Condition interaction was significant, $F(1,22) = 5.30$, $p < 0.05$. Planned comparisons indicated that, in the ball-box condition, the infants who saw the narrow-screen event ($M = 34.2$, $SD = 8.6$) looked reliably longer than those who saw the wide-screen event ($M = 20.4$, $SD = 8.2$), $F(1,22) = 6.76$, $p < 0.025$; in the ball-ball condition, in contrast, no reliable difference was found between the looking times of the infants who saw the narrow- ($M = 18.5$, $SD = 11.0$) or the wide-screen ($M = 22.0$, $SD = 10.3$) event, $F(1,22) = 0.43$.[6]

## Discussion

In the ball-box condition, the infants looked reliably longer when tested with the narrow as opposed to the wide screen; in the ball-ball condition, in contrast, the infants tended to look equally whether they were tested with the narrow or the wide screen. Together, these results suggest that the infants (a) were led by the available featural information to view the objects that emerged on either side of the screen as two distinct objects in the ball-box condition and as the same object in the ball-ball condition; (b) judged that the ball and box could both be occluded by the wide but not the narrow screen, whereas the ball alone could be occluded by either screen; and hence (c) were surprised in the ball-box narrow-screen condition when the ball and box were out of view at the same time.[7] These findings confirm our earlier results (Wilcox and Baillargeon, in press) and provide further evidence that 7.5-month-old infants can use featural information to individuate objects in occlusion events. The present findings also extend our previous results in that they indicate that infants are sensitive to both featural similarities and differences. Recall that the infants in our initial experiments were shown only different-objects occlusion events; the infants in Experiment 1 were shown same-object as well as different-objects events, and they interpreted both in a manner consistent with their featural content.

It might be objected that other, less interesting explanations could be offered for the results of Experiment 1. For example, one could argue that the infants in the ball-box condition looked reliably longer at the narrow- than at the wide-screen event because they found the narrow screen more attractive than the wide screen, or because they could see the objects for a longer time on the left and right of the narrow screen. These explanations are unlikely, however, for two reasons. First, the infants in the ball-ball condition did not show a reliable preference for the narrow- over the wide-screen event (recall that the analysis of the test trials did not reveal a significant main effect of screen condition). Second, data from two previous experiments with 7.5-month-olds support the interpretation offered here (Wilcox and Baillargeon, in press). The infants in one experiment were tested with a narrow and a wide screen similar to those in Experiment 1; half of the infants saw a ball and box identical to the ones used here, and half saw a smaller ball and box that could be simultaneously occluded by the narrow screen. Only the infants tested with the larger ball and box showed a reliable preference for the narrow-screen event. In another experiment, the small ball and the large box from the preceding experiment were used in conjunction with a screen that was either too narrow (narrow-screen event) or sufficiently large (wide-screen event) to occlude them simultaneously. The infants again looked reliably longer at the narrow- than at the wide-screen event. Although it would be possible to attribute the results of these various experiments to an arbitrary baseline preference for the narrow-screen event involving the large ball and large box or small ball and large box over all of the other narrow- and wide-screen events used in the experiments, such an explanation seems, at best, unparsimonious.

[6] Although the analysis of the familiarization data did not yield a significant main effect of object condition ($p = 0.25$), there was nevertheless a tendency for the ball-box infants to look longer than the ball-ball infants during the familiarization trials (see Figure 3). In light of this tendency, the test data were also subjected to an analysis of covariance (ANCOVA); the factors were the same as in the ANOVA, and the covariate was the infants' mean familiarization looking times. The purpose of this analysis was to examine whether the same test results would obtain after adjusting for the differences in looking times between the infants in the ball-box and ball-ball conditions. The results of the ANCOVA replicated those of the ANOVA: the Object Condition × Screen Condition interaction was significant, $F(1,21) = 4.54$, $p < 0.05$, and planned comparisons confirmed that the ball-box infants looked reliably longer at the narrow- than at the wide-screen event, $F(1,21) = 6.59$, $p < 0.025$, whereas the ball-ball infants looked about equally at the events, $F(1,21) = 0.23$.

