Social Engagement Leads Infants to Represent People as Individuals

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Abstract

How do infants come to represent people's identities? In two experiments (N = 86), we investigated 7- to 10-month-old infants' abilities to individuate (i) one of their own caregivers and an unfamiliar adult and (ii) people who are either socially engaged or disengaged. Although classic research has found that infants at these ages do not individuate objects (e.g., a duck and a ball), the infants in our experiments individuated people, so long as those people were socially engaging. These findings suggest that infants represent people as individual entities before they do objects, which may support the formation of children's relationships or their evaluations of others.

Keywords: cognitive development; social relationships; social engagement

Introduction

To make sense of social interactions, one must track peoples' identities. For example, imagine two friends, seated next to each other at a cafe. Some parts of this scene could be replaced (e.g., whether someone drinks tea or coffee), and the two friends would interact similarly. But if one of the friends was swapped out for a stranger or their boss, the two people's behavior would likely be different. The present experiments ask when and how infants come to individuate people: a skill that is required to understand social relationships and evaluate others (Woo et al., 2022).

Representing Objects and People as Distinct Kinds

A large body of research has examined infants' ability to track objects based on their kind (e.g. 'duck' and 'ball'; Croteau et al., 2024). In classic research, Xu and Carey (1996) presented 10- and 12-month-old infants with either one or two objects (e.g., a cup and a book), and they found that at baseline, infants looked longer when there were two objects than when there was just one. Then, in a test phase, two other distinct objects (e.g., a ball and a duck) emerged from behind an occluder, one at a time. Then, the occluder was removed, revealing either the two objects (as an adult would expect) or just one. Twelve-month-old infants looked longer when there was just one object compared to when there were two objects, suggesting they were surprised that one of the objects was no longer present. However, 10-month-old infants looked for equal amounts of time at the two outcomes, suggesting they were not surprised when only one object remained. Xu and Carey hypothesized that the 10-month-olds failed to represent and remember two distinct objects, because they did not recognize that the two objects were different kinds; when the second object appeared, the 10-month-old infants did not realize it was a different object than the one they had seen before.

Subsequent studies tested this hypothesis, revealing additional circumstances under which younger infants individuate objects. First, when two objects were labeled with different words by an experimenter (e.g., "a duck" and "a ball"), 9-month-old infants expected two objects. However, when the two objects were labeled with the same word (e.g., "toy" and "toy"), 9-month-olds did not expect two objects. Second, when the objects were a toy dog head and a doll head, 10-month-olds expected two objects (Bonatti et al., 2002). These studies suggest that younger infants individuate objects better when they are given evidence or recognize that two objects are different kinds (see Croteau et al., 2024). In the first case, distinct words may give infants evidence that objects are distinct kinds. In the second case, infants may already see people-like entities as distinct from toys and therefore individuate them.

In the present studies, we ask: Do infants individuate people? Tracking people is essential in forming relationships and evaluating potential social partners. Indeed, infants as young as 6 months look longer at unfamiliar faces compared to familiar faces (e.g., Pascalis et al., 2002); recognize their mother's face, scent and voice from birth (Bushnell, 2001; DeCasper & Fifer, 1980; Field et al., 1984; Porter & Winberg, 1999); and show selective neural responses to faces compared to other categories such as scenes or objects (Deen et al., 2017; Kosakowski et al., 2022). On the other hand, detecting familiar individuals, or distinguishing faces from other categories, may not be direct evidence for individuation; it does not require tracking entities across time and space. Moreover, tracking people may be more difficult than tracking objects, such as a ball and duck, because people have more in common perceptually. In line with these considerations, 10-month-old infants do not individuate doll heads that differ in hair and skin color (Bonatti et al., 2002).

Studies have provided mixed evidence for infants' abilities to individuate people. In one study, 11- to 27-month-old infants and toddlers individuated photographs depicting distinct faces of the same gender, regardless of whether they differed in race (Pickron et al., 2024). However, in other work, 12-month-old infants failed to individuate photographs of faces that differed in gender (i.e., individuating a man and a woman), while 24-month-old toddlers succeeded. Notably,

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in these studies infants were shown still photographs of people, which differs from typical interactions that infants have with people. In a more recent study, 1-year-old infants instead watched videos of people who either did or did not share their food and color preferences (Fogiel et al. 2023). Here, infants individuated people who shared the infants' preferences, not those who had different preferences or no preferences. Together, these findings provide mixed evidence as to when and whether infants individuate people. We hypothesize that social relevance may impact their ability to individuate people.

