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Toddlers' response to different race strangers: Developing a virtual paradigm

By

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Abstract

There is a growing interest in developmental psychology to understand the source of the tendency to prefer those similar to us (ingroup) and to dislike those who are different from us (outgroup). Previous studies concerning the origins of ingroup biases have shown the sensitivity to social categories emerges early in life, and even toddlers are able to detect social categories like race. This study explores whether toddlers (n = 20) will engage with a stranger over Zoom, as well as how toddlers (n = 10) react to two different race experimenters (one White and one East Asian experimenters). In the first experiment, we found that toddlers respond and engage with a stranger over Zoom and in the second experiment, we found preliminary evidence that toddlers engaged more with the racial outgroup experimenter, which is surprising considering previous studies that suggest racial ingroup biases may start in infancy. Our findings suggest that more racially diverse populations need to be tested to fully understand how toddlers react to different race strangers.

Toddlers' response to different race strangers: Developing a virtual paradigm

With a 276% increase of American people identifying with two or more racial backgrounds since 2010, it is increasingly common for individuals to encounter others from differing racial backgrounds, especially in densely populated areas (U.S. Census Bureau, 2021). However, racial tensions continue to be some of the most significant challenges to today's society. As such, understanding the development of the underlying mechanisms behind racial prejudice is more crucial than ever.

Historically, developmental psychology as a field has focused on children's tendency to prefer people who share one's background (i.e., ingroup) and to disfavor people who do not (i.e., outgroup), with the hope that understanding this tendency from a developmental perspective will provide insight into how to reduce the negative consequences of this inclination early in development (Waxman, 2021). Sensitivity to social categories emerges early in life (Rhodes & Baron, 2019). For instance, infants are able to construct social categories based on language and race (Liberman et al., 2017). By 3 months of age, infants tend to look longer at racial ingroup (i.e., same-race) individuals than outgroup (i.e., different-race) individuals (Kelly et al., 2005) and by 6 months of age, infants preferentially look at native language speakers over foreign language speakers (Kinzler et al., 2007). In addition, 10-month-old infants favorably follow the gaze of racial ingroup faces as opposed to outgroup faces (Pickron et al., 2017) and make positive and negative associations based on race of the faces presented (Xiao et al., 2018). Thus, by the end of their first year, infants may already use race as an important social cue. However, there is much to be understood about the mechanisms behind how young children learn about race.

For instance, much of past research has used static pictures or disembodied faces to test infants' responses to racial outgroup individuals (Rhodes & Baron, 2019). Thus, less is known about how infants react in an interpersonal context – such as how they respond to and interact with a stranger who is from a different racial background from themselves. By investigating more interactive and ecological contexts found in infants' lives, we can better understand how infants are starting to think and feel about racial outgroup individuals.

There is evidence that infants show greater fear towards racial outgroup strangers (Feinman, 1980; Persson-Blennow & McNeil, 1981). However, other studies have found no effect of stranger's race on infants' fear responses: that is, they find no difference in infants' stranger fear according to the stranger's race (Bronson, 1974; Cohen, et al., 1974). Due to these conflicting results, it has been difficult to understand what the influence of the stranger's race is on infants' social responses.

These conflicting results could be due to these studies not considering individual differences and social environmental factors. For example, since these studies, we now know that infants show individual variability in how they respond to strangers according to temperament – for instance, shyer infants tend to show more social wariness to strangers (Brooker et al., 2013). In fact, recent research suggests that shyer children are more likely to show greater social wariness to different-race strangers than same-race strangers (Hwang et al., in prep.). Thus, infants' individual differences in temperaments needs to be accounted for when examining their responses to strangers according to strangers' racial group membership.

We also know that how much infants have exposure to people from different racial backgrounds can influence infants' face processing such that more exposure can help infants better recognize racial outgroup faces (Bar-Haim et al., 2006; Anzures et al., 2012). Further,

latest research suggests that neighborhood racial demographics are related to infants' neural activity toward racial outgroup individuals (Hwang et al., 2021). In addition, for older school-age children, if they live in more racially diverse neighborhoods or attend more racially diverse schools, they are less likely to show racial essentialism and have more cross-race friendships (Mandalaywala et al., 2019; Pauker et al., 2016; McGlothlin & Killen, 2010). Thus, infants who have more exposure to racial diversity in their daily lives might show different responses to different-race strangers than infants with less exposure to racial diversity.

Thus, in this study, we aimed to create a new virtual paradigm that can allow us to collect more data about infants' individual differences in temperament as well as exposure to racial diversity through social networks and neighborhood environment compared to previous approaches. Further, this study reframes the stranger approach task to focus on measuring how infants engage with strangers according to the stranger's race.

In a typical stranger approach task, infants are seated in a highchair across the room from the door. The stranger approach occurs in multiple stages. A stranger (a person unfamiliar to the infant) would first enter the room and wait. The stranger would then slowly move towards the infant and wait again in an iterative process and infants' fear and engagement responses are measured at each stage (Planalp et al., 2017).

In the second experiment of this study, the stranger approach task is converted to an online format. This new format allows for a greater range of participants to participate, as families do not need to commute to a testing site. The online format also allows for additional flexibility in testing times that best suit the participating families, as well as the alleviation of scheduling for both the participants and experimenters. Thus, the online format is more accessible to populations that may be underrepresented in research due to commute/timing constraints. The

aim of this study is to examine how toddlers' engagement with strangers might differ according to whether they are interacting with strangers from a different or same racial background as them.

EXPERIMENT 1: Zoom Pilot

In preparation for designing a fully asynchronous study on the Lookit platform (lookit.mit.edu), a website where families can participate in child development studies on their own time from the comfort of their homes, it was essential to know what types of virtual interactions toddlers would be willing to engage in. As such, a pilot study was conducted to interact with 18-month-old toddlers in real time over Zoom, a videoconferencing platform. In this Zoom pilot study, researchers performed a number of interactions, urging the toddlers to react or respond. Interactions included general greetings and games like peekaboo and animal sound imitations.

Given the exploratory nature of this experiment, we investigated whether children would be willing to engage with the stranger over Zoom and respond to the requests of the stranger on Zoom. The aim of this pilot study was to determine what kinds of behaviors children do in response to a stranger on Zoom trying to engage with them (e.g., vocalizations, body tensing, smiling, etc.) such that we can develop a reliable coding scheme in the second experiment to measure infants' positive and negative responses to the stranger.

Method

Participants

Twenty 17- to 18-month-old toddlers (9 females, 11 males; M_{age} = 17.33 months, 14 White, 1 Hispanic or Latino, 2 Asian, 2 Asian and White, 1 Asian and Hispanic or Latino) participated in the Zoom pilot. All toddlers were recruited through email or text from the

participant database shared with University of Chicago Early Childhood Research laboratories. Participants spanned the United States and participated virtually over Zoom.

Design, Materials, and Procedure

In each session, a researcher first completed the consenting process with the parent and gave parents a brief overview of the experiment. All researchers were female, East Asian adults. At the end of the introduction, the child was asked to be seated in a highchair directly in front of the computer screen. After receiving consent, the researcher began recording the Zoom session and walked off screen and the testing session started. The testing sessions lasted about 10-12 minutes per child.

