires two responses 1) attending to the relevant stimulus dimension, and 2) approaching the correct cue of that dimension. Zeaman and House later modified this theory slightly in what they called the **multiple-look model**. This theory relaxed the restriction in breadth of attention, supporting the idea that subjects were capable of attending to more than one dimension of a stimulus object. Attention was assumed to be restricted only to dimensions which varied for the two choices on each trial (Zeaman & House, 1979).

Attention to stimulus characteristics in part determines choice, so it would follow logically that to direct choice, characteristics of the stimulus object should be explored. Several studies have looked at one of these characteristics: familiarity vs. novelty, finding that novel stimuli are preferred over relatively familiar alternatives in many circumstances (Berlyne, 1960; Zeaman,

1976). Valenti (1985) looked specifically at attention over the age range of preschool to first grade, as does the present study, and found that children throughout these two age groups consistently prefer novel objects over familiar objects.

Other possibly relevant factors in the direction of attention and choice behaviors, as explored in the present study, are size and complexity. These factors will be analyzed with respect to initial choice with the eyes, and final choice with the hands. Other factors included in the study will be proportion of looks toward the rewarded object as a function of positive and negative choice outcomes, and absolute familiarity (novelty) of the object

Method

Subjects.

Thirty-four children at two age levels (CA 4 and 6) were included in the original study. Both groups were equally divided by sex. For the purposes of the present study, it was necessary to omit Subject 7 in the preschool group and Subjects 41, 42, and 43 in the first grade group for lack of data. This brought the original number of children down to 30, 14 children in the preschool age group, and 16 in the first grade. All subjects were drawn

from schools in communities surrounding the DeKalb, Illinois area.

Procedure.

For each child used in the experiment, three trials were analyzed on the chosen variables. All subjects used were tested individually using a portable Wisconsin Test Apparatus. Three circular and open wells, built to hold reward objects (horse charms) were recessed into a sliding tray that was manually presented to the subject and then withdrawn. Stimuli for the learning set problems in this study were 6 multidimensionally heterogeneous "junk" stimuli, fabricated from scraps of wire, wood, electrical parts, fragments of toys, and household objects. Each session was recorded by a video camera mounted above the subject.

Each child received a series of learning set problems, each consisting of a demonstration treatment and a two-choice test. In the positive demonstration problems one single presentation of the correct, rewarded stimulus preceded the two-choice test; in the negative demonstration problems one single presentation of the negative (not rewarded) stimulus was presented prior to the two-choice test. These demonstration conditions were used

to vary the relative novelty of the stimulus objects prior to choice. Junk stimuli were replaced on each problem.

Half of the children at each age level received pretraining (not a factor in the present study) in a simple two-choice selective learning problem to a criterion of 20 correct in the last 25 trials. The remaining subjects were occupied for a comparable amount of time (about 5 minutes) with a series of tasks unrelated to the two-choice selective learning (writing one's name, counting plastic farm animals). The pretraining manipulation was included to investigate the effects of transfer of training on attention to novelty, which may be responsible for the occasional observation of developmental shifts from novelty to familiarity preference within retarded selective learning (Zeaman, 1976).

Analysis.

Two types of computer assisted analysis were done on the raw data coded from the videotaped learning tasks, quantitative and qualitative.

The quantitative data used in the final analysis involved the length of successive looks to the rewarded and unrewarded objects. The length of the look toward an individual object was measured by means of a digital time

display superimposed on the videotape image of the experimental task. A direction was specified for the look when the subject started head rotation away from forward orientation. Length of the look was recorded from the time of the initial deviation in a particular direction until such time as the head orientation was once again oriented in the forward direction. Further deviation from this point was considered the start of the next directional look.

The qualitative stimulus characteristics used in the present study included size, complexity, and long-term novelty (absolute familiarity).

Size was both an absolute measure, as determined by size in inches, and a term relative to the size of the other object in the paired presentation. Complexity was also both an absolute and a relative term. Its absolute aspect was measured as, roughly, the number of separate objects located on the stimulus block. Movement was an additional characteristic considered in the assignment of complexity. The relative component was in terms of the other object in the paired presentation. Long-term novelty was subjectively evaluated by the experimenter, and was judged on relative frequency of the stimulus object outside

of the experimental situation.

Final analysis was done using a SAS program run on the superwylbur system at Northern Illinois University. For a listing of the raw data points and the computer program used to analyze them, see Appendix A and Appendix B, respectively.

Results

When the raw data was analyzed for the preschool and first grade students, it was found that the different levels of stimulus characteristics investigated in this study had a differential effect on the preschool and first grade age groups.

When the rewarded stimulus object was characterized by low complexity, the percentage of rewarded choices in the preschool group for both initial look and final choice was 29.2%. First graders had a rewarded choice percentage for initial look of 57.1%, and for final choice of 75%. The proportion of time which the subject spent looking at the rewarded object, as a function of negative (nonrewarded) and positive (rewarded) choice outcomes indicates a lower level of looking at the rewarded object for both groups when the final choice had a negative choice outcome, with subjects in the first grade showing a larger percentage of

looks toward the rewarded object than the preschool subjects. On positive choice outcome trials, the proportion of looking time toward the rewarded object was nonsignificantly different for the two groups (see Figure 1).

Insert Figure 1 about here.