Research Overview

The current experiments test the hypothesis that infants (7 to 10 months old) individuate people who are socially relevant to them at ages at which they fail to individuate objects. In Experiment 1, we examined whether infants individuate their caregivers, who they depend on for survival and much of their early learning, as distinct from unfamiliar adults (Corriveau et al., 2009; Hrdy, 2011; Thomas et al., 2025; van Rooijen et al., 2019). Indeed, as newborns, infants already recognize and prefer their mother's face (Bushnell, 2001; Field et al., 1984), voice (DeCasper & Fifer, 1980), and smell (Porter & Winberg, 1999). Moreover, by 6 months, infants look more at photographs of their mother, relative to other female relatives (e.g., their grandma or aunt), when they hear words like "mommy" (Campbell & Hall, 2022). And by 12 months, infants distinguish the social interactions of their parents from those of strangers (Thomas et al., 2022). Thus, if infants individuate people based on their social relevance, their caregivers would be good candidates. However, it is possible that infants *recognize* their caregivers' features without tracking them in time and space. If so, we should find that infants fail to individuate people in this experiment.

In Experiment 2, we compared infants' individuation of socially engaging people (smiling, looking at the infants, and speaking in an upbeat tone) and socially unengaging people (neutral face, looking to the side, and speaking in a neutral tone). We reasoned that infants depend on many people for their survival (Hrdy, 2011; Hrdy & Burkart, 2020) and therefore may need to track adults who engage with them.

In both Experiments, we presented 7- to 10-month-old infants with videos of people using the individuation paradigm as described above (Xu & Carey, 1996; refer to Figure 1). In Experiment 1, these people were either (i) one of the infants' own caregivers and an unfamiliar adult (another participant's caregiver) or (ii) two unfamiliar adults (other participants' caregivers). In Experiment 1, all adults socially engaged with the infant. In Experiment 2, both adults were unfamiliar and either (i) socially engaged or (ii) disengaged with the infant. Together, these experiments enabled us to investigate the roles of familiarity and social engagement in infants' individuation of people.

Experiment 1: Caregivers and Strangers

In Experiment 1, we presented 7- to 10-month-old infants with either (i) one of the infants' caregivers and an unfamiliar adult (the One Familiar Condition) or (ii) two unfamiliar adults (the Both Unfamiliar Condition). Prior to the study sessions, infants' caregivers recorded videos of themselves smiling and saying, 'hello there!' in an upbeat friendly voice. We employed a yoked control design (following Thomas et al., 2022), such that the unfamiliar adults for one infant were (when possible) the caregivers for other infants. The actors for a single infant were matched in race and gender; when we did not have suitable videos from another caregiver, we used videos of a member of the lab.

Hypotheses: If infants represent their caregivers as distinct from unfamiliar adults, but do not track differences between unfamiliar adults, then they would individuate the actors in the One Familiar Condition, but not the Both Unfamiliar Condition. Alternatively, if infants' abilities to individuate people match the development of their abilities to individuate objects, then infants would not individuate the people in either condition, because they belong to the same kind (a conceptual replication of Bonatti et al).

Methods

Hypotheses, methods, and analyses for Experiments 1 and 2 were preregistered on the Open Science Framework. The preregistrations, example stimuli, data, and code are hosted at https://osf.io/5fst7/.

Participants Thirty-nine full-term 7- to 10-month-old infants contributed data to this experiment (16 girls, 23 boys; mean age visit 1 = 9.00 months; mean age visit 2 = 9.17 months; range = 7;3 – 10;31). None of the infants met the exclusion criteria. For all experiments, participants were tested with informed consent by their caregivers.

Twenty-eight infants participated in both conditions (order counterbalanced) over two separate study sessions. Five infants only participated in the One Familiar Condition, and 6 infants only participated in the Both Unfamiliar Condition; these infants either aged out so that they could not participate in the second condition, or their caregivers chose to not schedule a second visit.

Our sample size was based on power analyses, using pilot data as a starting point. We found that with 32 infants per condition, we would have 100% power to detect a difference in looking time comparable in size to that of the pilot data. More caregivers signed up to participate than anticipated, such that we had 33 or 34 infants per condition.

