

The Importance of Motion for the Perception of Affordances of Everyday Objects by Human Infants

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Abstract

A recent study conducted in our lab suggested that infants of 5½ months detect the affordances, or potential for action, of common objects. Infants were habituated to naturalistic displays of a woman performing an everyday activity (e.g., brushing hair, drinking) with a common object (e.g., brush or comb, glass or cup). Infants then received two types of test trials, each with a novel object used in the familiar activity, one showing the object used correctly, and the other, incorrectly (e.g., brushing hair with a comb versus a glass). Results indicated greater visual recovery to the novel object used incorrectly than correctly, suggesting that infants detected invariant relations between critical features of objects and the actions performed with them. The present study tested this "object-action relation" hypothesis by assessing the importance of motion for detecting affordances. If infants detect relations between object features and actions, then they should show no discrimination of the correct from incorrect object use when actions are eliminated. We replicated the methods of our previous study except that static images depicting the objects in the context of frozen actions were presented. As predicted, in contrast with our prior findings, infants in this static condition showed no significant visual recovery to the novel objects, and no difference in visual recovery to images of objects in the correct versus incorrect action context. Further, there was a significant interaction between condition (moving versus static) and object type (correct versus incorrect). These results demonstrate that motion is fundamental for detection of affordances.

Introduction

According to Gibson's ecological view of perceptual development, infants are active perceivers and can perceive the affordances of objects early in development (Adolph, Eppler, and Gibson, 1993; Gibson, 1969). An affordance is an object's potential for action and reflects an interaction between the organism and the environment. Prior research has demonstrated that young infants are able to perceive the affordances provided by the physical layout of surfaces in their environment, including those that support locomotion, afford falling, collision, or passing through. Little, if any research, however, has been conducted to determine whether and under what conditions infants can detect the potential for action provided by everyday objects. A prior study in our lab addressed this question. We demonstrated that 5½ month-old infants were able to perceive the affordances of common objects. Infants were habituated to a video of a woman performing an everyday activity with a common object used correctly (e.g. brushing hair with a hair brush). Results demonstrated that infants discriminated between a novel object used correctly versus a novel object used incorrectly in the familiar activity (e.g. brushing hair with a comb versus a glass). It was hypothesized that infants detected the relation between distinctive features of the objects and the nature of the actions performed with them. The present research sought to test this "object-action relation" interpretation by determining whether object motion was an important basis for infants' perception of the affordances. We assessed the ability of infants to detect affordances of these everyday objects without the benefit of dynamic actions.

Stimulus Events

Color video films used in our prior study depicted a woman performing repetitive, everyday activities with common objects. In the current study, static images taken from our dynamic displays were used. They depicted four activities (brushing hair, eating, drinking, and washing the face), each showing the woman using two objects correctly to accomplish a goal (e.g., eating with a spoon or with a fork) and two objects incorrectly to accomplish the goal (e.g., eating with a washcloth or with a sponge; see Figure 2).

Procedure

Procedures were identical to those of our prior study except static images were shown. Sixteen 5½ month-old infants were habituated in an infant-control procedure, to one of the static video displays of the woman performing an everyday activity with a common object. During habituation, the object was used correctly (e.g., brushing her hair with a brush). Following habituation, infants received four test trials showing the woman in the familiar activity with a novel object. Two trials depicted the novel object used correctly (e.g., brushing her hair with a comb), and two depicted the novel object used incorrectly (e.g., brushing her hair with a glass). Infants were randomly assigned to one of the four activity conditions, with half receiving one of the correct objects and half receiving the other correct object for habituation, (e.g., brushing hair with brush versus comb). Visual recovery to the novel object served as the primary dependent variable. It was expected that if motion was important for the detection of affordances, infants would no longer show significant visual recovery to the new object that was used incorrectly.

Results

Results supported our hypothesis and demonstrated that with still images of objects embedded in activities, infants showed no significant visual recovery on the test trials where the novel objects were used incorrectly or correctly in the familiar activities. This contrasts with results of our prior study using the moving stimuli, where infants showed significant visual recovery to the novel objects when they were used incorrectly ($p=.002$), no recovery when they were used correctly, and significantly greater visual recovery when they were used incorrectly versus correctly ($p=.001$; see Figure 1). Further, in comparing results across studies, there was a significant interaction between condition (moving versus static) and object use (correct versus incorrect; $p = .001$).