Approach segment. In the first 2 minutes, the researcher then reappeared to the side of the screen and waved to the child while far away from the camera. The researcher waved and greeted the child, encouraging waving and vocalization with prompts like "Hi baby, what's your name?" and "Hi! Can you wave hi?" In the next 2 minutes, the researcher then slowly moved closer to the camera until they were directly across from the participant's view. While seated, the researcher then slowly began to move towards the camera with arms outstretched, as if picking the child up through the screen. While reaching out to the child, the research asked questions like "You're so cute! Can I pick you up?" The researcher then returned to the center of the screen after 2 minutes of pretending to pick up the child.

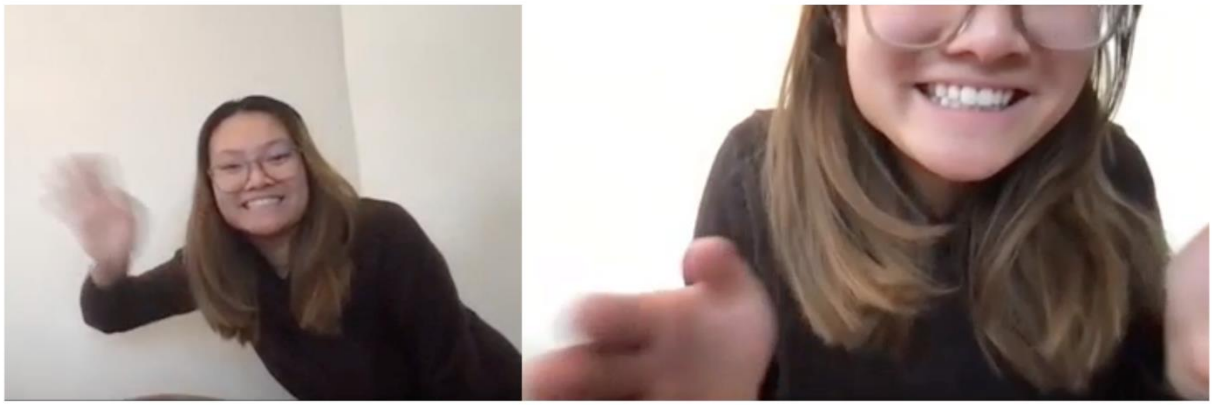

Figure 1. Screenshot examples of approach segment.

Animal sounds segment. For the next 3 minutes, the researcher then tried to engage the child with different animal sounds. Of the animal sounds, the first minute was spent imitating ducks quacking. The second minute was spent imitating dogs barking, and the third minute was spent imitating cats meowing. The experiment prompted the child to vocalize by saying questions such as, "What sound does a duck make? Does it go quack quack?"

Figure 2. Screenshot examples of animal sounds segment.

Peekaboo segment. After encouraging animal sounds, the researcher then introduced the familiar game of peekaboo. In this game, the researcher obstructed their face and body with a towel momentarily, asking "Uh oh where did she go?" The researcher then dramatically dropped the towel to reveal their presence, exclaiming "There she is!" This game was repeated three times.

Figure 3. Screenshot examples of peekaboo segment.

Novel objects segment. The researcher then introduced three novel objects. Toddlers were introduced to three brightly-colored, novel objects: a dog toy, a juicer, and a toilet flapper. These objects were assumed to be unfamiliar to children from previous studies (Gaither et al., 2014), and were given names unfamiliar to the children during the experiment. The researcher first pointed to the object and labeled the object (i.e., "This is a toma!"). The researcher repeated the label two more times for a total of three times. The researcher then displayed a unique action with the object, pairing it with a unique sound (such as spinning the juicer and telling the participant "This makes a sound like this 'wee woo wee woo'"). The researcher repeated the object's sound again two more times. The same sequence was done for all three novel objects. After each novel object was introduced, the novel objects were then reintroduced. The researcher showed the first object again and asked the participant if they remembered the object and to name it. The researcher after giving pause for children to respond would then correctly label the object and ask the participant to recall the sound the object made. The researcher then demonstrated the unique action from before, paired with the object's unique sound. The same sequence was done for all three novel objects.

Figure 4. Screenshot examples of novel objects segment.

Goodbye segment. The researcher then thanked the participant for "playing with [them]" and waved while exclaiming goodbye for the remaining minute of the session to elicit children to wave or vocalize good bye. While most of the Zoom sessions followed the procedure's order, some participants' sessions had to be adapted and shortened to accommodate the child's temperament and/or discomfort.

Figure 5. Screenshot example of goodbye segment.

Coding scheme. The coding scheme for this study was inspired by Fox (2001), in which an unfamiliar female research assistant slowly approached children. The main behaviors of interests were latency to vocalize to the stranger, latency to approach the stranger, and time spent in proximity to mother are measured. For this pilot analysis, we examined what types of

behaviors children engaged in during the testing session and the number of times this behavior occurred. See Table 1 for listing and description of the behaviors coded.

Table 1

Descriptions of Toddlers' Behaviors

Behaviors	Description
Vocalizations	Any type of sound children made while looking at the experimenter (e.g., babbling, laughter, names of novel objects, etc.)
Body tensing	Any signs of distress from children while looking at experimenter (e.g. eyebrow furrowing)
Social refencing	Any looking toward or movement children made towards parent
Smiling	Smiles children exhibited while looking at experimenter
Non-positive emotion	Any signs of negative emotion from children while looking at experimenter (e.g. crying, frowning)
Pointing	Any time children extended index finger while looking at experimenter
Waving	Any time children shook their hand while looking at experimenter

Results

Most zoom sessions ran as expected, however, some participants had negative reactions that required a shift to the session.

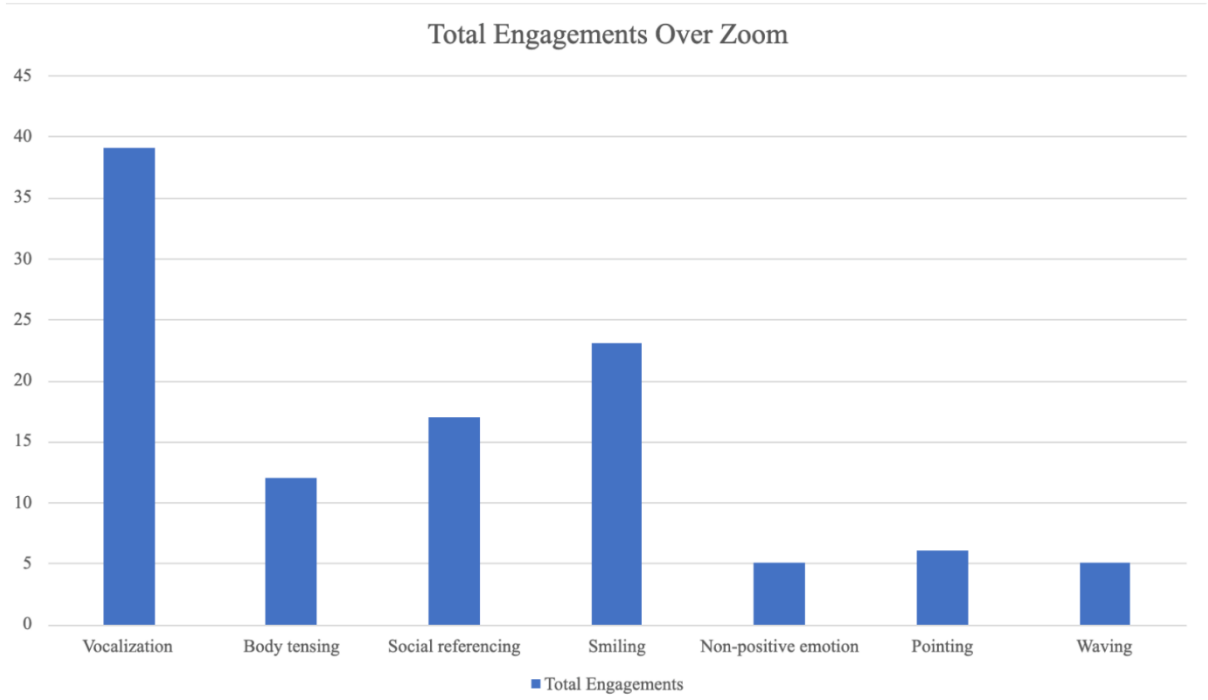

Figure 6. Total number of engagements over Zoom.