[7] It might be suggested that the infants in the ball-box narrow-screen condition were surprised for a different reason than the one just outlined: perhaps the infants, upon realizing that the ball and box could not stand side by side behind the narrow screen, concluded that the objects abruptly changed course when out of view so as to rest one in front of the other, between the screen and the apparatus's back wall. Although this alternative interpretation is logically possible, it is less parsimonious than the one given in the text. Both interpretations assume that the infants in the narrow-box condition recognized that (a) the ball and box were distinct objects and (b) the two objects could not be fully occluded when standing side by side behind the narrow screen. However, the alternative interpretation makes a further assumption, which is that the infants generated an explanation for the violation they observed – an abrupt trajectory change behind the screen – which in turn led to their prolonged looking.

## Experiment 2

Experiment 2 examined whether younger, 4.5-month-old infants would succeed when tested with the same task as in Experiment 1. There were two reasons to expect positive results in this experiment. First, recent findings by Needham and her colleagues (e.g., Needham, in press; Needham and Baillargeon, 1997; Needham, Baillargeon, and Kaufman, 1997) indicate that, contrary to earlier claims (e.g., Kellman and Spelke, 1983; Spelke, 1990; Spelke, Breinlinger, Jacobson, and Phillips, 1993), infants as young as 4.5 months of age use featural information to organize stationary adjacent and partly occluded displays. In the experiments in which infants were presented with a partly occluded display, similar or dissimilar surfaces were visible on either side of a screen; only featural information could be used to determine whether the surfaces belonged to the same object or to distinct objects. The infants' interpretation of the display was assessed by means of an event-monitoring task. To illustrate, in one experiment, 4.5-month-olds received familiarization trials in which they saw a stationary dissimilar partly occluded display (Needham, in press). This display consisted of a yellow cylinder and a tall blue box that protruded from behind the left and right edges, respectively, of a tall narrow screen. Next, the infants received test trials in which a hand grasped the cylinder and moved it back and forth toward and away from the screen. For half of the infants (move-together condition), the box moved with the cylinder; for the other infants (move-apart condition), the box remained stationary. The infants in the move-together condition looked reliably longer than did those in the move-apart condition. These and control results indicated that the infants (a) were led by the featural differences between the cylinder and box to view them as two distinct objects and (b) expected the cylinder to move alone and were surprised that it did not. These and related findings (see Needham *et al.*, 1997, for a review), suggest that, when tested with an event-monitoring task, infants as young as 4.5 months of age give evidence that they can use featural information to judge how many objects are included in a similar or a dissimilar partly occluded display.

The evidence just reviewed suggested that the 4.5-month-olds in Experiment 2 might be able to use the available featural information to individuate the objects in the ball-ball and ball-box events. But would the infants be able to give evidence of this ability? Consider, for example, the infants in the ball-box narrow-screen condition, who had to compare the combined width of the ball and box to that of the narrow screen. How likely were the infants to succeed at this task? The second reason to expect positive results in Experiment 2 had to do with this question. There have been several reports over the past few years of infants aged 3.5 months and older attending to objects' width or height when reasoning about various physical events (e.g., Aguiar and Baillargeon, in press; Baillargeon, 1987, 1991; Baillargeon and DeVos, 1991; Baillargeon and Graber, 1987; Sitskoorn and Smitsman, 1995; Spelke *et al.*, 1992). Of particular relevance here is the experiment by Spelke *et al.* (1992) that was described in the introduction; recall that 4-month-old infants successfully compared the width of a ball to that of a gap to determine whether the one could pass through the other behind a screen. In light of such results, it seemed possible that the 4.5-month-olds in Experiment 2 would also succeed at the width comparison task they were given.

## Method

### *Participants*

Participants were 28 healthy fullterm infants, 14 male and 14 female ($M = 4$ months, 23 days; range = 4 months, 3 days to 5 months, 15 days). Seven additional infants were tested but eliminated; they failed to complete six valid test trials, one because of procedural problems, two because of fussiness, and four because the primary observer was unable to follow the direction of the infant's gaze. Seven infants were randomly assigned to each of the four experimental conditions: ball-box narrow-screen ($M = 4$ months, 22 days); ball-box wide-screen ($M = 4$ months, 26 days); ball-ball narrow-screen ($M = 4$ months, 22 days); and ball-ball wide-screen ($M = 4$ months, 23 days).

