

Recognition of First-Person Action in Children II: Exploring Early Knowledge of Optic Flow with Body Movement

Megan A. Taylor
Mentor: Dr. Mark Jaime
Indiana University-Purdue University, Columbus

Introduction

The ability to self-recognize with a mirror is said to emerge at 2 years of age (Amsterdam, 1972; Bischof-Kohler, 1988; Sugiura, 2015; Zahn-Waxler et al., 1992). Variations of self-recognition tasks that exclude explicit information about the *self* suggests that children have different forms of self-concepts (Nielsen, et al., 2006). A child in motion creates perceptual information about the *self* in the environment (Goldstein, 2014). Some of this information is referred to as *optic flow*, which provides the child with visual information related to speed and direction of self-generated action (Gibson, 1966).

Objective

This study examined optic flow and its role in children's conceptualization of themselves. The objective was to explore whether children have the ability to recognize their own movements with previously recorded first-person videos and if so, whether this ability enhances with age. We predicted that when a child is presented with videos, one displaying the action he/she previously performed alongside another video displaying a different action, he/she will be able to recognize his/her video because he/she will be able to remember which action they performed.

Methods

Participants, N = 51

Condition 1: Different Action, N = 20		Condition 2: Same Action, N = 31	
Age Group # 1 (2 to 4 years of age):	n = 7	Age Group # 1 (2 to 4 years of age):	n = 16
Age Group # 2 (5 to 8 years of age):	n = 13	Age Group # 2 (5 to 8 years of age):	n = 15

Apparatus

First-person actions were recorded using a lightweight chest strapped camera.
Image of child wearing Ego Action Camera (Liquid Image, LLC).



Stimuli

Pre-test Phase: Picture Self-Recognition

- (1) Still image of participant's face.
- (2) Control image of face unknown to participant but matching in sex and age.

Test Phase: First-Person Action Self-Recognition

- * Condition 1: Different Action (Figure 1)
- * Condition 2: Same Action (Figure 2 & 3)

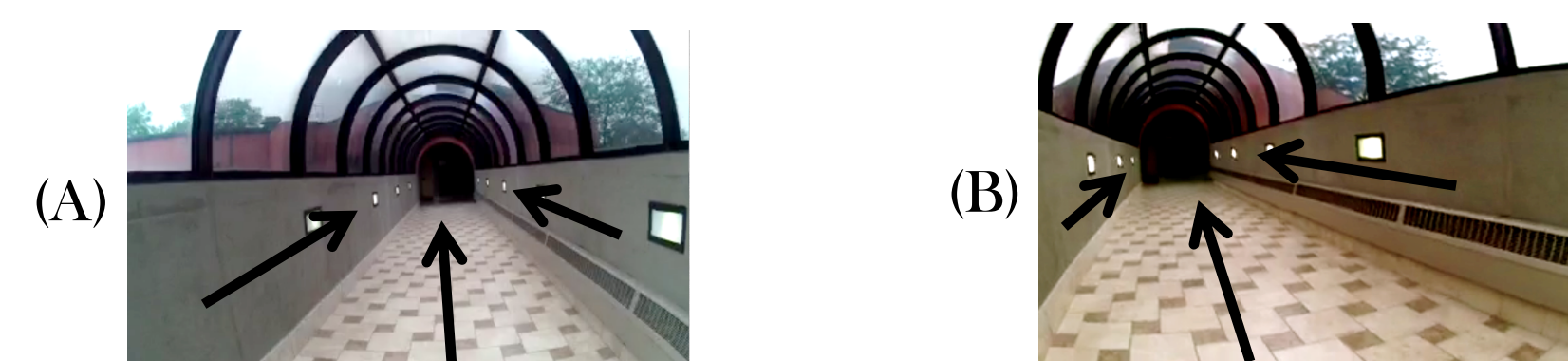
Fig. 1. Condition 1: Different Action, screenshot example of stimulus presented to participant. (A) Video created by participant. (B) Video created by another person unknown to participant (Fig. 1, 2 & 3). *Arrows indicate direction of movement (Fig. 1, 2 & 3)



Fig. 2. Condition 2: Same Action, screenshot example of a "jump" trial stimulus.



Fig. 3. Condition 2: Same Action, screenshot example of a "walk" trial stimulus.



Procedure

One digital photo was taken of participant after consent form was signed. In condition 1, participant performed either a walk or jump action which created one first-person action video. In condition 2, participant performed a walk & jump action which creates a variation of two first-person action videos.

