List Learning in Children

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Introduction

The purpose of this pilot study is to determine the cognitive processes underlying list learning in young children. Results across great apes, human children and human adults show both spontaneous and trained strategy development. This list learning task was previously used by Swartz, Himmanen, and Shumaker (2007) with two adult orangutans. To improve memory performance, orangutans Bonnie and Iris spontaneously developed a response strategy in which they searched the screen beginning on the right side and moved to the left, identifying list items as they encountered them on the screen.

Human adults and older children show the ability to develop and use several types of organization strategies. Some researchers categorize the types of clustering memory organization as categorical clustering and associative clustering . In human adults and older children from 8 to 10 years, Laurence (1966) reported a significant correlation between recall scores and degree of subjective organization; a method usually found in tests of word recall in which the person develops a strategy of grouping together particular words from the given list when recalling the words. The subjects in this study are younger than 8 years old, so It may be that although young children do not possess this skill of subjective organization, they are able to formulate a successful response strategy on this task just as the orangutans developed in the Swartz et al. (2007) study.

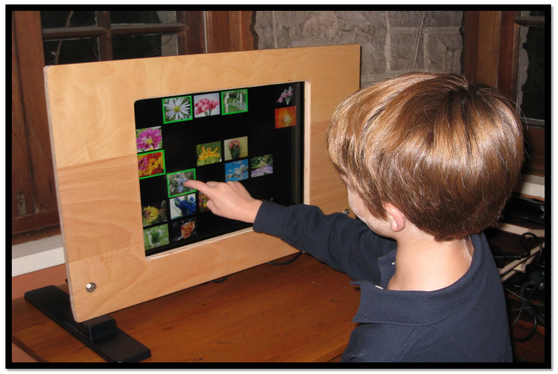

Figure 1. Child participant performing the task.

Method

Subjects

Two children, a 2 year old girl and a 6 year old boy, participated in this study.

Procedure

To begin a trial, a blue triangle was presented in the middle of the screen. After it was touched, the list stimuli would appear on the screen one by one in random locations. When each stimulus was touched a red border appeared around it and that stimulus disappeared followed by another from the list. Once all had been presented and touched, the stimuli appeared on the screen simultaneously along with the distractor stimuli (items that were not in the presented list). The subject's task was to touch the list items in any order while avoiding the distractor stimuli. Correct completion of the list resulted in a chime, praise from the experimenters, and a reward of candy and/or stickers that were presented at the end of the session. An incorrect touch on the screen resulted in a buzzer.

List Organization

The lists used in the present study varied from 1-12 target stimuli and 1-6 distractor stimuli. Each child began the experiment at a level below their expected capacity based on age. The levels correspond with the type of list. The lists were organized based on the number of targets and number of distractors. The simplest list and level was 1:1 (1 target and 1 distractor) followed by the second level 2:1 (2 targets and 1 distractor), up to 12:6.

A full session consisted of 50 trials. The children were encouraged to finish this amount, but stopped the task if they wanted to. Within a session the same list items and distracters were used on every trial. After completion of one list, a novel list was given at the same level if the performance was at chance or up one level if performance was above chance.

Results

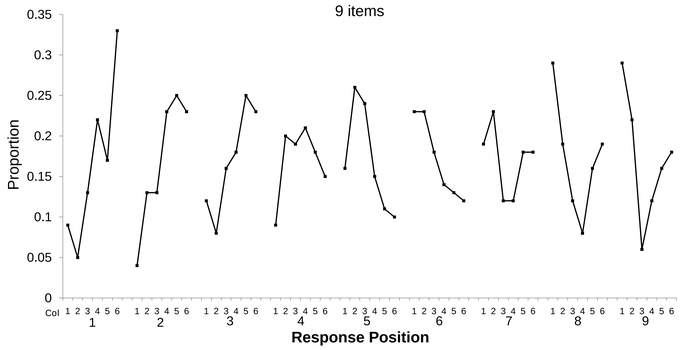

Figure 2. The proportion of response made to each of the 6 columns of the display by the 6 year old participant on each response. The columns (col) are numbered from left to right, with 1 as the left-most column and 6 as the right-most column.

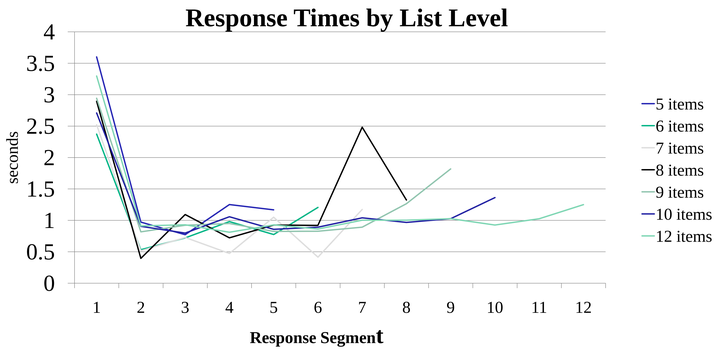

Figure 3. The average response time of each touch (response segment) across each list level.