### *Apparatus and stimuli*

The apparatus and stimuli used in Experiment 2 were similar to those in Experiment 1, except that a different system was used to change the objects behind the screen. As was noted earlier, this new system made it possible to present the infants in the ball-box narrow-screen condition with a 5-cm instead of a 1-cm violation. The modifications introduced were as follows. First, a new box was used that was closed on all sides and was 10.25 cm square, rather than 11.75 cm square; thus, the box was now of the same width as the ball. Second, the ball and box each rested on a Plexiglas base 10 cm wide, 6.5 cm deep, and 0.3 cm thick. Each base had a handle 16 cm long that protruded through an opening 3.25 cm high between the back wall and floor of the apparatus; the opening was partly concealed by cream-colored fringe. By moving the Plexiglas handle, an experimenter could move the ball and box left and right along the platform. Third, two identical balls were used in the ball-ball condition; one appeared to the left and one to the right of the screen. Fourth, embedded in the center of the platform was a metal bi-level composed of an upper and a lower shelf 16 cm apart; each shelf was 12.7 cm wide, 13 cm deep, and 0.2 cm thick. The upper shelf was level with the top of the platform and the bottom shelf extended underneath the platform. The bi-level could be lifted by means of a handle 19 cm long that protruded through an opening 19.5 cm high and 7 cm wide in the apparatus's back wall; when the bi-level was lifted, its lower shelf became level with the platform. Finally, the screen used in the familiarization trials was 30 cm wide and 41 cm high; it was made of yellow cardboard and covered with clear contact paper. The wide test screen was 30 cm wide and 33 cm high and the narrow test screen was 15.5 cm wide and 41 cm high; the wide test screen thus differed from the familiarization screen in height and the narrow test screen in width. Both test screens were made of blue cardboard, were decorated with small gold and silver stars, and were covered with clear contact paper. The screens were mounted on a wooden stand that was centered in front of the platform.

### *Events*

#### Ball-box narrow-screen condition

Familiarization event At the start of each familiarization trial, the ball sat with its center 6 cm from the left end of the platform. The familiarization screen stood upright and centered in front of the platform, and the box sat on the lower shelf of the bi-level.

Each familiarization trial began with a brief pretrial during which the observers monitored the infant's looking at the ball until the computer signaled that the infant had looked for 1 cumulative second. After a 1-s pause, the ball moved to the right until it reached the upper shelf of the bi-level behind the screen (2 s). Next, the bi-level was lifted until its lower shelf was level with the platform (1 s); the box then emerged from behind the screen and moved to the right until its center was 6 cm from the right end of the platform (2 s). After a 1-s pause, the box returned to the bi-level (2 s) which was lowered (1 s) until its top shelf was once again level with the platform; the ball then returned to its starting position at the left end of the platform (2 s). The ball and box moved at a speed of about 12 cm per s. The 12-s event sequence just described was repeated continuously until the trial ended.

Test event The test event was identical to the familiarization event except that the familiarization screen was replaced with the narrow test screen.

#### Ball-box wide-screen condition

The familiarization and test events in the ball-box wide-screen condition were identical to those in the ball-box narrow-screen condition except that the narrow test screen was replaced with the wide test screen.

#### Ball-ball narrow- and wide-screen conditions

The familiarization and test events in the ball-ball narrow- and wide-screen conditions were identical to those in the ball-box narrow- and wide-screen conditions, respectively, with one exception: the box was replaced with a second, identical ball.