Pre-Test Phase: Picture Self-Recognition

Participants were asked to identify with one of the two still images presented to them in 5 trials. A criterion of 80% or 3 consecutive correct self-recognitions were required before participant could continue to the test phase.

Test Phase : First-Person Action Self-Recognition

In condition # 1, different action & condition # 2: same action, participants were asked to identify with one of the two first-person videos presented to them in 10 trials.

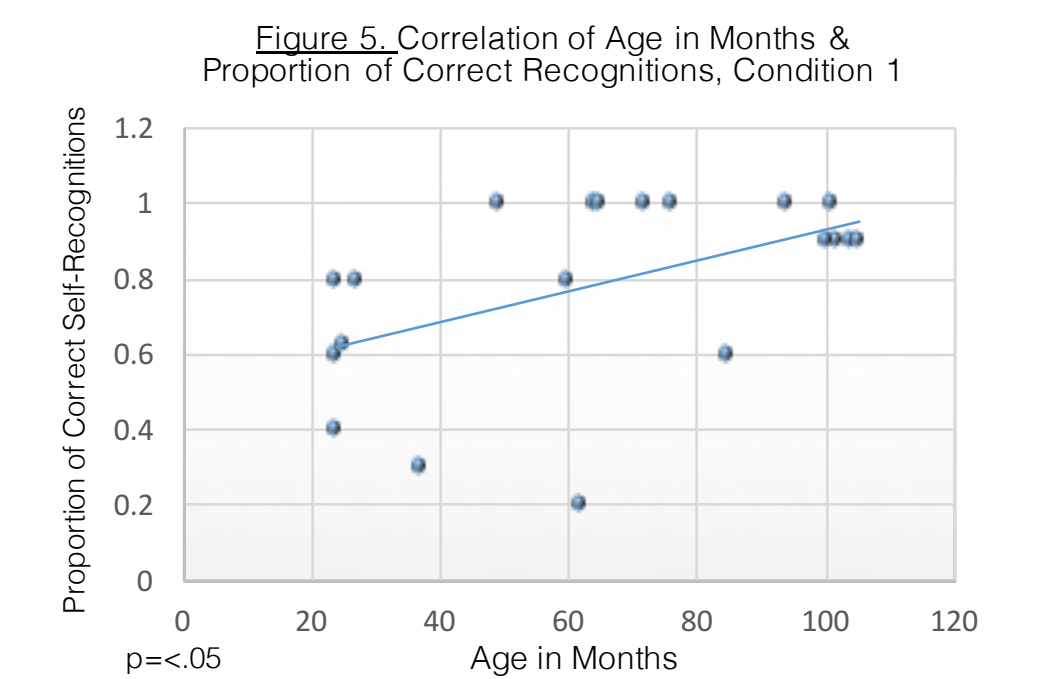
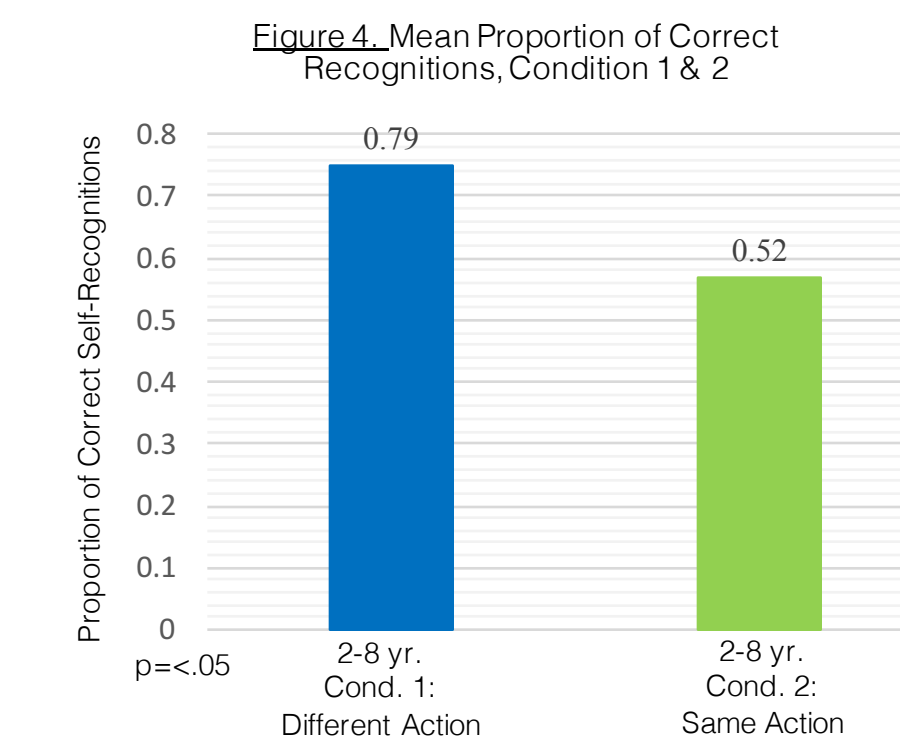
Dependent Measures