We recruited participants through a combination of our own database, social media ads, and ChildrenHelpingScience.com (Scott & Schulz, 2017).

Displays There were two conditions (the One Familiar Condition and the Both Unfamiliar Condition), and each infant participated in both conditions whenever possible, over two separate study sessions. In each condition, infants first viewed 6 baseline trials, followed by 2 familiarization trials, and finally 9 test trials. There were two actors per each study session, who were on either the left side or the right side of

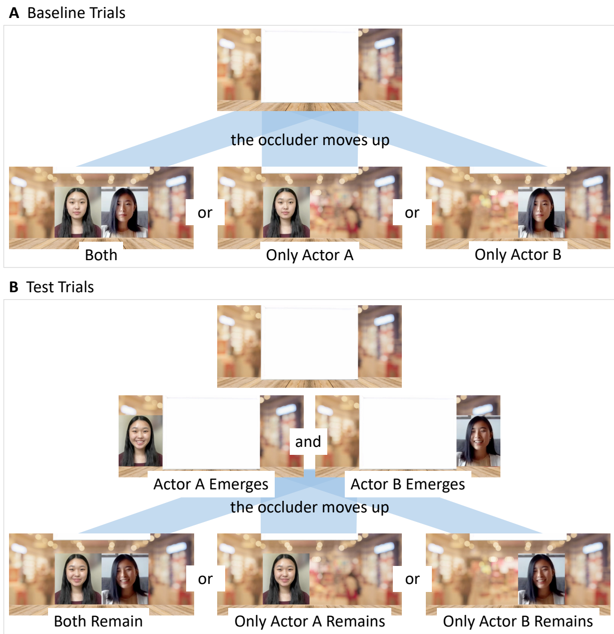

Figure 1: Example baseline and test trials. In baseline trials, an occluder moved up, revealing either both actors or just one of the actors. In the test trials, the two actors alternatingly emerged from behind the occluder and returned to their original position, and then the occluder moved up, revealing either both actors or just one.

the screen: We will refer to the left one as Actor A and the right one as Actor B.

In the One Familiar Condition, one actor was one of the infant's own caregivers. In the Both Unfamiliar Condition, both actors were unfamiliar to the infant. When the same infant participated in both conditions, there was no repetition of actors between conditions.

Before an infant's first study session, the research team coordinated with one of the infant's caregivers to have the caregiver record themselves saying "Hello there!". The research team instructed the caregivers to smile, look at the camera, and speak as though they were talking to their own baby. The researchers edited these recordings to produce the videos in the baseline, familiarization, and test trials.

The goal of the baseline trials was to determine how long infants attended when there were one or two actors on the screen, without speech involved. Although prior research has found that infants at baseline look longer at two objects compared to one (Xu & Carey, 1996), it was unclear how including the infants' caregivers would affect looking time. In the baseline trials, the videos began with an occluder present on the screen (Fig. 1A). Then, the occluder moved up, and in alternating trials, there was either one actor or two actors behind the occluder.

The goal of the familiarization trials was to familiarize infants to both actors' voices. In both familiarization trials, one actor emerged from behind the occluder and said "Hello there!". After, the actor moved back behind the occluder.

The goal of the test trials was to examine whether infants expect there to be one or two actors behind the occluder, after seeing both of them emerge in alternation (Fig. 1B). Each test trial began like the familiarization trials: One actor emerged from behind the occluder and said "Hello there!". The actor then returned to their original position behind the occluder, and the other actor emerged and said "Hello there!". Then the second actor returned to their original position, and the occluder moved up to reveal one or both of the actors.

Procedure Data collection took place over Zoom video calls. Infants sat on their caregivers laps or in highchairs and viewed displays on computer devices at home. Caregivers were instructed to sit quietly and not influence their infants and to look away from displays during the test trials.

There was one experimenter per testing session. This experimenter prepared multiple slide decks (for the One Familiar and the Both Unfamiliar Condition) for each infant and shuffled them before selecting one for the infant, such that the experimenter remained unaware of the counterbalanced variables. During the study, the experimenter controlled the slides remotely using a browser window that they could not see; this practice maintained the experimenter's lack of knowledge of the counterbalanced variables throughout the study sessions.