### *Procedure*

The procedure used in Experiment 2 was identical to that in Experiment 1, with two exceptions. First, the infants saw six, rather than three, successive test trials. Pilot data suggested that the infants enjoyed the task and rarely became fussy, making it possible to give them more test trials (in our earlier research with infants aged 7.5 to 11.5 months, infants tended to become less attentive as the experiment progressed and so were typically given fewer trials; see Wilcox and Baillargeon, in press). Second, because each event cycle now lasted 12 s, instead of 10 s, the criteria used for terminating the familiarization and test trials were modified slightly. Each trial now ended when the infant either (a) looked away for 2 consecutive seconds after having looked at the event for at least 6 cumulative s (beginning at the end of the pretrial) or (b) looked for 60 cumulative seconds without looking away for 2 consecutive seconds.

Interobserver agreement averaged 90% per test trial per infant. Preliminary analysis of the infants' mean looking times during the test trials did not yield a significant Sex × Object Condition (ball-box or ball-ball) × Screen Condition (narrow or wide) interaction, $F(1, 20) = 0.77$; the data were therefore collapsed across sex in subsequent analyses.

## Results

*Familiarization trials*

The infants' looking times during the six familiarization trials (see Figure 4) were averaged and analyzed as in Experiment 1. The main effects of object condition, $F(1, 24) = 3.41$, and screen condition, $F(1, 24) = 1.22$, were not significant, both $p$'s $> 0.05$. In addition, the Object Condition × Screen Condition interaction was not significant, $F(1, 24) = 0.01$, indicating that the infants in the four different conditions did not differ reliably in their mean looking times during the familiarization trials (ball-box narrow-screen, $M = 37.1$, $SD = 9.3$; ball-box wide-screen, $M = 42.1$, $SD = 9.1$; ball-ball narrow-screen, $M = 27.8$, $SD = 15.1$; ball-ball wide-screen, $M = 33.5$, $SD = 16.1$).

*Test trials*

The infants' mean looking times during the six test trials (see Figure 4) were averaged and analyzed in the same fashion as the familiarization trials. The main effects of object condition, $F(1, 24) = 3.33$, and screen condition, $F(1, 24) = 1.38$, were not significant, both $p$'s $> 0.05$. However, the analysis yielded a significant Object Condition × Screen Condition interaction, $F(1, 24) = 4.49$, $p < 0.05$. Planned comparisons indicated that, in the ball-box condition, the infants who saw the narrow-screen event ($M = 40.2$, $SD = 10.5$) looked reliably longer than those who saw the wide-screen event ($M = 25.8$, $SD = 13.7$), $F(1, 24) = 5.43$, $p < 0.05$; in the ball-ball condition, in contrast, no reliable difference was found between the looking times of the infants who saw the narrow- ($M = 22.9$, $SD = 9.2$) or the wide-screen ($M = 27.1$, $SD = 12.5$) event, $F(1, 24) = 0.44$.[8]

