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ASSESSING 12-MONTH-OLD INFANTS' ABILITY TO ATTEND TO OCCLUSION CHANGE-DETECTION EVENTS IN A VIRTUAL SETTING

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Abstract

By 12-months, the way infants remember and represent an object is heavily affected by the way the object is named. When infants are shown different objects with different labels from the same category, they encode the distinctions among them, but not when they are given the same labels. Evidence has supported that infants' sensitivity to changes in objects is affected by how they mentally categorize the objects. But how robust are their representations of that object? To address this, the LaTourette & Waxman paradigm will be adapted by adding an occlusion task to test 12-month-old infants' representation of the distinct individuals in a virtual setting. But first, to ensure that even at only 12 months, infants are able to attend to these objects in a virtual environment, we ran a pilot experiment showing only the occlusion tasks to confirm that infants are able to look at the paradigm significantly above chance. 80 infants were shown four occlusion events in the virtual laboratory Lookit. In the occlusion event, one object was soon hidden from view with a descending screen and then reappeared as either the same or a different object. Infants' looking behavior was then coded frame-by-frame to determine whether the infant was attentive during the trials. Data supported that infants, even at 12-months, are attentive enough to this occlusion task even in a virtual setting. With the data from the pilot study in mind, the next phase of this study implemented the full paradigm: infants are shown four different objects labeled with either a same or distinct name, and then the objects are soon occluded from view, reappearing as either the same or a different object. Via the violation-of-expectations paradigm, infants tend to look longer at events they find interesting or surprising. Thus, we predict that infants who are given a distinct label – but not the same label – will be surprised at the object change trials. Data collection, still underway, is promising. If they are given distinct labels, remembering the individual object would suggest that infants' representation of the object is robust enough to be retained over an occlusion task. Further investigation comparing infants' abilities to detect the object change depending on whether they are given distinct or consistent names will provide an additional test for this claim.

Keywords: *Attention, occlusion, virtual, development, infancy.*

1. Introduction

Based on the violation-of-expectations paradigm, infants look longer at unexpected than expected events because they find them to be more interesting or surprising (Xu & Garcia, 2008). By 12 months, infants are long able to understand that even when an object is covered from view by another object, the first object still exists and should not change in identity once it reappears in sight (Baillargeon & Wang, 2002). Thus, when the occluder disappears but the object changes in featural or categorical quality, infants should be surprised because this event violates their expectations.

LaTourette & Waxman (2020) found that infants encode distinctions between objects when they are labeled with different names but encode commonalities when they are labeled with the same name. Thus, we predict that if infants are primed with distinct labels for different objects, they will be more surprised when an object changes to another during an occlusion event than if they are primed with the same labels for those different objects. However, are infants, at 12 months, able to attend enough to these occlusion change-detection tasks in a virtual setting for there to even be an effect based on labeling?

In this present study, we tested whether infants can pay attention to a virtual occlusion task. Their ability to look at the virtual event significantly above chance will signify that they are capable of paying attention and supporting future research comparing the virtual effects of labeling on their ability to detect change in occlusion tasks.

2. Method

2.1. Participants

Participants were full-term infants between 11.5-12.5 months (n = 80, *M* = 11.73 months, 44 female, 36 male) with English as their primary language and exposed to a second language less than 45% of the time all recruited from the United States. This sample size was procured based on a power analysis assuming $\alpha = 0.05$ and an effect size of $d = 0.88$, and we aimed for 99% power, yielding a target sample size of 48 infants per condition.

2.2. Procedure

The study was administered virtually via Lookit (Scott & Schulz, 2017). Parents were asked to hold the infant in their laps facing the screen, and they were also asked to keep their eyes closed or looking away from the screen to prevent accidentally affecting where the infant looks. The infants were then presented with the material on the computer screen, with their looking behavior being recorded through the webcam.