For the baseline and test trials, the experimenter began coding looking times as soon as the occluder moved up. Trials ended after 60 cumulative seconds passed or after infants had looked away for 2 consecutive seconds, whichever happened first.

After the experiment, we asked caregivers about whether they recognized the unfamiliar adult(s). None reported recognizing the adult.

Counterbalancing We counterbalanced the first condition that infants participated in, the order in which infants saw outcomes presenting both actors vs. just one actor, and the order of the actors relative to each other (Actor A first or Actor B first). There were eight possible combinations of these counterbalanced variables. In the One Familiar Condition, Actor A was always the infant's own caregiver.

Results

Baseline Data We first examined whether, in the baseline phase, infants looked differently when they saw one or two people. In the baseline trials, the occluder moved up to reveal one or two actors; the actors themselves never moved in these trials, and there was no reason for infants to expect there to be one or two actors. In past research (Xu & Carey, 1996), infants typically look longer when there are two entities than when there is one entity on screen. We found that a lognormal distribution fit the looking time data better than did a normal distribution, so we first log-transformed the data.

We then fit a Bayesian mixed-effects model, using default priors, in which log-transformed looking time was the dependent variable. The actors behind the occluder (Both Actors, Actor A, or Actor B), condition (One Familiar vs.

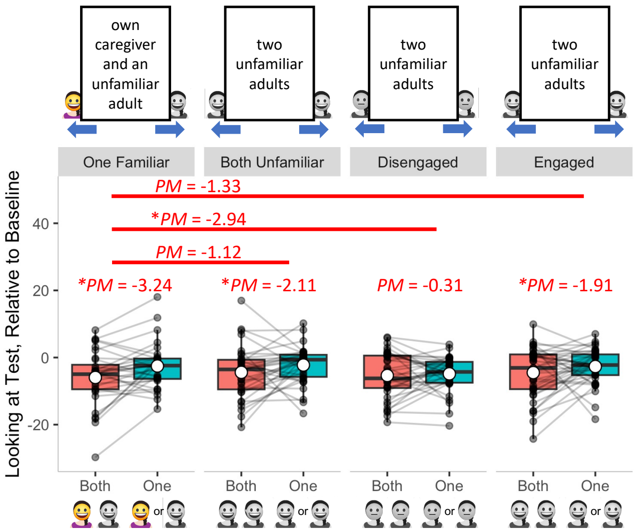

Figure 2: Box plots depicting the time that infants looked in the test trials, relative to their looking in the baseline trials, when there were both actors or just one actor. On the x-axis, smiles indicate that the actors were socially engaging, and neutral faces indicate that the actors were disengaged. In the box plots, the horizontal lines within the boxes indicate the medians, the white circles indicate means, the boxes indicate the interquartile ranges, the whiskers indicate 1.5 times the interquartile range, and the connected dots indicate data from individual participants. *PM* indicates posterior median, and the asterisks indicate that 0 is not in the 95% credible interval. Colored faces indicate that the actor was the infant's own caregiver, and gray faces indicate that the actor was an unfamiliar adult.

Both Unfamiliar), and the resulting interaction were fixed effects. We included participant ID as a random effect. For the fixed effect of actors behind the occluder, we had "Both Actors" serve as the reference group.

In the Both Unfamiliar Condition, infants looked longer when there were both actors ($mean_{both}$ = 14.03 s, SD_{both} = 9.32 s) than when there was just one actor (either Actor A or Actor B; $mean_A$ = 9.53 s, SD_A = 7.98 s; $mean_B$ = 11.28 s, SD_B = 9.55 s) in the baseline trials (0 not in 95% credible interval (CI)). In the One Familiar Condition, infants also looked longer when there were both actors ($mean_{both}$ = 13.17 s; SD_{both} = 10.51 s) than when there was just Actor B ($mean_B$ = 10.15 s, SD_B = 8.32 s), the unfamiliar adult (*PM* = 0.27, 95% CI [0.02, 0.48]). However, infants did not look differently when there were both actors and just Actor A ($mean_A$ = 11.81 s, SD_A = 9.13 s), their own caregiver (*PM* = 0.11, 95% CI [-0.10, 0.35]). These findings suggest that infants recognized their own caregiver.