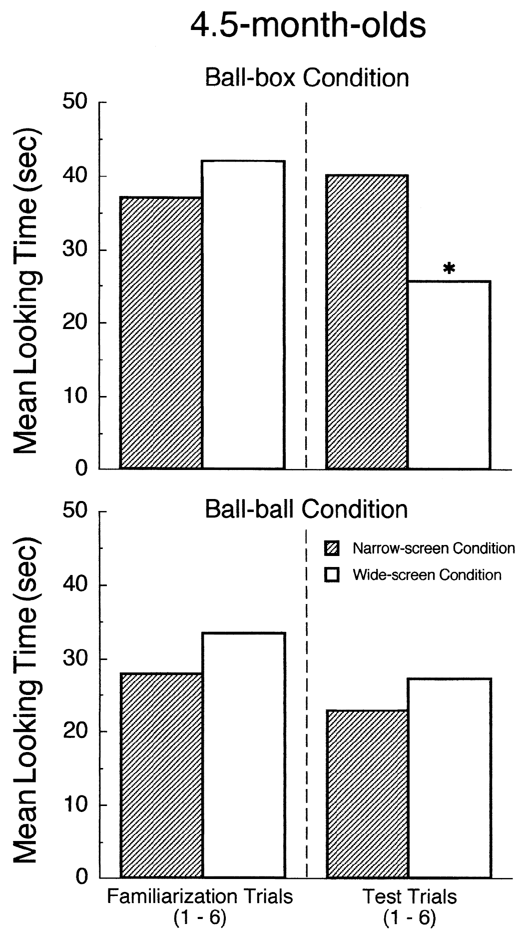


**Figure 4.** *Mean looking times of the infants in Experiment 2 during the familiarization and test trials.*

## Discussion

The 4.5-month-olds in Experiment 2 produced the same test looking pattern as the 7.5-month-olds in Experiment 1. In the ball-box condition, the infants looked reliably longer when tested with the narrow as opposed to the wide screen; in the ball-ball condition, in contrast, the infants tended to look equally whether they were tested with the narrow or the wide screen. These results suggest that the ball-box infants (a) were led by the featural differences between the ball and box to view them as distinct objects; (b) realized that the combined width of the ball and box relative to that of the screen determined whether the two objects could be simultaneously occluded behind the screen; (c) judged that the ball and box could both be occluded by the wide but not the narrow screen; and hence (d) were surprised in the narrow-screen event when this last judgment was violated. On the other hand, the ball-ball infants (a) assumed, based on the featural similarities of the balls that appeared on either side of the screen, that they were one and the same ball; (b) recognized that the ball could be occluded by either the narrow or the wide screen; and

[8] Although the analysis of the familiarization data did not yield a significant main effect of object condition ($p = 0.077$), there was nevertheless a tendency for the ball-box infants to look longer than the ball-ball infants during the familiarization trials (see Figure 4). In light of this tendency, the test data were subjected, as in Experiment 1, to an ANCOVA using the infants' mean familiarization looking times as the covariate. The results of the ANCOVA replicated those of the ANOVA: the Object Condition × Screen Condition interaction was again significant, $F(1, 23) = 4.46$, $p < 0.05$, and planned comparisons confirmed that the ball-box infants looked reliably longer at the narrow- than at the wide-screen event, $F(1, 23) = 6.14$, $p < 0.025$, whereas the ball-ball infants looked about equally at the events, $F(1, 23) = 0.23$.

hence (c) found neither the narrow- nor the wide-screen event surprising.

These results indicate that, by 4.5 months of age, infants are sensitive to featural differences and similarities between objects and use this information to individuate objects in occlusion events. As such, the present results confirm previous positive findings obtained with different-objects (Wilcox and Baillargeon, in press) and same-object (Aguiar and Baillargeon, 1997a, 1997b; Baillargeon and DeVos, 1991; Baillargeon and Graber, 1987) occlusion events. The present results also extend these previous reports by making clear that infants' responses to same-object occlusion events are based on a comparison of the featural properties, rather than the motions, of the objects that emerge on either side of the occluder. The 4.5-month-olds in Experiment 2 responded differently when the object that emerged to the right of the screen was a ball as opposed to a box, even though the ball and box underwent similar motions.

The results of Experiment 2 are also consistent with those obtained by Needham and her colleagues in object segregation tasks (e.g., Needham, in press; Needham *et al.*, 1997). Recall that 4.5-month-old infants were found to organize partly occluded displays in accordance with their featural content, grouping together similar but not dissimilar surfaces.

Finally, the present results are consistent with reports in the physical reasoning literature that infants aged 3.5 months and older can use information about the width or height of objects to predict the outcome of events involving the objects (e.g., Baillargeon, 1991; Baillargeon and DeVos, 1991; Baillargeon and Graber, 1987; Sitskoorn and Smitsman, 1995; Spelke *et al.*, 1992). The present findings also extend these prior results in two ways. First, they indicate that, by 4.5 months of age, infants recognize that the width of an object relative to that of an occluder determines whether the object will be fully or only partly concealed when behind the occluder. Second, the present research reveals that, when reasoning about an occlusion event, 4.5-month-olds can take into account not only the width of an individual object, but also about the combined width of two distinct objects: the infants in the ball-box condition in Experiment 2 appreciated that, although the ball or box *alone* could be fully occluded by the narrow screen, the two objects *together* could not.

