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The Development of Social Exclusion Detection in Early Childhood: Awareness of Social Exclusion Does Not Always Align with Social Preferences

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Abstract

Starting in the preschool years, children show socially exclusive behaviors, such as intentionally leaving out another child from a ball game. Prior research investigating social exclusion understanding in preschoolers primarily used interview methods and it is clear that the verbal and cognitive skills necessary to identify and reason about social exclusion become more sophisticated with age. Yet it is unknown how children's ability to identify social exclusion relates to their own behavior, such as their social preference for socially inclusive or exclusive individuals. Further, whether such social preferences remain stable or change across development is an open question. Thus, the current study investigated whether the ability to identify social exclusion develops in tandem with social preference behavior by assessing 3- to 6-year-old children's (N = 256) identification of social exclusion and preferences between socially exclusive and inclusive agents. Five- to six-year-old children correctly identified social exclusion and preferred inclusive agents over exclusive agents across two experiments. Three- to four-year-old children could correctly identify social exclusion, but did not show evidence of a preference for inclusive agents over exclusive agents. Children were also able to detect implicit, nonverbalized social exclusion equally well as explicit, verbalized social exclusion across development. These findings suggest that young children's social preferences are not wholly dictated by their ability to identify socially exclusive agents. This divergent pattern of social preference from identification has implications for interpreting social preference behavior in young children.

Keywords

social exclusion; ostracism; social cognition; social preference

Feeling excluded from a group is a common human experience that begins in childhood. To what extent are young children aware of being excluded and how does their behavior in response to social exclusion change with development? It is important to identify the typical developmental trajectory of children's responses to social exclusion because difficulties with social exclusive behaviors and relational aggression – behavior intended to exclude or hurt

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others through non-physical manipulation, threat, or damage to close relationships and social status (Crick, Casas, & Mosher, 1997) – are related to difficulties in social, emotional, and cognitive development, as well as future school adjustment and success (Burk et al., 2011; Card, Stucky, Sawalani, & Little, 2008; Crick et al., 2006).

The extant literature suggests that the earliest signs of exclusionary behavior and relational aggression are observed in the preschool years (Crick et al., 1997; Crick, Casas, & Ku, 1999; Crick et al., 2006). Extensive research in moral development, especially in social domain theory (Smetana, Jambon, & Ball, 2014) and social reasoning developmental perspective (Killen & Smetana, 2015; Rutland, Killen, & Abrams, 2010), using interview methods find that children's reasoning about social exclusion becomes more sophisticated from early to middle childhood. For instance, younger preschoolers tend to verbally justify their judgements of social exclusion on unidimensional moral concerns (e.g., "Excluding someone is bad"), whereas older preschoolers and school age children tend to incorporate more multidimensional factors, such as intergroup dynamics and group loyalty as well as the intention of the group in their judgements (e.g., "You can't be part of the team because you are not a good player") (see Killen & Rutland, 2011, for a review). It is important to note that there are contexts in which it is perfectly appropriate to exclude someone based on concerns about group functioning (e.g., picking an Olympic team), but there are also contexts in which someone is excluded for unjust reasons (e.g., rejection due to gender, race, or ethnicity). Thus, children need to assess the intention behind the exclusion situation to correctly evaluate whether exclusion was justified or not. It is clear that evaluating such intentional issues require more sophisticated socio-cognitive abilities that develop with age.

However, little is known about the more basic skill of when children can detect social exclusion and how they respond to experiencing exclusion. The current study aims to investigate not the development of sophisticated moral reasoning, but the more primitive but fundamental skill of noticing when exclusion has occurred. Past research suggests there are age-related differences in children's verbal abilities to identify bullies and targets of bullying in their classrooms from early preschool years (3- to 4-years of age) to later preschool years (5- to 6-years of age) (for reviews, see Card et al., 2008; Vlachou, Andreou, Botsoglou, & Didaskalou, 2011). Younger preschoolers tend to show more difficulty recognizing and reporting relational and nonphysical forms of bullying (e.g., ignoring others) compared to physically aggressive forms of bullying (e.g., hitting others). Further, more sophisticated language skills have been associated with greater instances of relational aggression, suggesting that language skills are linked to children's ability to understand social exclusion (Bonica, Arnold, Fisher, Zeljo, & Yershova, 2003; Shahaeian, Razmjoee, Wang, Elliott, & Hughes, 2017).

In addition to these interview-based methods of assessing preschoolers' understanding of social exclusion, recent work has examined young children's behavioral responses to social exclusion. In these studies, children's behaviors are assessed after being primed with social exclusion (Over & Carpenter, 2009; Song, Over, & Carpenter, 2015; Watson-Jones, Legare, Whitehouse, & Clegg, 2014; Watson-Jones, Whitehouse, & Legare, 2015). In these studies, 3- to 6-year-old children are primed by watching videos of abstract shapes that either exclude or include another shape. When primed with exclusion, children tended to

imitate an experimenter's actions more faithfully and draw individuals closer together than when primed with inclusion. These studies suggest some age-related differences, with older preschoolers showing greater effects of exclusion; however, younger preschoolers do show robust responses to social exclusion as well in these paradigms. Additionally, by ages 3 and 4, children demonstrate an awareness of group norms, joint commitments, and group loyalty (Gräfenhain, Behne, Carpenter, & Tomasello, 2009; Rakoczy & Schmidt, 2013; Misch, Over, & Carpenter, 2014), suggesting that even younger preschoolers are aware of group dynamics.