- (1) Mean proportion of correct self-recognitions in the test phase of condition 1 & 2.
- (2) Average percent of passes across age groups & conditions. Each proportion of correct self-recognitions in the test phase of condition 1 & 2 that was 60% and higher received a pass.

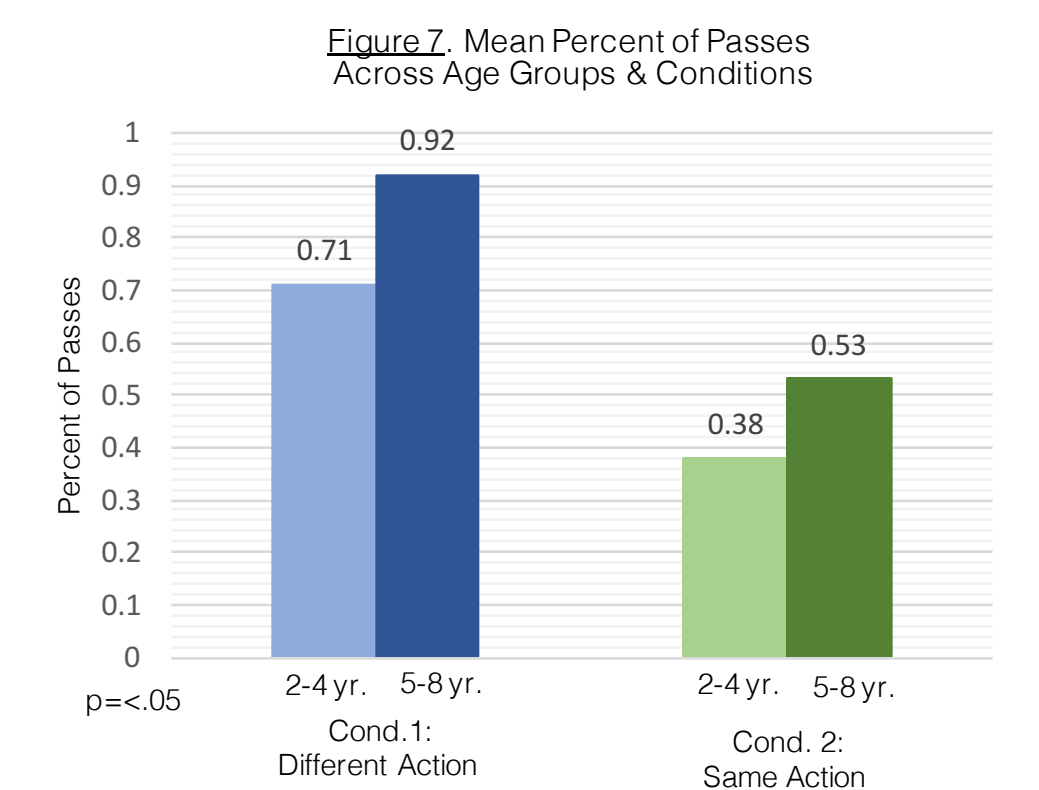
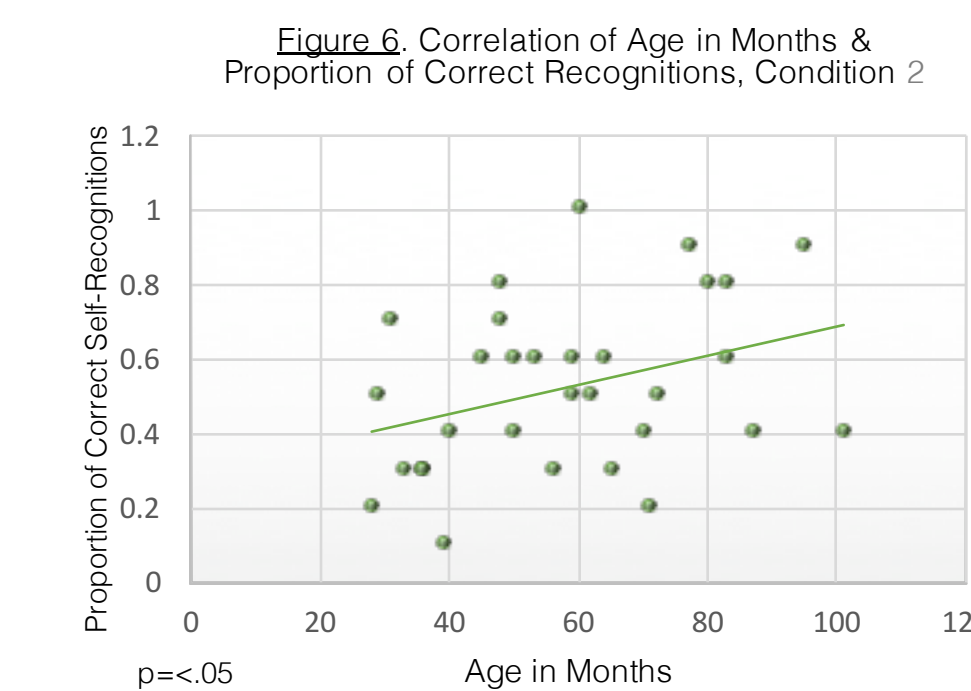
Results