## Conclusion

The present research indicates that 7.5- and 4.5-month-old infants can use featural information to determine how many objects are involved in an occlusion event. When the objects that emerge on either side of a screen possess similar featural properties, infants assume that a single object is involved in the event (even though two identical objects may actually be used to produce the event, as in Experiment 2). In contrast, when the objects that emerge on either side of the screen differ in shape, color, and pattern, infants conclude that two distinct objects are present. These results confirm positive findings that have been obtained in similar tasks with same-object (Aguiar and Baillargeon, 1997a, 1997b; Baillargeon and DeVos, 1991; Baillargeon and Graber, 1987) and different-objects (Wilcox and Baillargeon, in press) occlusion events. The present results are also consistent with recent reports by Needham and her colleagues (e.g., Needham, in press; Needham *et al.*, 1997) that 4.5-month-old infants attend to featural similarities and differences when segregating stationary adjacent and partly occluded displays. Finally, the present findings bear on previous research on infants' expectations about occlusion events. As was noted in the introduction, a typical approach in many investigations has been to first present infants with one or more objects in an otherwise empty apparatus, and then occlude the objects (e.g., Baillargeon, 1986; Baillargeon *et al.*, 1985, 1990; Peterson, 1997; Spelke *et al.*, 1992; Wilcox *et al.*, 1996). The present results extend this research by showing that infants aged 4.5 months and older can represent and reason about occlusion events even when they are *not* given unambiguous spatiotemporal information about the number of objects in the events and must use featural information to individuate the objects. The infants in Experiments 1 and 2 succeeded in both (a) determining how many objects were present in each test event, based on the available featural information, and (b) judging whether the object(s) could be fully occluded when behind the screen.

At the same time that it confirms and extends positive reports on young infants' ability to use featural information to individuate objects, the present research also makes even more marked the discrepancy between these positive findings and the negative results reported by Spelke *et al.* (1995) and Xu and Carey (1996; see also Leslie *et al.*, 1996, and Wilcox and Baillargeon, in press). Recall that Spelke *et al.* found that 4-month-old infants made no assumption, when shown a same-object occlusion event, as to the number of objects involved in the event. Similarly, Xu and Carey reported that 10-month-old infants were unable to determine, when shown a different-objects occlusion event, whether the event involved one or two objects. How can we account for these discrepant results?

As was discussed in the introduction, we believe that the most likely explanation for this discrepancy has to do with the nature of the tasks used to assess infants' capacity for individuation. All of the tasks that have produced negative results (e.g., Leslie *et al.*, 1996; Spelke *et al.*, 1995; Wilcox and Baillargeon, in press; Xu and Carey, 1996) have made use of *event-mapping* tasks: infants are shown a same-object or a different-objects occlusion event, and then the screen is removed to reveal a test display composed of one or two objects. In contrast, all of the tasks that have produced positive findings (Aguiar and Baillargeon, 1997a, b; Baillargeon and DeVos, 1991; Baillargeon and Graber, 1987; Wilcox and Baillargeon, in press) have used *event-monitoring* tasks: infants are again shown a same-object or a different-objects occlusion event, but the screen is never removed; infants simply monitor the event as it unfolds.

Why are event-mapping tasks more difficult for infants than are event-monitoring tasks? Our explanation for this difference (see Wilcox and Baillargeon, in press, for a fuller account) rests on four assumptions. The first is that, when shown an occlusion event, infants categorize the physical situation before them as one of occlusion. When the screen is later removed, infants assign the situation to a novel category which, for lack of a better term, we will describe as a no-occlusion situation. This re-categorization in turn compels infants to set up a new representation. What is being argued, then, is that instead of viewing the screen's removal simply as a change within an ongoing situation, infants are prompted by the screen's removal to initiate a new and distinct representation.

Our second assumption is that, just as infants are motivated to monitor changes *within* any one physical situation, to determine whether they are consistent with their physical knowledge, infants also seek to keep track of changes *across* situations, to make sense of the world as it unfolds around them. It should be obvious that most of our experimental tools would fail if infants were content to observe the world without reacting to it and evaluating, comparing, and learning from past and present situations.

