Early attention perseveration in a context of the preferential paradigm.

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Abstract

Perseveration is known as the inability to shift, change, or discard a pattern of behavior for a new situation. Young infants are known to demonstrate some level of perseverative behavior or perseveration when searching for objects during task-switching (Piaget, 1954). However, the processing mechanisms behind inhibiting this behavior through saliency and word-learning remains unknown. The present study explores this preferential looking phenomenon in infants, aged 3-18 months, during a word-learning task using eye-tracking. Trial duration and the use of generalized stimuli indicate strong correlations with perseveration levels.

Background

PERSEVERATION

- Past research on understanding perseveration in infants have documented many efforts in the context of the A-not-B task (Diedrich et. al., 2001; Smith et. al., 1999).
  - However, the traditional A-not-B task relies on the infant performing a reach to some location (Clearfield et. al., 2009), a feat that is not easily testable in younger infants of 3-5 months of age with large variations in motor skill.
- After 12 months of age, research suggests that infants are less likely to perseverate (Wellman et. al., 1986).
  - However, the modeling of age in Thelen et. al. (2001), as an increase of the resting level, claims that strong variations in cue strength may still compensate for lower resting levels.

EYE-TRACKING

- The current study uses a preferential paradigm and utilizes eye-tracking, as the advent and acceptance of eye-tracking devices for use on infants to investigate looking patterns and in the context of reaching (Williams et. al., 2010), allows researchers to test those younger populations.

Experimental Question(s):

- **What link does perseveration have with age in the context of a preferential looking task?**
- **What effect does generalized stimuli have on perseveration?**

Experiment

PARTICIPANTS

94 infants, three to eighteen-months-old, participated in the study.

- Mean age: 10.46 (SD = 4.28) months

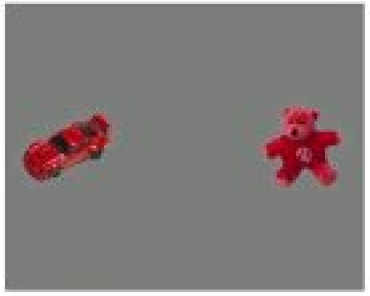
PROCEDURE

- After infants were familiarized with a structured play session, using three-dimensional variants of selected objects, they participated in a word-learning task, administered on a 17" TOBII T60 eye-tracker
- Infants were seated on their mother's lap or modified infant seat for support.
  - Mothers had to cover their eyes using blackout glasses, to reduce bias.

- For 16 trials, two objects were displayed, side-by-side, on a neutral background, and the associated name ("bear", "bunny", "car", "cookie") for one of the objects, was heard.
  - Infants also viewed 12 control trials, where a tone was heard instead of its associated name.
  - Trial type, object order, and object location was counter-balanced.
- Trials ended after 15 seconds or just after the infant looked away.

TESTING TRIALS:

- 16 total trials, where each object and generalized variant was tested once.

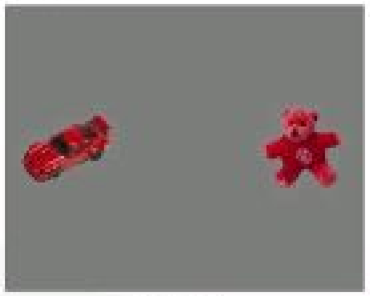


"Look at the bear!"

"Look at the bear!"

CONTROL TRIALS:

- 12 total trials, where objects and generalized variants were randomly chosen.



"beep!"

"beep!"

Results

- Eye-tracking data was synthesized into a heatmap, for each trial, using Kernel density estimation, allowing fixations and selection preferences to be easily observed.

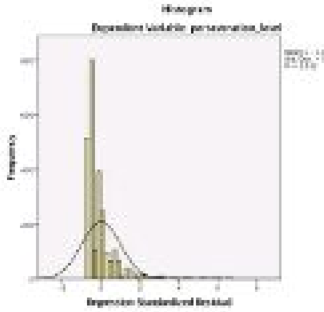
Example: Infant's fixations favor stimuli on the left side.

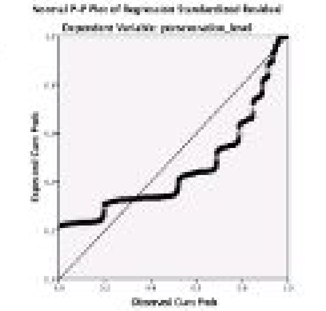
- Perseveration was measured as a level, and increased by one for every trial that a switch did not occur.
  - A correlation was found between perseveration level and age [r = .046*,n = 2631,p = .019].
  - A negative correlation was found between perseveration level and trial time [r = -.055**,n = 2632,p = .005.

Pearson Correlation		Trial Duration	Age	Accuracy
perseveration (level)	r	**-.055****	**.046***	-.003
	N	2632	2632	2632
	Sig. [p] (2-tailed)	.005	.019	.875

Regression analysis indicates that perseveration level can be predicted from generalized stimuli usage (a binary measurement) and trial duration by the following formula:

perseveration level = 0.150[gen. stimuli]-0.051[trial duration]





Conclusions

The study provides evidence for a significant relation between ***perseveration*** and ***age***, where older infants experienced slightly higher levels of perseveration. The study also discovered a highly significant relation between ***perseveration*** and ***trial duration***, where longer trials experienced significantly lower levels of perseveration. A future analysis will incorporate measurements of saliency differences between stimuli to further isolate any other interaction.

References

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