In this study, the most common behavior was vocalization: toddlers vocalized a total of 39 times. The next common behavior was smiling; participants smiled a total of 23 times. The third common behavior was social referencing; The toddlers social referenced 17 times. Negative behaviors were rare in occurrence, with a total of 5 times. The most common negative behavior was body tensing. The toddlers displayed body tensing a total of 12 times. The toddlers displayed non-positive emotions a total of 5 times. Waving and pointing behaviors were also rare in occurrence: the participants waved a total of 5 times and pointed a total of 6 times.

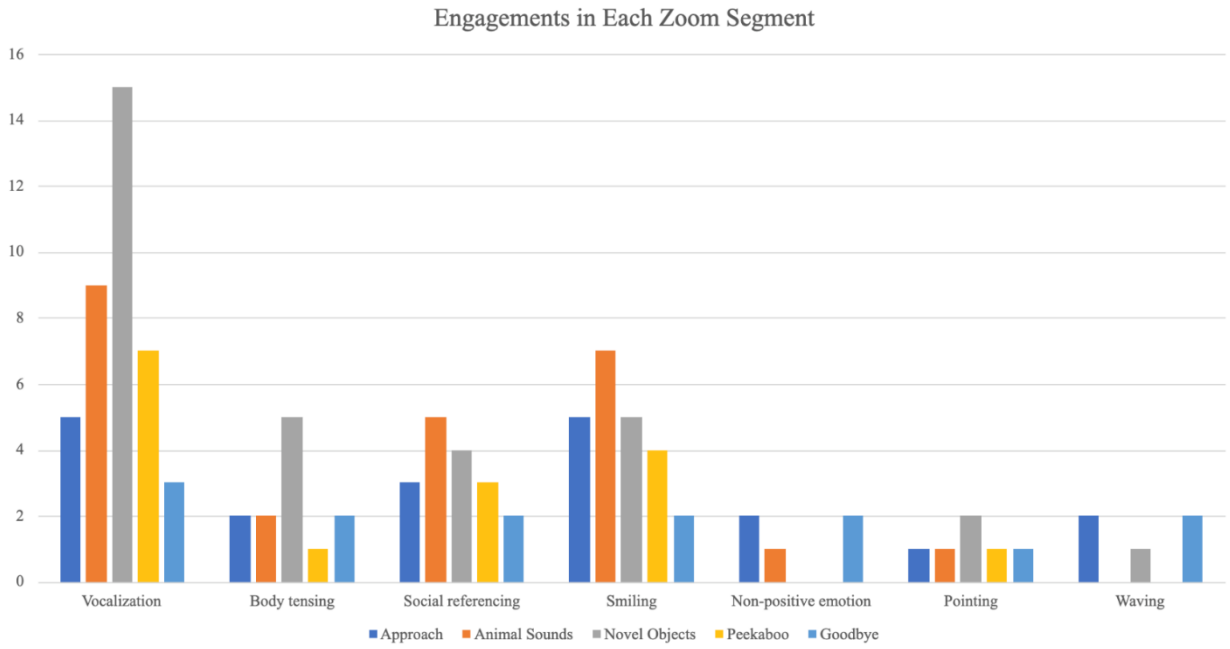

Figure 7. Number of engagements during each Zoom segment.

Approach segment. In the approach segment, children vocalized 5 times, tensed their body 2 times, and socially referenced 3 times. Children also smiled 5 times and expressed non-positive emotions 2 times. Children pointed 1 time and waved 2 times during the approach segment.

Animal sounds segment. In the animal sounds segment, children vocalized 9 times, tensed their body 2 times, and socially referenced 5 times. Children also smiled 7 times and expressed non-positive emotions 1 time. Children pointed 1 time and did not wave during the animal sounds segment.

Novel objects segment. In the novel objects segment, children vocalized 15 times, tensed their body 5 times, and socially referenced 4 times. Children also smiled 5 times and did not express non-positive emotions. Children pointed 2 times and waved 1 time during the novel objects segment.

Peekaboo segment. In the peekaboo segment, children vocalized 7 times, tensed their body 1 time, and socially referenced 3 times. Children also smiled 4 times and did not express non-positive emotions. Children pointed 1 time and did not wave during the peekaboo segment.

Goodbye segment. In the goodbye segment, children vocalized 3 times, tensed their body 2 times, and socially referenced 2 times. Children also smiled 2 times and expressed non-positive emotions 2 times. Children pointed 1 time and waved 2 times during the goodbye segment.

Discussion

This pilot study explored the types of interactions toddlers respond to through a videoconferencing Zoom platform. Our findings suggest that toddlers were responsive to and engaged in different behaviors in respond to interacting with a stranger on Zoom. This finding indicates that toddlers are able to interpret interactions across the computer screen similarly to real-life interactions, as we were able to observe a range of emotions from positive (e.g., smiling) to negative (e.g., expressing distress).

In this exploratory experiment, toddlers vocalized more than any other behaviors. The toddlers' high frequency of vocalizations encouraged the inclusion of animal sound segment in the subsequent Lookit study, as the animal sound segment seemed to engage the children and had direct, simple prompts to vocalize. Although the novel objects segment yielded more vocalizations than animal sounds segment, this segment was longer and more complex than the other segments. As such, this segment was omitted from the Lookit experiment. The toddlers also smiled more during the segments with animal sounds. These results informed the types of trials we included in the Lookit study. The behaviors observed also informed the final coding scheme in the Lookit study.

EXPERIMENT 2: Lookit Study

This experiment was conducted over Lookit, an online study platform created by MIT. Participants watched and reacted to videos on this Lookit platform on their own time and from their own home. Pre-recorded clips of adults from differing racial backgrounds (i.e., one White and one East Asian) were presented. In the video, the adults approached and attempted to engage with the child through the screen.

We hypothesized that toddlers would display more positive forms of engagement (such as more smiling and vocalization) and less fearful responses (such as decreased body tensing and crying) to a more familiar-race stranger than unfamiliar-race stranger. (Feinman, 1980; Persson-Blennow & McNeil, 1981). Additionally, we hypothesized that children who were rated to be shyer by their parents were expected to be more wary of strangers who belong to a racial outgroup. Additionally, we expected children who live in more racially diverse neighborhoods and social networks to show greater engagement with racial outgroup strangers than children who encounter less racial diversity (Mandalaywala et al., 2019; Pauker et al., 2016; McGlothlin & Killen, 2010).

Method

Participants

Ten 18- to 22-month-old toddlers (7 female, 3 male; M_{age} = 19.5, age range = 18-23; 7 White, 1 Hispanic or Latino, 1 South Asian, 1 African American) participated in the Lookit study. All toddlers were recruited through email or text from the participant database shared with University of Chicago Early Childhood Research laboratories and Lookit database. Participants spanned the United States and participated virtually over Lookit in their own time.