Our third assumption is that the attempt to link up two successive representations requires, at the very least, mapping or aligning the objects involved in the two representations. Thus, after setting up the new representation, infants attempt to retrieve information about the objects in the previous representation, to align them with those in the present representation.

Our fourth and last assumption is that infants have little difficulty retrieving object information from a prior representation when this information was based on unambiguous spatiotemporal information (e.g., the infants saw the ball and box simultaneously prior to the test trials; see Wilcox and Baillargeon, in press, and Xu and Carey, 1996). When the object information was based on featural information, however, a more complex process seems to be required: infants apparently attempt to retrieve and scan the previous event to determine what objects were involved in it.

The explanation just outlined makes several testable predictions. One is that infants might succeed at an event-mapping task if the occlusion situation were made extremely simple and brief so as to reduce the burden associated with retrieving and scanning the situation. We have recently obtained data confirming this prediction (Wilcox and Baillargeon, in press). In one experiment, 9-month-old infants received a single test trial in which they saw the following event sequence: a box moved a short distance to the right until it disappeared behind the left edge of a wide screen; next, a ball emerged from behind the screen's right edge and moved a short distance to the right; finally, the screen was lowered to the apparatus floor to reveal an empty area (only the ball was visible to the right of the screen). Infants in control conditions saw the same test event except that (a) a ball was shown on either side of the screen or (b) when the screen was lowered, a half-screen was revealed that was sufficiently tall to hide the box. The infants in the experimental condition looked reliably longer than those in the control conditions, suggesting that they expected the box to be revealed when the screen was removed and were surprised when this expectation was violated. Further data indicated that the positive result obtained in this event-mapping task was extremely fragile. When the event sequence shown to the experimental infants was made slightly longer – the box sat behind the screen at the start of the trial and first moved to the left, into view, before proceeding to the right as before – the infants no longer responded with prolonged looking. Adding a single reversal to the box's motion at the start of the event sequence was thus sufficient to confound the infants: they no longer succeeded in judging whether the objects involved in the occlusion situation correctly mapped onto those revealed in the no-occlusion situation.

We are currently testing additional predictions suggested by our explanation for infants' difficulties with tasks involving mappings based on featural information. For example, we are exploring whether the same patterns of results arise when infants are presented with a different pair of physical situations, such as an occlusion and a containment situation. Whatever the outcome of these experiments and the final status of our explanation, however, two broad conclusions have been achieved. First, the view that infants' difficulties with event-mapping tasks stem from an inability to use featural information to individuate objects (e.g., Spelke *et al.*, 1995; Xu and Carey, 1996) seems highly unlikely. The 7.5- and 4.5-month-olds in the present experiments could not have detected the violation embedded in the ball-box narrow-screen event if they had not realized that the ball and box were two distinct objects. Second, the present research and the explanatory framework within which we interpret it underscore the need for a theory that spells out precisely how infants form and use representations of physical events. Within the field of infancy research, several debates have cropped up over the past few years as to the nature and content of infants' representations (e.g., Haith, 1997; Munakata, 1997; Thelen and Smith, 1994). Regardless of their particular perspectives, however, all participants in these debates are coming to the realization that developmental science will not be able to fully explain infants' responses across cognitive tasks and across ages without an explicit account of how infants form and manipulate representations.

## Acknowledgement

This research was supported by a grant from the Research Enhancement Program at the University of Texas at Arlington to the first author and a grant from the National Institute of Child Health and Human Development (HD-21104) to the second author. We would like to thank Terry Barnhardt and Jerry DeJong for helpful comments; Amanda Rose for her help with the statistical analyses; and Andrea Aguiar, Laura Brueckner, Cathy Chapa, Lisa Kaufman, Ellen McCrady, Amy Putthof, Gina Ramirez, Helen Raschke, and the undergraduate assistants of the Infant Cognition Laboratories at the University of Texas at Arlington and the University of Illinois at Urbana-Champaign for their help with data collection. We would also like to thank the parents who kindly agreed to have their infants participate in the research.

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Received 30 July 1997
Accepted 10 October 1997