Normed Test Data To account for the possibility that, at baseline, infants look longer when they see two people than when they see one, we normed the test data. First, we calculated the means for the amount of time that infants looked in the baseline trials when they saw two actors, Actor A, and Actor B. Next, we subtracted the corresponding mean from each test trial, resulting in our normed looking time data.

We asked whether infants looked longer when there are two or one actors behind the occluder at test, relative to their looking at baseline, and whether the pattern of looking differed by condition. We fit a Bayesian mixed-effects model, using default priors. In this model, we had the normed looking time as the dependent variable; the number behind the occluder at test (One Actor vs. Both Actors), condition (One Familiar vs. Both Unfamiliar), and the resulting interaction as fixed effects. (After norming the data, we collapsed the data involving Actor A and Actor B for the present analysis, treating them both as trials involving one actor.) We included participant ID as a random effect, and we centered the fixed effects.

We found no evidence for an effect of condition nor an interaction (0 not in 95% CI). Instead, for both conditions, there was a main effect of trial type: Infants looked longer at test, relative to baseline, when there was one actor ($mean_{one}$ = -2.39, SD_{one} = 9.19) than when both actors ($mean_{both}$ = -4.99, SD_{both} = 9.17) were present (*PM* = 2.70, 95% CI [1.31, 4.12]) (Fig. 3). The pattern of findings did not differ in either condition depending on which actor was involved (Actor A or B).

Discussion

We found that 7- to 10-month-old infants individuated the actors in Experiment 1, regardless of whether one of the actors was an infant's own caregiver. These findings stand in contrast with past research in which infants at this age do not individuate people and other people-like entities (Bonatti et al., 2002; Fogiel et al., 2023; Pickron & Cheries, 2019). Why did infants succeed at individuating people in Experiment 1 but not in most past research?

One possibility is that the adults in Experiment 1 were more socially engaging than those of past research. In Experiment 1, all adults received instructions to smile, engage in eye contact, and speak as though they were talking to their own baby. From early in development, infants prefer looking at people who engage in each of these behaviors (Cooper & Aslin, 1990; Farroni et al., 2002; Kuchuk et al., 1986; ManyBabies Consortium, 2020). In contrast, speech was not possible in past studies using dolls or pictures of people (Bonatti et al., 2002; Pickron & Cheries, 2019), and affect appears to have been neutral in the one study involving real people (Fogiel et al., 2023). Infants may recognize when a person wishes to engage with them and then become motivated to track them as an individual.

Experiment 2: The Role of Social Engagement

In Experiment 2, we sought to test the role of social engagement in infants' individuation of people. We presented infants with two unfamiliar adults who were both either socially engaging or disengaged. When the actors were to be

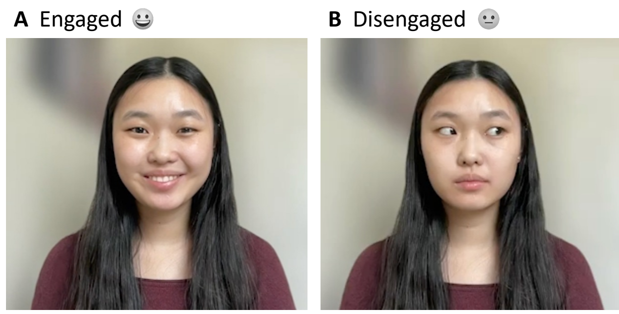

Figure 3: Examples of the same actor being engaged (A) and disengaged (B).

socially engaging, they followed the same instructions given to caregivers in Experiment 1: to smile, look at the camera, and speak as though they were interacting with a baby in an upbeat tone. In contrast, when the actors were to be disengaged, the actors received instructions to be neutral, look away from the camera, and speak as though they were talking to an adult stranger in a neutral tone.

If infants are more likely to individuate people that are engaging, then they should individuate in the Engaged Condition but not in the Disengaged Condition. Alternatively, if infants are more likely to individuate people when presented with animate stimuli (as opposed to still stimuli like dolls or photographs; Bonatti et al., 2002; Pickron & Cheries, 2019), regardless of engagement, then infants may individuate the actors in both conditions.

Methods

Participants Forty-seven full-term 7- to 10-month-old infants contributed data to this experiment (22 girls, 25 boys; mean$_{\text{age visit 1}}$ = 8.25 months; mean$_{\text{age visit 2}}$ = 8.61 months; range = 6;27 – 10;24). No infants met the exclusion criteria.