A factorial ANOVA tested the effect of condition on children's (2 to 8 years of age) ability to self-recognize through previously recorded first-person action videos. Results indicated a significant main effect for condition, $F(1,49)=15.09$, $p<.001$ (fig.4). A bivariate Pearson's Correlation was then performed in order to examine the relationship between participant's age and the proportion of correct self-recognitions for both conditions.

In condition #1, different action, there was a positive correlation, $r=0.493$, $n=20$, $p=0.027$ (fig.5), between the proportion of correct self-recognitions and age.



In condition #2, same action, there was a marginally non-significant correlation, $r=0.345$, $n=31$, $p=0.058$ (fig.6), between the proportion of correct self-recognitions and age. As we hypothesized, children have a more difficult time self-recognizing with first-person action videos when presented with 2 videos displaying the same action. A 2-way ANOVA tested effects of age group (age group 1= 2 to 4 years of age; age group 2= 5 to 4 years) and condition on passes received. Results revealed that there was no effect of age group on passes received, $F(1,47)= 1.84$, $p=.181$ (fig.7) and no significant interaction between age group and condition, $F(1,47)= .035$, $p=.853$ (fig.7). However, there was a significant effect of condition on passes received, $F(1,47)= 7.28$, $p=.010$ (fig.7).



Discussion

Self-produced information is when a child makes a movement, that movement makes information, and the information makes a guide for further movement. Optic flow is self-produced information created by the visual system when a child is in motion (Goldstein, 2014). When discrete actions, such as walk or jump, are associated with the memory of optic flow children 2 to 8 years of age have the ability to self-recognize with previously recorded first-person action videos. Our results suggest that detailed memory of optic flow may decay quickly.

References

- Amsterdam, B., (1972). *Mirror self-image reactions before age two*. *Developmental Psychology*. 5(4), 297-305.
Bischof-Kohler, D., (1988). *On the connection between empathy and the ability to recognize oneself in the mirror*. *Schweizerische Zeitschrift Psychol. Rev. Suisse Psychol.* 47, 147-159.
Gibson, J.J., (1966). *The senses considered as perceptual systems*. Boston: Houghton Mifflin.
Goldstein, B.E., (2014). *Sensation and Perception, Ninth Edition*. Belmont, CA: Wadsworth, 154-159.
Neilson, M., Suddendorf, T., Slaughter, V., (2006). *Mirror Self-Recognition Beyond the face*. *Child Development*. 77(1), 176-185.
Sugiura, M., (2015). *Three faces of self-face recognition: Potential for multi-dimensional diagnostic tool*. *Neuroscience Research*. 90, 56-64.
Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., Chapman, M., (1992). *Development of concern for others*. *Dev. Psychol.* 28, 126-136.