

# Detection of Familiar Object-Action Relations by 3½-Month-Old Infants

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## Abstract

Prior research has demonstrated that young infants are able to perceive the affordance, or the potential for action, provided by the physical layout of their environment, including surfaces that support locomotion, those that afford falling, and those that afford collision versus passing through. Little, if any research, however has been conducted to determine whether infants can detect the potential for action provided by ordinary household objects. A series of studies conducted in our lab suggested that infants of 5½ months detect the affordances of common objects (Anasagasti, Bahrck, & Batista, 2002; Anasagasti, Batista, & Bahrck, 2003). In one experiment, 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 new object used in the familiar activity, one where the object was appropriate for the action, and another where it was inappropriate (e.g., brushing hair with a comb versus a glass). Results indicated greater visual recovery to the new object when it was inappropriate than appropriate, suggesting that infants detected the objects' affordances, or the fit between the object and the action performed. One interpretation of these findings is that infants perceive the fit between the object and action by detecting invariant relations between distinctive features of objects and the actions performed (e.g. drinking with objects that are concave). To evaluate this "object-action relation" hypothesis we conducted a control condition using static images of the objects, thereby eliminating the object-action relations. 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 the objects in the appropriate versus the inappropriate action context. Results of this control condition supported our object-action relation hypothesis and demonstrate that motion is fundamental for detection of affordances in 5½-month-old infants. The present study sought to examine the emergence of infants' detection of object affordances by extending our test to younger infants of 3½ months. We replicated the previous habituation study in which infants saw moving displays of a woman performing everyday activities. Surprisingly, results demonstrated detection of the object-action relations at 3½-months of age. Visual recovery to both events with new objects was significant, and recovery to the inappropriately used object was significantly greater than to the appropriately used object ( $p < .05$ ). These findings suggest that even by the age of 3½-months, infants attend to and perceive the relation between familiar objects and the nature of actions performed with them, and detect violations of familiar object-action relations.

## Introduction

According to Gibson's ecological view of perceptual development, infants 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 research in our lab addressed this question (Anasagasti, Bahrck, & Batista, 2002; Anasagasti, Batista, & Bahrck, 2003). 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). One interpretation of these findings is that infants perceive the fit between the object and action by detecting invariant relations between distinctive features of objects and the actions performed (e.g. drinking with objects that are concave). To evaluate this "object-action relation" hypothesis we conducted a control condition using static images of the objects, thereby eliminating the object-action relations. 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 the objects in the appropriate versus the inappropriate action context. Results of this control condition supported our object-action relation hypothesis and demonstrate that motion is fundamental for detection of affordances in 5½-month-old infants. The present study sought to examine the emergence of infants' detection of object-action relation by extending our test to younger infants of 3½ months.

Figure 1



## Stimulus Events

Color video films from our prior study with 5½-month-olds of a woman performing repetitive, everyday activities with common objects. Four activities (brushing hair, eating, drinking, and washing the face) were filmed, each depicting the woman using two objects correctly to accomplish the 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 1). There were 16 different events and each object was used correctly in one activity and incorrectly in another activity.

## Procedure

Sixteen 3½-month-old infants were habituated in an infant-control procedure, to one of the 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 engaged 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 infants were sensitive to the affordances of these objects, they would show greater visual recovery to the new object that was used incorrectly than to the new object that was used correctly.

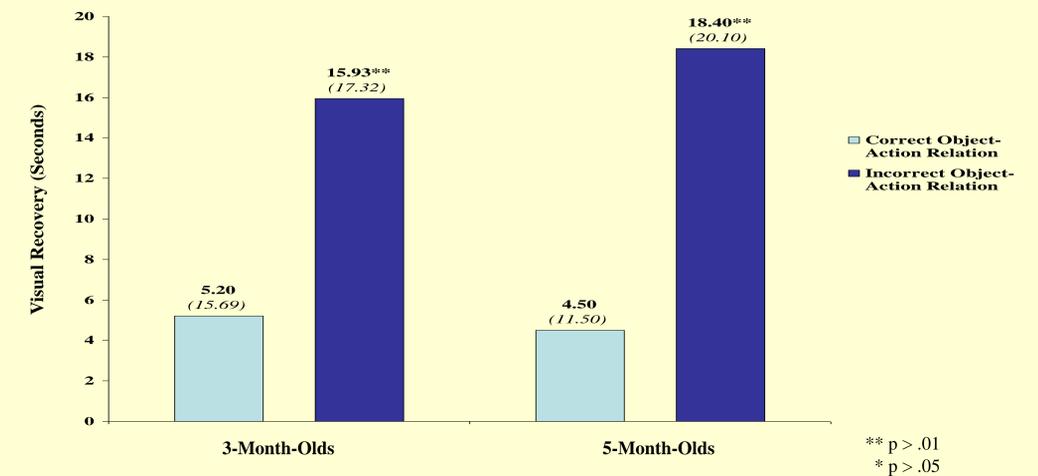
## Results

Results support our hypothesis and demonstrate that infants showed significant visual recovery on the test trials where the novel objects were used incorrectly ( $t(15) = 3.68, p = .002$ ) and no significant visual recovery on the test trials where the novel objects were used correctly ( $t(15) = 1.32, p > .1$ , see Figure 2).

## Conclusions

These findings replicate those of our 5½-month-olds and indicate that by 3½ months of age, infants perceive the affordances for action of everyday objects. These results demonstrate that even by the age of 3½ months, infants are sensitive to the way common objects are used in the context of actions and can discriminate between the correct and incorrect use of common objects. These findings are consistent with an invariant detection view of perceptual development. By the age of 3½ months, infants likely attend to the critical features of everyday objects and detect invariant relations between these features and the nature of the actions performed with the objects.

Figure 2. Mean visual recovery (and SD) to a novel object in the context of action for trials where the object was used correctly vs incorrectly



## References

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