Design, Materials, and Procedure

Toddlers watched a total of seven video clips: a baseline video and six videos of two adult female experimenters (one White and one East Asian). Children saw the experimenters (1) approach, (2) make animal sounds, and (3) play peekaboo. Each experimenter (one White and one East Asian) was recorded doing these three segments. Each experimental segment was 1 minute long, and the order of videos shown were counterbalanced across children with approach videos always occurring first. Half of the children were randomly assigned to watch the White experimenter's videos first, whereas the other half saw the East Asian experimenter's videos first. Toddlers' racial group identification was derived from parent-reported demographic survey.

Baseline video. In the experiment, participants first encountered a 10 second baseline video of two puppets "dancing." This segment was accompanied by relaxing music and was engaging for toddlers. This segment was included to be a baseline measure to see whether toddlers would show more body tensing compared to this baseline to when they saw the experimenters (strangers) approach in the next segment.

Figure 8. Screenshot example of puppet baseline.

Approach videos. In the Approach videos, the experimenter appeared from off screen and walked towards the center. The experimenter then waved from afar and greeted the participant. She continued waving as she introduced herself as "Tiffany" and asked the participant for their name. She sat down on the chair in the center of the video and continued waving and greeting the participant. She then slowly approached the center of the camera with her arms outstretched, asking "You're so cute! Can I pick you up?" The experiment came closer to the screen such that it would look from the participant's perspective that the experimenter was very close, and her face filled the whole screen. The experimenter then retracted into her seat and said she had to go. The experimenter waved and said goodbye, and the trial ended.

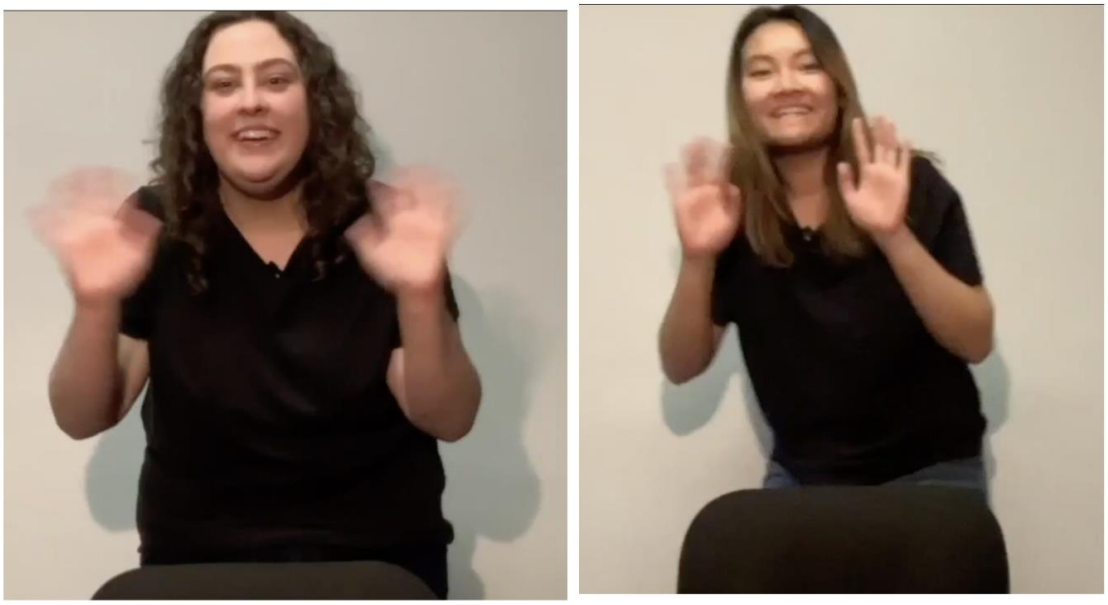

Figure 9. Screenshot examples of White and East Asian experimenter trials.

Peekaboo videos. In the Peekaboo videos, again, the experimenter appeared from off screen and walked towards the center, while waving and greeting the participant. She reintroduced herself as "Tiffany" and stated that they (the experimenter and participant) will be playing peekaboo. The experimenter hid behind a neutral-colored towel and asked "Uh oh! Where did Tiffany go?" twice. The experimenter then dramatically brought the towel down to reveal herself waving and smiling. The experimenter stated "There she is! Hi!" This sequence repeated three times. After the third time, the experimenter claimed that she had to go. The experimenter waved and said goodbye, and the trial ended.

Animal sounds videos. In the Animal sounds videos, the video started identical to the Approach and Peekaboo videos with the experimenter appearing from off screen and walking towards the center as she waved and greeted the participant. She reintroduced herself as "Tiffany" and stated that they (the experimenter and participant) will be making animal sounds. The experimenter asked the participant if they know what a dog sounded like. After a pause to allow the participant to respond, the experimenter stated "Yes! A dog goes woof woof!" and

waved her hands like dog paws. The experimenter asked if the participant could make a dog's sound and repeated the animal sounds two more times. The experimenter then asked the participant if they know what a cat sounded like. After a pause, the experimenter stated "Yes! A cat goes meow meow!" and bent her fingers like cat ears. The experimenter asked if the participant could make a cat's sound and repeated the animal sounds two more times. The experimenter then said that she had to go, waved and said goodbye, and the trial ended.

After completing the videos, parents were asked to complete two optional surveys: the Social Network Survey (SNS) and the social fear subscale from the Toddler Behavior Assessment Questionnaire (TBAQ). The SNS includes questions about participants' residential zip code, social network, and the ethnic and racial backgrounds of everyone in the child's network (See Appendix II for more detail). The TBAQ asked parents to describe the participants' social fearfulness, such as "In the past month, when your child saw other children while in the park or playground, how often did your child: approach and immediately join in play?" Parents then selected their answer from a scale of 1 to 7, with 1 representing "never" and 7 representing "always" (See Appendix I for more detail).

Coding scheme. The coding scheme was similar to Experiment 1. "Non-positive emotion" was changed to specify "Crying." "Pointing" and "waving" behaviors were combined. "Nodding," a behavior characterized by vertical head movement children made while looking at the experimenter, was added as well.

Results

One participant's Animal Sound video with the White experimenter was cut short because their parent paused the trial. As such, this trial was omitted from analysis. This participant however resumed and completed the remaining the videos completely.

No toddlers cried during any of the trials, and all participants completed every trial except the one participant noted above. Each video, which was about 60 seconds long, was divided into 10 second intervals (resulting in total 6 to 7 intervals per video), and the behavior was counted as occurring if the behavior occurred at any time point in each 10 second interval.