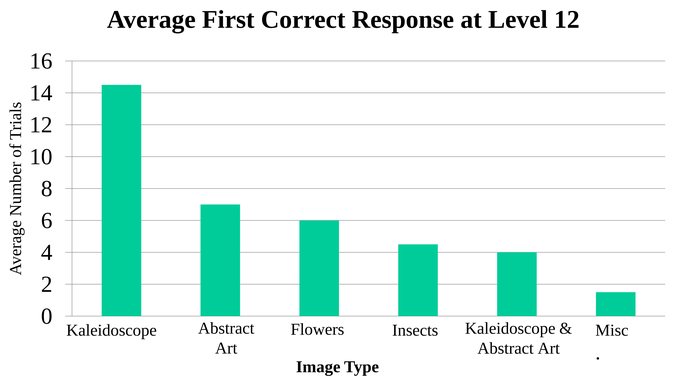

Figure 4. Average number of trials before the first correct trial at Level 12 by each image type.

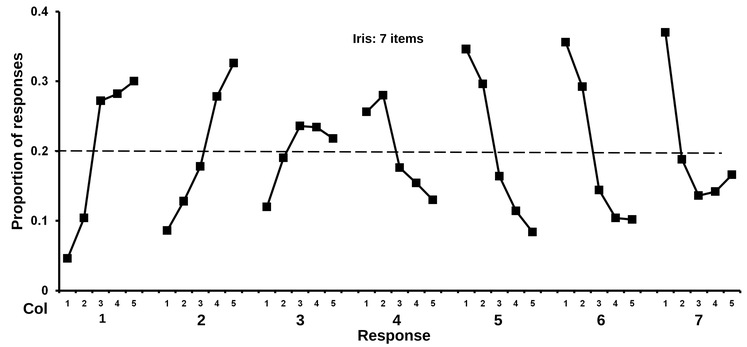

Figure 5. (Data table from the original Swartz et al. (2007) study) The proportion of response made to each of the 5 columns of the display by Iris the orangutan on each response. The columns (col) are numbered from left to right, with 1 as the left-most column and 5 as the right-most column.

Discussion

This is a pilot study with further trials to be pursued, so most data remains in a descriptive stage. Figure 2 suggests a response pattern that spontaneously occurred at list level 9. This right to left response pattern looks similar to the one Swartz et al (2007) found while investigating strategies in list learning with orangutans. The orangutans both showed this spatial response strategy when the task reached a point of difficulty where responses changed from chance responses at different positions to this right to left response pattern. 5 items for the orangutans seemed to display an important shift in difficulty where a response strategy was necessary in order to decrease memory load. According to Figure 2 , this right to left response strategy may serve the same purpose, only for the child beginning at a higher level with 9 items.

The results in Figure 3 display an interesting pattern that needs further investigation. At every list level, the first touch was the slowest (mean=2.9 sec) followed by a quicker touch (mean=0.7 sec) with the rest of the touches staying around 1 sec. A possibility for this pattern could be that as soon as the list items appear on the screen with the distractor items in the response phase, the child immediately focused all of his attention on refreshing the previous memory traces which caused the initial pause. This consistent pattern is supported by information that working memory begins to be quite stable beginning at this age, 6 years old (Barrouillet et al, 2009).

In Figure 4 a trend can be seen in the higher level lists. At list level 9, new image types began to be introduced outside of the misc. category (naturally occurring objects). New lists were made of entirely kaleidoscope images, abstract art images, and of one type of naturally occurring object entirely (flowers or insects). Children generally do perform better on memory tasks involving familiar objects (Visu-Petra et al., 2008). Kaleidoscope and abstract art images are the most unfamiliar of the image types and have less salient attributes to recall. Interestingly, kaleidoscope and abstract art images together in the same list did not prove to be as difficult in making a correct first trial.

Further research needs to be conducted in order to find if young children do develop and use an effective spatial response strategy consistently, and at which ages. This can clarify the distinct developmental differences in relation to memory strategy formation. The analysis of performance may also lead to greater knowledge of the true trends in the progression of strategy production.

Acknowledgments

I would like to thank Dr. Karyl Swartz and Great Ape Trust of Iowa for allowing me to assist on this study. Also, thank you to Dr. Maria Bohorquez and the DUSCI summer internship program.

References

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