2.3. Design

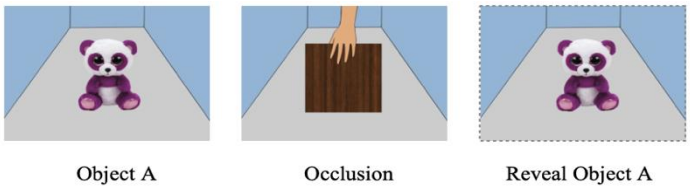
The study utilized a 2 (change outcome) x 1 (looking time) within-subjects design. All infants were shown a total of 4 stimuli videos each lasting 38 seconds, two of which were a within-change outcome and two of which were a no-change outcome. The order in which they were shown the different change outcomes was counterbalanced.

2.3.1. Within-Change Outcome. In a Within-Change Outcome Change Detection, Object A was shown for 4 seconds, and then an occluder screen came down and hid Object A from view for 5 seconds. Afterwards, the occluder screen was lifted for 1 second to reveal a different Object B. This new object was shown on the screen for 20 seconds, and then a hand came into the screen and removed the object from view.

Figure 1. Within-Change Outcome Event.

2.3.2. No-Change Outcome. In a No-Change Outcome Change Detection, Object A was shown for 4 seconds, and then an occluder screen came down and hid Object A from view for 5 seconds. Afterwards, the occluder screen was lifted for 1 second to reveal the same Object A. The object was shown on the screen for 20 seconds, and then a hand came into the screen and removed the object from view.

Figure 2. No-Change Outcome Event.



2.4. Coding

Infants' looking time throughout the trials served as the main dependent variable throughout this study. Looking behavior was coded using offline eye-tracking software Datavyu (Datavyu Team, 2014) to confirm that they were attending to each trial. Trained condition-blind coders manually aligned the participant videos to the stimuli videos then went frame-by-frame to code for whether the infant was looking on or away from the screen throughout the trials.

3. Discussion

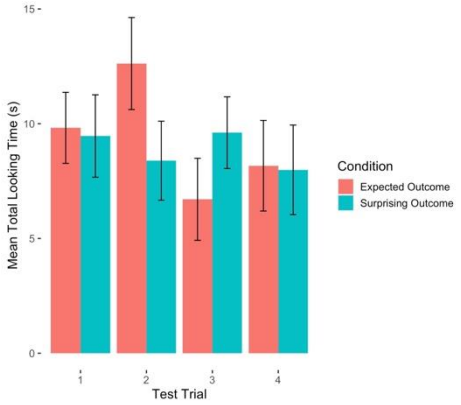
The purpose of this experiment was to test whether 12-month-old infants would be attentive enough in a virtual platform for there to be an effect once variables become manipulated for a later full study. The results showed that infants were, in fact, highly attentive when looking at the occlusion

change-detection trials even in this virtual environment. During the pilot, because there was no prior priming of the infants to the different objects, the infants' overall looking time did not significantly differ across the expected (M = 9.330, SD = 5.962, P < 0.0001) and surprising (M = 8.864, SD = 5.756, P < 0.0001) outcomes; however, looking in both conditions were significantly above chance, supporting the hypothesis that infants would still be attentive in a virtual laboratory environment.

Figure 3. Table of Looking Times for All Trials.

	Condition	Subphase	mean	sd	sem	lower	upper
1	Expected Outcome	Pair1	9.820707	5.358232	1.546788	8.273919	11.367496
2	Expected Outcome	Pair2	12.622896	6.010305	2.003435	10.619461	14.626331
3	Expected Outcome	Pair3	6.707071	5.364450	1.788150	4.918921	8.495221
4	Expected Outcome	Pair4	8.170163	7.115628	1.973520	6.196643	10.143683
5	Surprising Outcome	Pair1	9.463636	5.673281	1.794049	7.669587	11.257685
6	Surprising Outcome	Pair2	8.389277	6.204305	1.720764	6.668513	10.110042
7	Surprising Outcome	Pair3	9.610723	5.629732	1.561407	8.049316	11.172129
8	Surprising Outcome	Pair4	7.992424	5.518617	1.951126	6.041298	9.943550

Figure 4. Graph of Mean Looking Times.



The next phase of this study will implement the full LaTourrette and Waxman paradigm, adding two of the trials from this pilot study as a test to compare infants' performance in detecting change based on how the objects during the learning trials are named. Data collection, still underway, is promising.

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