Toddler Behaviors according to each trial type

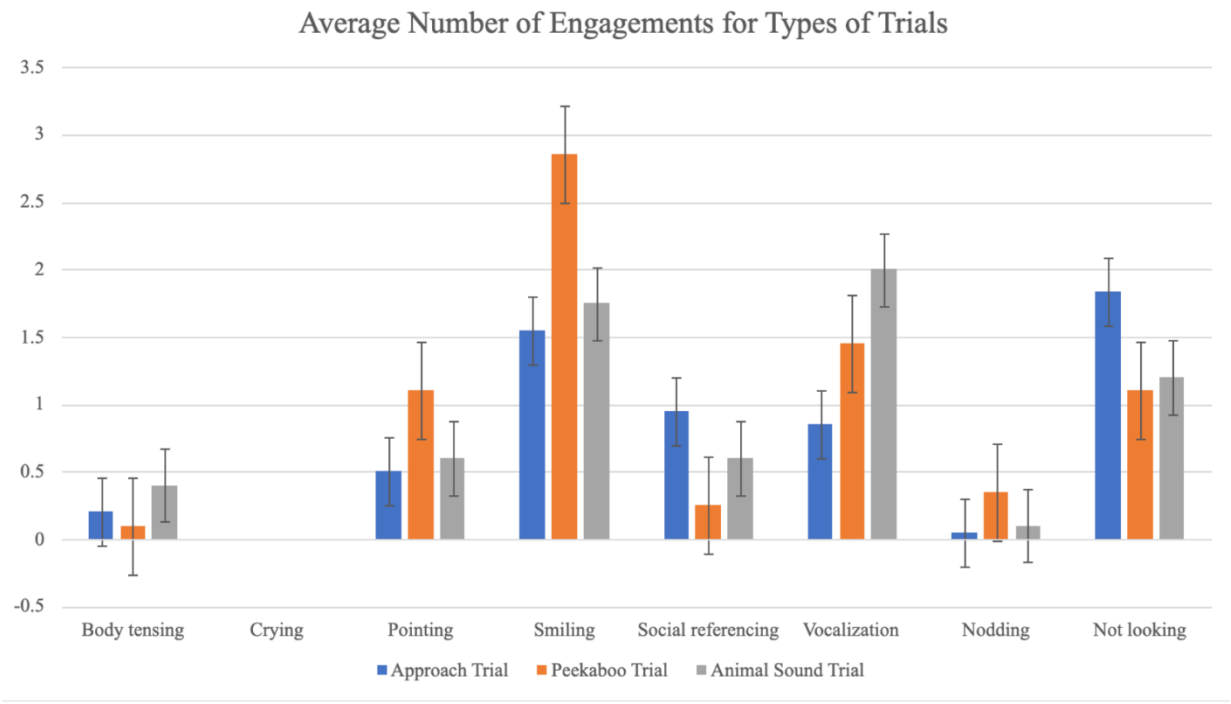

Figure 10. Average number of engagements for each trial type.

In the approach trials, the following behaviors were most common. Toddlers socially referenced more during the approach trials (M = 0.95, SD = 1.76) than the peekaboo trials (M = 0.25, SD = 0.72) and animal trials (M = 0.6, SD = 1.23). Toddlers looked away more during the approach trials (M = 1.83, SD = 1.67) than the peekaboo trials (M = 1.1, SD = 1.29) or the animal trials (M = 1.2, SD = 1.15).

In the animal sound trials, the following behaviors were most common. Toddlers showed body tensing during the animal trials more (M = 0.4, SD = 1.05) than during the approach trials

(M = 0.2, SD = 0.52) or the peekaboo trials (M= 0.1, SD = 0.45). Toddlers vocalized more during the animal trials (M = 2, SD = 2.00) than approach trials (M = 0.85, SD = 1.35) or peekaboo trials (M = 1.45, SD = 2.14).

In the peekaboo trials, the following behaviors were most common. Toddlers pointed more during the peekaboo trials (M = 1.1, SD = 1.33) than the approach trials (M = 0.5, SD = 0.89) or the animal trials (M = 0.6, SD = 1.14). Toddlers smiled more during the peekaboo trials (M = 2.85, SD = 2.16) than approach trials (M = 1.55, SD = 2.06) or animal trials (M = 1.75, SD = 2.25). Toddlers nodded more during peekaboo trials (M = 0.35, SD = 0.81) than approach trials (M = 0.05, SD = 0.22) or animal trials (M = 0.1, SD = 0.31).

Toddler Behaviors according to East Asian vs. White experimenter

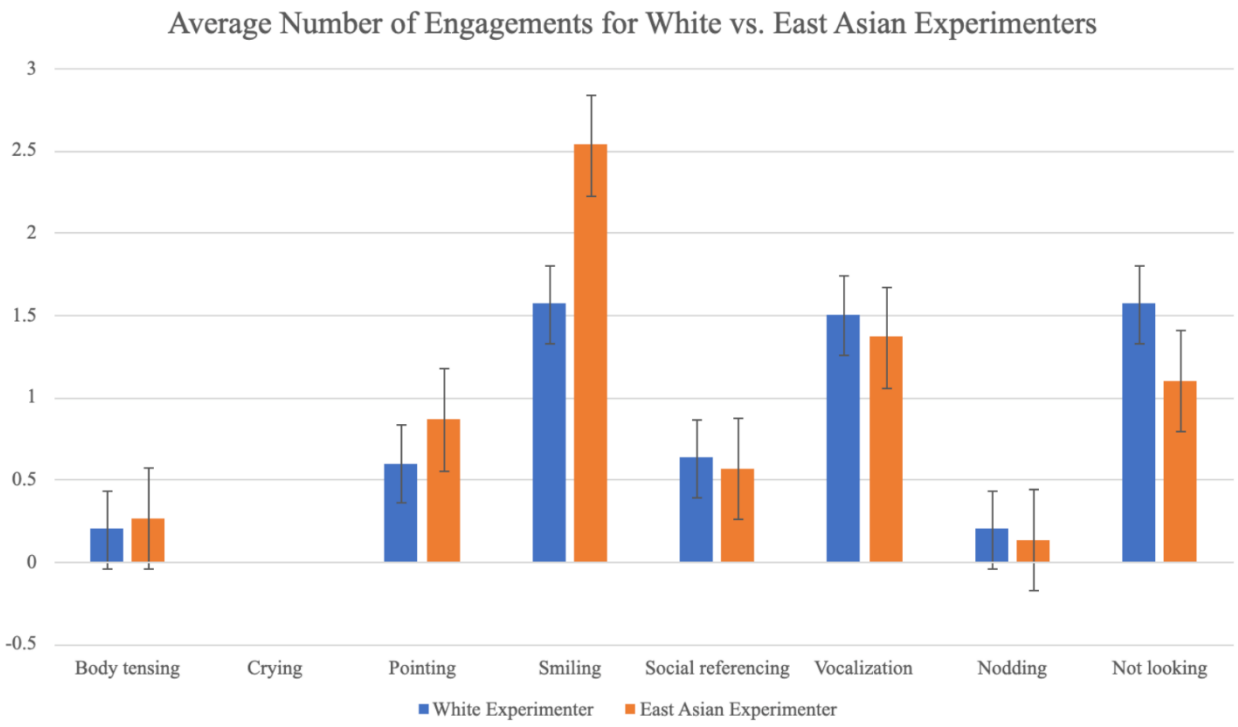

Figure 11. Average number of engagements for White vs. East Asian Experimenters

In the following types of behaviors, toddlers exhibited more behaviors toward the East Asian than White experimenter. Overall, toddlers displayed slightly more body tensing during

the East Asian trials (M = 0.27, SD = 0.83) than the White trials (M = 0.2, SD = 0.61). Toddlers pointed toward the screen more during the trials with the East Asian experimenter (M = 0.87, SD = 1.28) than the White experimenter (M = 0.6, SD = 1.00). Toddlers also smiled more during the trials with the East Asian experimenter (M = 2.53, SD = 2.32) than the White experimenter (M = 1.57, SD = 1.99).

In contrast, toddlers exhibited more of the following behaviors toward the East Asian experimenter than White experimenter. Toddlers socially referenced more during the trials with the White experimenter (M = 0.63, SD = 1.30) than the East Asian experimenter (M = 0.57, SD = 1.36). Toddlers also vocalized more during the trials with the White experimenter (M = 0.2, SD = 0.66) than in the East Asian experimenter (M = 0.13, SD = 0.35). Toddlers nodded more during trials with White trials (M = 0.25, SD = 0.74) than East Asian trials (M = 0.16, SD = 0.37). Toddlers looked away more during trials with White experimenter (M = 1.57, SD = 1.41) than East Asian experimenter (M = 1.1, SD = 1.35).