When the stimulus object was rated as highly complex, differences between the age groups were also apparent. Preschool children had above chance performance in both initial look and final choice for highly complex rewarded objects (58.8% and 52.9%, respectively). First grade children responded with an 80% rewarded response rate for both the eye choice (initial look) and the hand choice (final choice). The proportion of looks towards the rewarded object on negative outcome trials was higher for preschool than firstgrade children (45.3% and 33.1%, respectively), and was nonsignificantly different for the positive choice outcome trials, being 70% rewarded and 67.2% rewarded response rate for the first and preschool ages, respectively (see Figure 2).

Insert Figure 2 about here.

The results obtained using size as a stimulus characteristic effecting choice also showed a difference in preschool and first grade performance. When the stimulus object was small, preschoolers made the rewarded choice with their eyes initially on 29.4% of the trials, and with their hands on 47.1%. First graders were correct in their initial choice 47.8% of the time, and chose the rewarded object with their hands on 65.2% of the trials. The proportion of looks toward the rewarded object on negative outcome trials was 39.8% and 21.5% for the first grade and preschool subjects, respectively (see Figure 3).

Insert Figure 3 about here.

When a large object was the rewarded stimulus, preschoolers made correct choices with their eyes 44.4% of the time, and with their hands on 66.7% of the trials. First grade children chose correctly on both the initial look and final choice of object 89.5% of the time. When the proportion of looks towards the rewarded object was examined, preschoolers and first grade children perform nonsignificantly different on negative outcome trials (40.4% and 43.5%, respectively), and on the positive outcome trials, preschool children looked at the rewarded

object 82.6% of the time, and first graders on 67.8% of the trials (see Figure 4).

Insert Figure 4 about here.

A third stimulus characteristic on which only one level had sufficient data for analysis, was absolute familiarity, or long-term novelty. It was found that this type of novelty had a similar function for both age groups (see Figure 5).

Insert Figure 5 about here.

For a summary of descriptive statistics for the characteristics size and complexity, see Table I and II, respectively.

Discussion

When complexity and size data for initial look and final choice responses for preschool and first grade children are analyzed, it appears that there is a differential effect of stimulus characteristics at the two grade levels. Preschoolers prefer highly complex over low complexity objects, and large over small size on both eye and hand choice behavior. First grade children, while their initial look is drawn to highly complex rewarded

stimuli more, relative to low complexity objects, show about the same percentage of rewarded responses in both conditions. Complexity then, for the older children, does not appear to be a significant factor in the final choice.

When size was considered as a factor in the choice response, it was found that size was not a factor in final choice behavior in preschool age children, but as measured by initial look, a preference of attention was shown for large stimulus objects. First grade children preferred large relative to small objects in both initial look and final choice behavior.

Long-term novelty, assessed as familiarity outside the experimental setting, was found to be about the same for both preschool and first grade children.

When the proportion of looks toward the rewarded object, as a function of negative and positive choice outcomes was analyzed, it was found that the percentage of looks toward the rewarded object on positive choice outcome trials varied positively, that is in positive choice outcomes percentage of looks toward the rewarded objects were consistently higher than the percentage on negative choice outcome trials for each age level.

In sum, the findings of this study are that in both

age groups, increasing size and complexity of the rewarded object are associated with elevated levels of response to the rewarded object. Further, first grade children, in general, appear to be able to attend to relevant stimulus characteristics to a greater extent than preschool children; as supported by consistently higher percentages of rewarded responses in both initial look and final choice behavior.

References

- Berlyne, D. E. Conflict, arousal, and curiosity. New York: McGraw-Hill, 1960.
- Zeaman, D. The ubiquity of novelty-familiarity (habituation?) effects. In T. J. Tighe and R. N. Leaton (Eds.), Habituation: Perspectives from child development, animal behavior, and Neurophysiology. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1976.
- Zeaman, D. & House, B. A review of attention theory. In N. R. Ellis (Ed.), Handbook of mental deficiency, physiological theory and research. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1979.
- Valenti, S. (1985). Children's preference for novelty in selective learning: Developmental stability or change? Journal of Experimental Child Psychology, 40, 406-419.

Table 1

Percentage of Rewarded Responses

	Complexity of Rewarded Object			
	Low		High	
	Initial Look	Final	Initial Look	Final
Grade				
Pre	29.2%	29.2%	52.9%	58.8%
1st	75%	57.1%	80%	80%

Table 2

Percentage Rewarded Responses

Size of Rewarded Object

Grade	Small		Large	
	Initial Look	Final	Initial Look	Final
Pre	47.1%	29.4%	49.4%	66.7%
1st	65.2%	47.8%	89.5%	89.5%

Figure Caption

Figure 1. Proportion of looks by preschool and first grade children at a rewarded low complexity stimulus object as a function of negative and positive choice outcome.

Figure Caption

Figure 2. Proportion of looks by preschool and first grade children at a rewarded high complexity stimulus object as a function of positive and negative choice outcomes.

Figure Caption

Figure 3. Proportion of looks by preschool and first grade children at a rewarded small stimulus object as a function of positive and negative choice outcomes.

Figure Caption

Figure 4. Proportion of looks by preschool and first grade children at a rewarded large stimulus object as a function of positive and negative choice outcomes.

Figure Caption

Figure 5. Proportion of looks by preschool and first grade children at a rewarded highly novel (long-term) stimulus object as a function of positive and negative choice outcomes.