Figure 1

Mean Visual Recovery (and SD) to a novel object for trials where the object was used correctly vs. incorrectly in a moving and static display

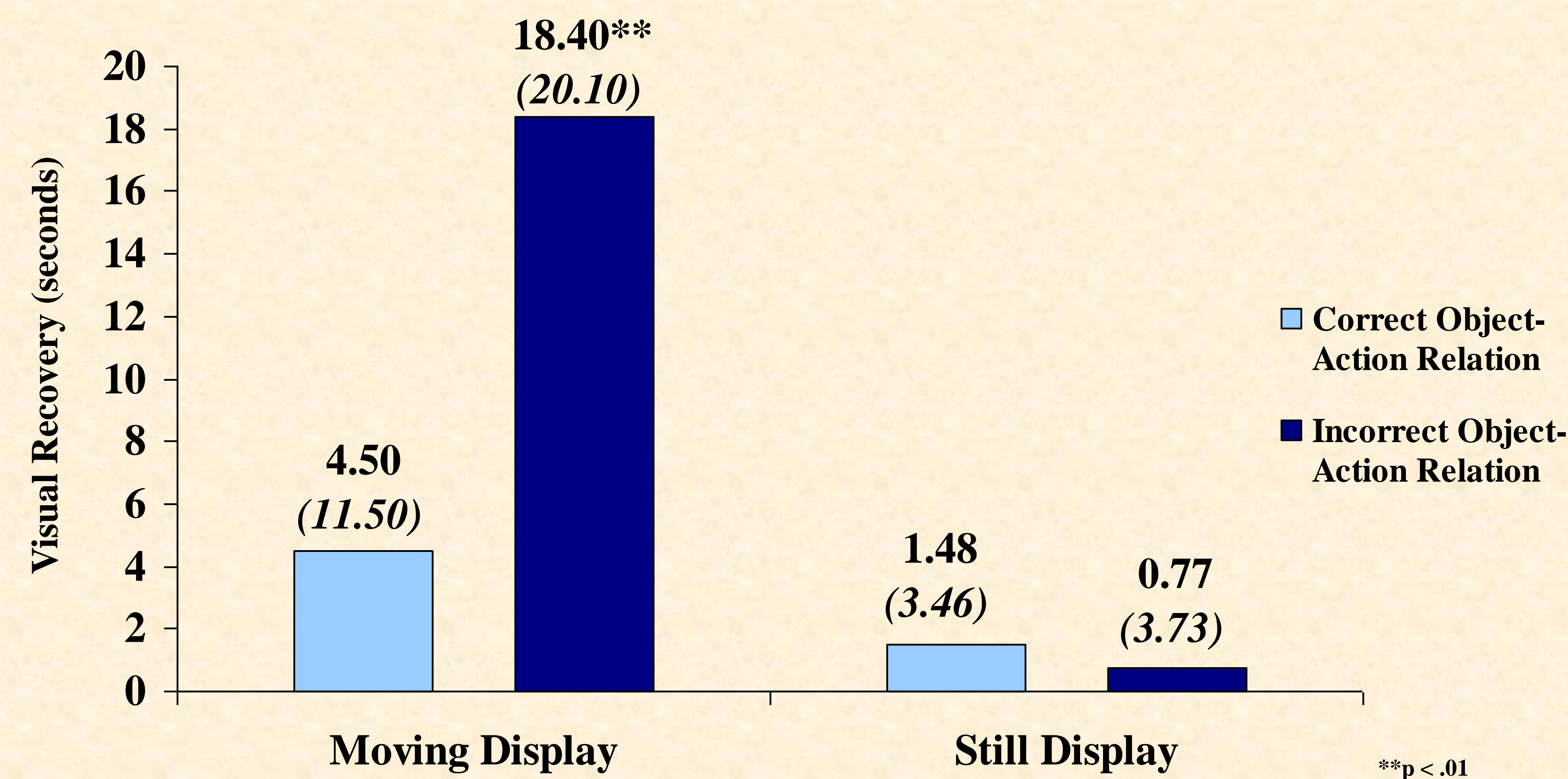
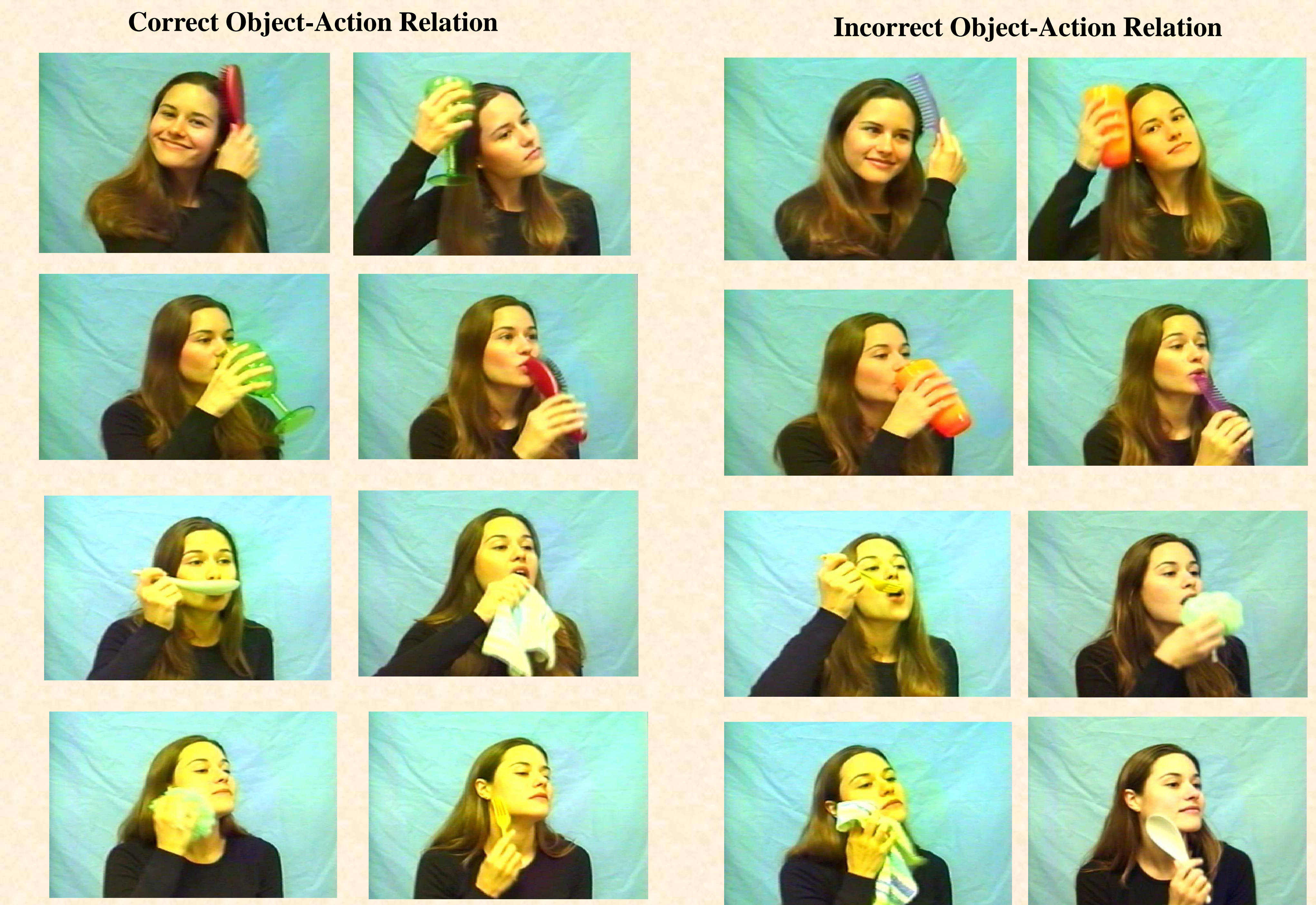


Figure 2



Conclusions

These results demonstrate that in early development, the perception of affordances of everyday objects depends on observing objects involved in dynamic activities. The findings support the interpretation of our prior study, that by 5½ months of age, infants perceive the affordances for action of everyday objects by attending to invariant relations between the critical features of the objects and the nature of the actions performed. These findings are consistent with an invariant detection view of perceptual development and demonstrate that motion is fundamental for detection of affordances during early development.

References

- Adolph, K.E., Eppler, M.A., & Gibson, E.J. (1993). Development of perception of affordances. In C. Rovee-Collier & L.P. Lipsitt (Eds.). *Advances in Infancy Research*. (Vol. 8, pp.51-98). Norwood, NJ: Ablex.
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