Toddler Behaviors according to Ingroup vs. Outgroup experimenter

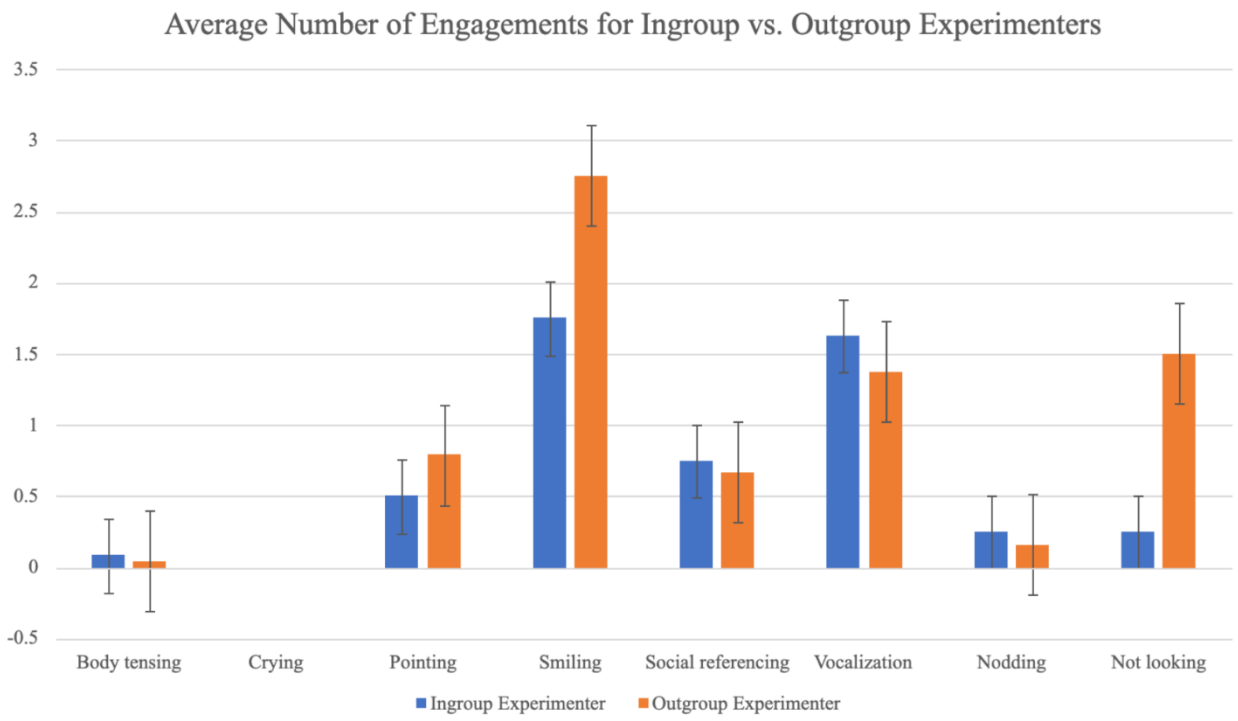

Figure 12. Average number of engagements for Ingroup vs. Outgroup Experimenters.

Of the 10 participants, 7 participants identified as White and 1 participant identified as South Asian. Thus, the remaining two participants (one identified as Hispanic/Latino and one identified as Black/African American) saw two outgroup adults, rather than one outgroup adult and one ingroup adult like the others and were omitted from this analysis.

For the following behaviors, toddlers showed more of these behaviors toward the ingroup experimenter than outgroup experimenter. Toddlers' bodies tensed more during ingroup trials (M = 0.08, SD = 0.41) than outgroup trials (M = 0.04, SD = 0.20). Toddlers socially referenced more in ingroup trials (M = 0.75, SD = 1.42) than in outgroup trials (M = 0.67, SD = 1.49). Toddlers vocalized more during ingroup trials (M = 1.63, SD = 2.24) than outgroup trials (M = 1.38, SD = 1.88). Toddlers nodded more during ingroup trials (M = 0.25, SD = 0.74) than outgroup trials (M = 0.16, SD = 0.37).

In contrast, toddlers were more likely to show the following behaviors toward the outgroup experimenter than the ingroup experimenter. Toddlers pointed more in outgroup trials (M = 0.79, SD = 1.32) than in ingroup trials (M = 0.5, SD = 0.83). Toddlers smiled nearly twice as much during the outgroup trials (M = 2.75, SD = 2.44) than the ingroup trials (M = 1.75, SD = 2.13). Toddlers looked away more during outgroup trials (M = 1.5, SD = 1.53) than ingroup trials (M=0.25, SD = 0.74).

Discussion

Experiment 2 used Lookit to explore the different types of toddler engagement towards strangers of differing racial backgrounds.

In the study, toddlers displayed a range of behaviors across the different trial types. The most common behavior was smiling. Participants smiled the most during the peekaboo trials. This may be due to the familiar nature of peekaboo. It is a familiar game that adults often play with toddlers and as such, may have elicited the most smiles from toddlers.

The second most common behavior was vocalization. toddlers vocalized the most during the animal sound trials. Imitating animal sounds is another common game parents tend to play with their toddlers and the experimenter did explicitly prompt toddlers to respond or imitate her sounds, which may have increased their vocalizations. However, an important point to note is that not all animal sounds are universal, and imitations could range due to language, culture and/or individual family socialization differences. As such, some animal sounds may be more novel to the participants and may have limited some participants' eagerness to engage and resulted in more individual differences.

In addition to vocalizations and smiles, another common behavior participants displayed was looking away. On average, toddlers looked away the most during the approach trial. Given

that toddlers also socially referenced the most frequently during the approach trial, children's looking away behavior may be due to toddlers' discomfort with an increasingly closer stranger. This behavior suggests that children may view interactions from the computer screen similarly to interactions in real life. However, it must also be noted that some parents choose to completely face away from the camera during the experiment, and some participants noticed and looked over to their parent to potentially understand why their parents were not jointly attending with them on a video. Thus, the looking away behaviors may not necessarily signal discomfort but the toddler noticing their parent looking away and following their parents' gaze. Nonetheless, it is interesting to note that infants were more likely to look away and social reference in the approach trial, which may be the most threatening and stranger fear eliciting trial.

In terms of the different behaviors predicted according to the race of the experimenters, we hypothesized that toddlers would display more positive forms of engagement in the trials with the White experimenter than East Asian experimenter. However, this was not the case. In the comparison of toddlers' behaviors toward the East Asians experimenter and the White experimenter, toddlers, on average, smiled more often when encountering the East Asian experimenter than White experimenter. Toddlers also pointed more during trials with the East Asian experimenter than White experimenter.

On the other hand, toddlers vocalized more, on average, during the trials with the White experimenter than the East Asian experimenter. Vocalization is potentially reflecting toddlers feeling more comfortable with someone from a familiar race or trying to communicate more with a familiar race person (Waxman, 2021). Toddlers also, on average, looked away more often during trials with the White experimenter than the East Asian experimenter. Thus, toddlers did

not necessarily show systematically greater positive engagement to the White experimenter than the East Asian experimenter but showed different patterns according to the types of behaviors.