Thirty infants participated in both conditions (order counterbalanced) over two separate study sessions. Ten infants only participated in the Engaged Condition, and 8 only participated in the Disengaged Condition; these infants either aged out after participating in the first condition, or their caregivers chose to not schedule a second visit.

Our sample size was based on power analyses, using the data of Experiment 1 as a starting point. We found that with 32 infants per condition, we would have 94% power to detect a difference in looking time comparable in size to that of the pilot data. More caregivers signed up to participate than anticipated, such that we had 38 or 40 infants per condition.

Displays and Procedure The displays and procedure were like that of Experiment 1, except as follows. First, instead of featuring the infant's caregiver and other infants' caregivers, the videos only depicted unfamiliar adults who were members of the lab or friends of the researchers. There were four adults who acted as actors, and they were all women of East Asian heritage with North American accents.

Second, the conditions were different, relative to Experiment 1. We had the same four actors record videos that could be used for either condition. For the Engaged Condition (Fig. 3A), the actors received instructions to smile, look at the camera, and speak as though they were interacting with a baby (i.e., the same instructions that caregivers had received in Experiment 1). For the Disengaged Condition (Fig. 3B), the actors received instructions to be neutral, look away from the camera, and speak as though they were talking to an adult in a neutral tone.

Counterbalancing As in Experiment 1, we counterbalanced the first condition that infants participated in, the order in which infants saw outcomes presenting both actors vs. just one actor, and the order of the actors relative to each other (Actor A first or Actor B first). There were four actors, and we consistently separated them into two pairs; we counterbalanced which pair of actors infants saw in each condition. There were therefore sixteen possible combinations of these counterbalanced variables.

Results

We conducted the same kinds of analyses as in Experiment 1. Because Actors A and B were always unfamiliar adults in Experiment 2, we have collapsed the data from those trials for the present analyses. (The findings did not differ if we analyzed the data from the trials separately.)

Baseline Data We fit a Bayesian mixed-effects model, using default priors, in which log-transformed looking time was the dependent variable. The actors behind the occluder (One vs. Both Actors), condition (Engaged vs. Disengaged), and the resulting interaction were fixed effects. We included participant ID as a random effect.

There was no interaction between conditions, nor was there an effect of condition (0 not in 95% CI). There was a main effect of trial type (*PM* = -0.22, 95% CI [-0.36, -0.09]). For both conditions, infants looked longer at baseline at two actors (mean$_{\text{both}}$ = 13.75 s, SD_{both} = 9.47 s) than at just one actor (mean$_{\text{one}}$ = 10.94, SD_{one} = 7.94 s).

Normed Test Data We normed the test data as in Experiment 1. We fit a Bayesian mixed-effects model, using default priors. In this model, we had the normed looking time as the dependent variable; the number behind the occluder at test (One Actor vs. Both Actors), condition (Engaged vs. Disengaged), and the resulting interaction as fixed effects. We included participant ID as a random effect, and we centered the fixed effects.

We found that in the Engaged Condition, infants looked longer at test, relative to baseline, when there was one actor (mean$_{\text{one}}$ = -2.76, SD_{one} = 8.73) than when there were both actors (mean$_{\text{both}}$ = -4.71, SD_{both} = 8.98) (PM = -1.93, 95% CI [-3.55, -0.28]). By contrast, in the Disengaged Condition, infants did not look differently to trials involving one actor (mean$_{\text{one}}$ = -4.95, SD_{one} = 6.62) and both actors (mean$_{\text{both}}$ = -5.25, SD_{both} = 8.15) (*PM* = -0.26, 95% CI [-2.06, 1.28]). However, there was no significant interaction: The pattern of findings did not differ between conditions (*PM* = 1.65, 95% CI [-0.68, 4.03]).

Comparing Experiments In exploratory analyses, we examined whether the pattern of findings differed across conditions in the two experiments. We fit a model on the normed test data, like those above. Here, we set the One Familiar Condition (involving the infant's own caregiver and a stranger) as the reference group, given that the effect appeared larger there. We examined whether the trial type and condition interacted in predicting the normed looking time data at test.