We also hypothesized that toddlers would positively engage and produce less fearful responses in the trials with the racial ingroup experimenter than the racial outgroup experimenter. However, toddlers smiled more, on average, during the trials with the outgroup experimenter than ingroup experimenter. However, toddlers vocalized more during trials with the ingroup experimenter than trials with outgroup experimenter. Toddlers were also more likely to look away from the outgroup than ingroup experimenter, potentially signaling less interest in the outgroup experimenter. Thus, toddlers were not uniformly showing positive engagement to ingroup experimenter nor more negative engagement to outgroup experimenter.

General Discussion

This study explored the types of interactions toddlers engage with over an online format. This study also explored how toddlers engage with strangers from racial ingroup and outgroup backgrounds. Although our hypothesis of toddlers engaging more with the ingroup experimenter was not uniformly found, our finding suggests that toddlers are able to robustly engage with strangers over both synchronous (i.e., Zoom videoconferencing) as well as asynchronous (i.e., Lookit platform) interactions over the computer screen.

In Experiment 1, we found that toddlers can engage with strangers over Zoom. Of the behaviors observed, the most common behavior was vocalization, which was followed by smiling and social refencing. Children vocalized the most during the novel object segment, followed by the animal sounds segment. Children smiled the most during the animal sounds

segment, followed by the approach and novel objects segments. These findings influenced the types of trials included in Experiment 2.

In Experiment 2, we found that, on average, toddlers engaged the most during the peekaboo trial. Of the peekaboo trials, the most common behavior among children was smiling, followed by vocalization. Of the approach trials, the most common behavior among children was looking away, followed by smiling. Of the animal sound trials, the most common behavior among children was smiling, followed by looking away. When comparing the White and East Asian experimenter trials in Experiment 2, we also found that children, on average, vocalized more and looked away more often during the trials with the White experimenter. Children also smiled more often during the trials with the East Asian experimenter. In Experiment 2's comparison between ingroup and outgroup responses, we found that, on average, children smiled more and looked away during the trials with the outgroup experimenter. Children also vocalized more during the trials with the ingroup experimenter. In these comparisons, participants' positive engagements, like vocalizations and smiling, could suggest that they feel more comfortable and display more efforts to communicate. In contrast, participants could look away as a fear response when feeling uncomfortable, as observed in some participants during the approach trials.

Although the current study found toddlers did not necessarily show a strong ingroup engagement, there may be more subtle influences behind toddlers' early biases towards social categories like race that we were unable to measure in the current study. One limitation of the current study was that it did not have enough East Asian infants to match the number of White participants in the ingroup/outgroup comparison. We had more White than East Asian participants. Another limitation of this study was that we only had one person each to act as the White and East Asian experimenters. As such, we are unable to determine whether the effects we

observed were due to the individual experimenters and not toddlers responding a group of people based on race. This study would have also benefited from an analysis on infants' latency in interactions. Previous temperament and stranger fear studies have used latency as a measure of social wariness toward strangers (Brooker et al., 2013). In this study, we have also collected participants' temperament and social network and neighborhood variables. However, we were unable to analyze these variables in time for the manuscript. In future studies, it could be important to explore if toddlers who are shyer were less likely to vocalize and engage in other positive interactions like smiling. In addition to expanding upon the current study's limitations, future studies could also include more participants and more racial groups represented (in both the experiments and participants). In an increasingly diverse world, it is more important now than ever to broaden our understanding of early social biases like race.

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APPENDIX I: Toddler Behavior Assessment Questionnaire (TBAQ) used in Lookit Study

INSTRUCTIONS: Please read carefully before starting.

As you read each description of the child's behavior below, please indicate how often the child did this during the last month by selecting one of the numbers. These numbers indicate how often you observed the behavior described during the last month.

1) Never

2) Very rarely

3) Less than half the time

4) About half the time

5) More than half the time

6) Almost always

7) Always

NA) Does not apply

The "Not Applicable" choice (NA) is used when you did not see the child in the situation described during the last month. For example, if the situation mentions the child going to the doctor and there was no time during the last month when the child went to the doctor, select the NA choice. "Does not apply" (NA) is different from "Never" (1). "Never" is used when you saw the child in the situation but the child never engaged in the behavior mentioned during the last month. Please be sure to select a number or NA for every item.

1. In the past month, when your child saw other children while in the park or playground, how often did your child:

    a. approach and immediately join in play?

2. In the past month, when at the doctor's office, how often did your child:
    a. cling to the parent?
    b. seem unconcerned and comfortable?
    c. cry or struggle when the doctor tried to touch her/him
3. In the past month, when first meeting a stranger coming to visit in the home, how often did your child:
    a. allow her/himself to be picked up without protest?
    b. abandon the parent to go to the stranger?
    c. "warm up" to the stranger within 10 minutes?
4. In the past month, 2hen the child knew the parents were about to leave her/him at home, how often did your child:
    a. cry?
    b. cling to the parent?
    c. show no evidence of distress?
5. In the past month, 2hen one of the parents' friends who does not have daily contact with your child visited the home, how often did your child:
    a. check with parent for assurance?
    b. talk much less than usual?
    c. enthusiastically greet them?
6. In the past month, when first visiting a babysitting co-op, daycare center, or church nursery, how often did your child:
    a. cry when not being held by the parent and resist being put down?

b. feel at ease within 10 minutes?

c. immediately begin to explore?

7. In the past month, when your child was being approached by an unfamiliar adult while shopping or out walking, how often did your child:

    a. babble or talk?

    b. show distress or cry?

    c. avoid possible danger by looking to parent for assurance?Appendix II: Social Network Questionnaire (SNQ) Used in Lookit Study

This is an optional survey that is part of the Lookit study "Hi Stranger!"

Welcome to the Social Network Survey! This survey will ask you about the people your child interacts with on a regular basis. This survey will also ask about the typical activities your child engages in and demographic information about the people your child regularly sees and interacts with as part of these activities. We are asking for this information so that we can better understand how infants' social networks relate to their reactions to strangers. Your responses to this survey will be linked to the video data from the Lookit study "Hi Stranger!"

This survey is optional and should take about 10-15 minutes to fill out. Participation is voluntary. You will receive a $5 Amazon gift card by email for completing this survey. The gift card will be sent within the next week. To be eligible for the gift card, your child must be in the age range for this study, you need to submit a valid consent statement and we need to see that there is a child with you in the Lookit study "Hi Stranger!"

As you go through the survey, think about your child's typical schedule Monday-Sunday. Think about the different activities your child participates in and the different people they see at those activities.

We recognize that the COVID-19 pandemic has changed what "typical" activities mean. As you go through the survey, please reflect on who your child has interacted with in the past 2 weeks. We understand that your child's schedule right now looks different than it did before the pandemic and that schedules have been changing in response to different public health guidelines. For this survey, we simply want to know about who your child has been interacting with most recently, specifically within the last 2 weeks.

Again, please think about your child's typical schedule Monday-Sunday. Please include contact your child has in-person and virtually.

1. Who are the people that live at home with your child? (Including yourself)
    a. Please write their names and relationships to your child below. Only include people that have lived with your child the past two weeks. If your child lives in more than one home, please include all the people in the other home(s) as well.
    b. Please include yourself if you live with your child.

    Example. Nicole - Mom

    a. For each person in the home:
        i. What is this person's age?

1. Child (0-12 years of age)
2. Teenager (13-17 years of age)
3. Adult (18+ years of age)

ii. What is this person's gender?

1. Female
2. Male
3. Other: _____

iii. What is this person's race? (Please select all that apply)

1. American Indian or Alaska Native
2. Asian
3. Black or African-American
4. Hispanic or Latino
5. White
6. Native Hawaiian or Other Pacific Islander
7. Other: _____

iv. How many languages does this person speak or use with your child?

1. Speaks only one language that is not English (please list the language below, including sign language)
2. Speaks more than one language (please list the languages below, including sign languages)
3. Preverbal / nonverbal

v. Does your child interact with this person:

1. In-person only

2. Virtually only (e.g., over Zoom or video chats)
3. Both virtually and in-person

2. Does your child attend daycare, preschool, school, or other child care outside of home?
    a. (Please only check "Yes" if your child has attended daycare/child care/school within the past two weeks)
    b. Please enter all the teachers/adults in your child's daycare, child care, or class that your child has regularly interacted with (e.g., they take care of your child, say hi to your child, etc.) within the past 2 weeks. Teacher Aides/Assistants should be included.
    c. Please write their name and relationship to your child below. Only include people that your child has regularly interacted with (i.e., interacted with at least once in the past 2 weeks).

    Example. Teacher Nina

    a. For each teacher:
        i. What is this person's age?
            1. Child (0-12 years of age)
            2. Teenager (13-17 years of age)
            3. Adult (18+ years of age)
        ii. What is this person's gender?
            1. Female
            2. Male
            3. Other: _____
        iii. What is this person's race? (Please select all that apply)

1. American Indian or Alaska Native
2. Asian
3. Black or African-American
4. Hispanic or Latino
5. White
6. Native Hawaiian or Other Pacific Islander
7. Other: _____

iv. How many languages does this person speak or use with your child?

1. Speaks only one language that is not English (please list the language below, including sign language)
2. Speaks more than one language (please list the languages below, including sign languages)
3. Preverbal / nonverbal

v. Does your child interact with this person:

1. In-person only
2. Virtually only (e.g., over Zoom or video chats)
3. Both virtually and in-person

b. Thinking about the kids in the daycare, child care, or class, does anyone stand out as a friend? If no one stands out as a friend, please select "no". If your child does have friend(s), please list the first names of those children below.

c. For each friend:

i. What is this person's age?

1. Child (0-12 years of age)

2. Teenager (13-17 years of age)
3. Adult (18+ years of age)

ii. What is this person's gender?

1. Female
2. Male
3. Other: _____

iii. What is this person's race? (Please select all that apply)

1. American Indian or Alaska Native
2. Asian
3. Black or African-American
4. Hispanic or Latino
5. White
6. Native Hawaiian or Other Pacific Islander
7. Other: _____

iv. How many languages does this person speak or use with your child?

1. Speaks only one language that is not English (please list the language below, including sign language)
2. Speaks more than one language (please list the languages below, including sign languages)
3. Preverbal / nonverbal

v. Does your child interact with this person:

1. In-person only
2. Virtually only (e.g., over Zoom or video chats)

3. Both virtually and in-person

2. Are there any other people who take care of your child regularly (i.e., nanny, babysitter, grandparents) that you have not mentioned yet?
    a. Please write their name and relationship to your child below. Only include people that your child has regularly interacted with (i.e., interacted with at least once in the past two weeks).

    Example. Grace - Nanny

    a. For each caregiver:
        i. What is this person's age?
            1. Child (0-12 years of age)
            2. Teenager (13-17 years of age)
            3. Adult (18+ years of age)
        ii. What is this person's gender?
            1. Female
            2. Male
            3. Other: _____
        iii. What is this person's race? (Please select all that apply)
            1. American Indian or Alaska Native
            2. Asian
            3. Black or African-American
            4. Hispanic or Latino
            5. White
            6. Native Hawaiian or Other Pacific Islander

7. Other: _____

iv. How many languages does this person speak or use with your child?

1. Speaks only one language that is not English (please list the language below, including sign language)
2. Speaks more than one language (please list the languages below, including sign languages)
3. Preverbal / nonverbal

v. Does your child interact with this person:

1. In-person only
2. Virtually only (e.g., over Zoom or video chats)
3. Both virtually and in-person

2. Does your child see extended family on a regular basis (either in-person or over video chat) who were not mentioned yet?

a. Please write their name and relationship to your child below. Only include people that your child has regularly interacted with (i.e., interacted with at least once a week in the past 2 weeks).

Example. Laura - Grandma

a. For each extended family member:

i. What is this person's age?

1. Child (0-12 years of age)
2. Teenager (13-17 years of age)
3. Adult (18+ years of age)

ii. What is this person's gender?

1. Female
2. Male
3. Other: _____

iii. What is this person's race? (Please select all that apply)

1. American Indian or Alaska Native
2. Asian
3. Black or African-American
4. Hispanic or Latino
5. White
6. Native Hawaiian or Other Pacific Islander
7. Other: _____

iv. How many languages does this person speak or use with your child?

1. Speaks only one language that is not English (please list the language below, including sign language)
2. Speaks more than one language (please list the languages below, including sign languages)
3. Preverbal / nonverbal

v. Does your child interact with this person:

1. In-person only
2. Virtually only (e.g., over Zoom or video chats)
3. Both virtually and in-person

2. Please think about your child's schedule Monday-Sunday. Think about the different activities they participate in each day.

Over the past 2 weeks, has your child done any regular social activities (i.e., an activity with people once a week in the past 2 weeks)? For example, these activities can include library storytime, music class, playdates or others. These activities can be in-person or virtual.

a. List the activity below! If your child has not attended any regular social activities, please select "None".
b. For each activity listed:
    i. Is this a class/activity with other children?
    ii. Write in the names of the adults your child interacts with at this activity. Only include specific people your child knows by name.
        1. For each adult:
            a. What is this person's age?
                i. Child (0-12 years of age)
                ii. Teenager (13-17 years of age)
                iii. Adult (18+ years of age)
            b. What is this person's gender?
                i. Female
                ii. Male
                iii. Other: _____
            c. What is this person's race? (Please select all that apply)
                i. American Indian or Alaska Native
                ii. Asian
                iii. Black or African-American

iv. Hispanic or Latino

v. White

vi. Native Hawaiian or Other Pacific Islander

vii. Other: _____

d. How many languages does this person speak or use with your child?

i. Speaks only one language that is not English (please list the language below, including sign language)

ii. Speaks more than one language (please list the languages below, including sign languages)

iii. Preverbal / nonverbal

e. Does your child interact with this person:

i. In-person only

ii. Virtually only (e.g., over Zoom or video chats)

iii. Both virtually and in-person

iii. Thinking of the kids at this activity, does anyone stand out as a friend to your child? If yes, please write in those names below.

1. For each friend:

a. What is this person's age?

i. Child (0-12 years of age)

ii. Teenager (13-17 years of age)

iii. Adult (18+ years of age)

b. What is this person's gender?

i. Female

ii. Male

iii. Other: _____

c. What is this person's race? (Please select all that apply)

i. American Indian or Alaska Native

ii. Asian

iii. Black or African-American

iv. Hispanic or Latino

v. White

vi. Native Hawaiian or Other Pacific Islander

vii. Other: _____

d. How many languages does this person speak or use with your child?

i. Speaks only one language that is not English (please list the language below, including sign language)

ii. Speaks more than one language (please list the languages below, including sign languages)

iii. Preverbal / nonverbal

e. Does your child interact with this person:

i. In-person only

ii. Virtually only (e.g., over Zoom or video chats)

iii. Both virtually and in-person