When comparing the One Familiar Condition to the Both Unfamiliar Condition and the Engaged Condition, there were no significant interactions between condition and trial type (0 not in 95% CIs). However, when comparing the One Familiar Condition to the Disengaged Condition, there was a significant interaction between condition and trial type ($PM = -2.94$, 95% CI [-5.59, -0.30]). That is, the effect of trial type was stronger in the One Familiar Condition than in the Disengaged Condition. Thus, the effect of trial type appeared weakest in the Disengaged Condition.

Discussion

We found some evidence that infants individuated actors who were socially engaging but not actors who were disengaged; the pattern of findings across conditions, however, did not differ. When comparing the conditions across experiments, we found evidence that infants did not individuate actors in the Disengaged Condition to the same degree that they did in the other conditions. Thus, infants appear to better individuate people who are socially engaging. However, the analysis across experiments was not preregistered, and we should exercise caution when interpreting it.

General Discussion

In the present experiments, we found that 7- to 10-month-old infants individuated two people, even when they were both unfamiliar to the infants, so long as the two people were socially engaging. In Experiment 1, infants individuated their caregivers, whom they have had countless hours of experience with, and unfamiliar adults, who they encountered for the first time in the experiment. In Experiment 2, we replicated this result involving unfamiliar adults who were socially engaging, and we found that infants did not individuate two unfamiliar adults who were disengaged. These findings build on a long history of research concerning infants' sensitivity to social engagement in terms of affect (Kuchuk et al., 1986), eye contact (Farroni et al., 2002), and speech intonations (Cooper & Aslin, 1990; ManyBabies Consortium, 2020). We found that these cues of social engagement led infants to represent a person as an individual and track that person across space and time.

Our findings stand in direct contrast with (i) decades of research suggestive that infants in this age range do not readily individuate objects in the same paradigm (Croteau et al., 2024) and (ii) studies suggestive that even older infants have mixed abilities to individuate people and people-like entities (Bonatti et al., 2002; Fogiel et al., 2023; Pickron et al., 2024; Pickron & Cheries, 2019). Notably, the faces in our experiments were always matched on race and gender, making it unlikely that infants more easily tracked them because they were more perceptually different than the stimuli of previous individuation experiments. If anything, the stimuli of past experiments (e.g., a toy duck and a ball) were more perceptually different than those of the present experiments. Thus, infants appear to represent facial features or voices of socially engaged people earlier than they do the perceptual features of objects. It remains an open question as to which aspects of social engagement mattered: eye contact, speech intonations, voice, affect, or some combination.

Why might infants fail to individuate objects but succeed in individuating socially engaging people? We posit that tracking people is a central task for any social species: Infants must learn about large social networks, made up of many relationships and individuals. This ability may have deep phylogenetic roots; for example, chimpanzees can recognize the faces of their groupmates, even after having been separated from them for up to 26 years (Lewis et al., 2023). Research in cognitive neuroscience suggests that even infants who are as young as 2 months old have regions of the brain that selectively respond to faces compared to objects or scenes (Kosakowski et al., 2022). Moreover, in response to images of faces, infants from 2 months of age show adult-like activation patterns in regions of the brain that are implicated in social value (Kosakowski et al., 2024). Thus, the present findings support the possibility that the ability to track and remember individual faces is early-emerging (Powell et al., 2018; Spelke, 2022). Our findings add to this body of research: Infants not only have mechanisms to recognize familiar faces or to distinguish faces from other categories of stimuli, but track individual people across space and time.

The present findings also raise an interpretation of evidence from other research that has found that infants individuate people who share their food and color preferences, but that infants do not individuate people who either have different preferences or lack preferences (Fogiel et al., 2023). In this other research, the actors in the individuation task demonstrated their preferences after the infants had demonstrated their own, and an experimenter explicitly pointed out whether the actors' preferences matched those of the infants. It is possible that infants interpreted the matching of preference as an act of social engagement with them. Infants may have therefore felt motivated to individuate the actors.

In sum, the present findings suggest that there is a privileged role of social engagement in infants' learning about people. When people are socially engaged with infants, infants represent those people as individuals and track them across space and time, even at an age at which infants do not reliably represent objects in this manner. The ability to represent people as distinct may facilitate infants' own engagement and navigation with the social world, identifying people who intend to teach or help them and enabling them to form and maintain relationships.

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