Another piece of evidence that suggests there is an early emerging ability to detect social exclusion comes from findings that infants can discriminate positive and negative social interactions. Six- and ten-month-old infants preferentially reach for an agent that previously helped someone achieve their goal (i.e., prosocial agent) over one who hindered it (i.e., antisocial agent) (Hamlin, Wynn, & Bloom, 2007; Hamlin, Wynn, Bloom, & Mahajan, 2011). Fifteen-month-old infants also prefer individuals who distributed resources fairly over those who distributed unfairly (Burns & Sommerville, 2014; Geraci & Surian, 2011; Schmidt & Sommerville, 2011). One recent study found that 3-year-old children – but not 2-year-olds – preferred agents who were excluded by others over agents who excluded others (Hwang, Marrus, Irvin, & Markson, 2017). Thus, infancy research suggests preferences may reveal children's understanding of complex social interactions before they are able to verbally articulate it.

Thus, previous research suggests it is possible that the avoidance of individuals who exclude others and a preference for individuals who include others may emerge early in childhood. Thus, testing children's preference for socially inclusive individuals across ages will help to elucidate the developmental trajectory of children's responses to social exclusion. In the current study, we specifically tested younger preschoolers (3- to 4-year-olds) compared to older preschoolers (5- to 6-year-olds) to determine how children's ability to identify social exclusion converges or diverges from their preference behavior toward socially inclusive and exclusive others.

In addition to potential developmental differences between identification and social preference behavior, how well children detect social exclusion could depend on how explicitly or implicitly exclusion is communicated. Specifically, past research suggests that there may be differences in how well children can detect social exclusion that occurs explicitly (e.g., a group directly telling children they cannot play) versus implicitly (e.g., a group not tossing the ball to the children, but not verbally telling them they cannot play). As reviewed above, prior research suggests that younger preschool age children may have more difficulty recognizing nonverbal or nonphysical forms of bullying than older preschool age children (see Card et al., 2008). Younger preschoolers also exhibit relatively simple and direct relational aggression, such as directly telling a peer they cannot play with them, whereas older preschoolers and school age children start to show more complicated relational aggression, such as playing nice upfront but disseminating malicious rumors behind the back (Crick et al., 1999; Card et al., 2008). Thus, verbalized or explicit social exclusion may be detected earlier in development than nonverbalized or implicit social exclusion.

The present study aims to trace how social exclusion detection emerges in development using a multi-method approach and to clarify how children's ability to identify social exclusion may converge or diverge from their social preference behavior. Specifically, the present study tested whether 3- to 6-year-old children show differences in their identification of exclusion and social preferences toward socially inclusive or exclusive agents when they experience explicit, verbalized exclusion compared to implicit, nonverbalized exclusion. Two different paradigms, a live puppet paradigm (Experiment 1) and a virtual ball game paradigm (Experiment 2), were used to elicit social exclusion.

We hypothesized that children would identify explicit, verbalized exclusion at an earlier age than implicit, nonverbalized exclusion because younger preschoolers (3- to 4-year-olds) have more difficulty recognizing relational bullying than older preschoolers (5- to 6-year-olds). We also hypothesized that younger preschoolers may not be able to correctly identify socially exclusive agents but would robustly prefer socially inclusive agents over socially exclusive agents. In contrast, we hypothesized that older preschoolers would correctly identify social exclusion and also robustly prefer socially inclusive agents over socially exclusive agents. Data, experiment materials, and data analysis scripts from this study can be found on Open Science Framework (OSF): https://osf.io/7re9t/

Experiment 1a: Implicit Social Exclusion

Experiment 1a used a live, interactive puppet paradigm to test whether 3- to 6-year-old children show differing verbal identification and preference responses after experiencing exclusion compared to inclusion when intentions of the agents are implicit (i.e., not verbally stated).

Method

Participants.—The final sample consisted of 96 children: 32 3-year-old children (15 females, M_{age} = 3;5, range = 3;0–3;10), 32 4-year-old children (17 females, M_{age} = 4;6, range = 4;0–4;11), and 32 5- to 6-year-old children (14 females, M_{age} = 5;8, range = 5;0–6;9). Eight additional children were tested but excluded from the final sample due to parental interference (n = 1), experimenter error (n = 3), or failure to complete the study (n = 4). A sample size of 32 for each age group was chosen based on previous research that used preference measures to investigate children's response to prosocial and antisocial agents (Burns & Sommerville, 2014; Hamlin et al., 2007, 2011; Hwang et al., 2017).

Children were recruited from a database of families interested in participating in research from a midwestern United States metropolitan area. All children were tested in the laboratory. The racial and ethnic composition of the children were 77.08% White, 15.63% bi- or multi-racial, 2.08% other, 1.04% Black, 1.04% Hispanic, and 1.04% Asian. In this experiment and all subsequent experiments, children were from families with an average yearly income bracket of $75,000 to $100,000 and all parents reported having some college education.

Materials.—Stimuli included one ball (3 × 3.5 in) and four identical hippopotamus puppets (5 × 9 in). Two of the puppets wore black shirts and the other two wore brown shirts.

The shirt colors were counterbalanced: For half of the children, puppets with black shirts excluded them from a ball game and puppets with brown shirts included them, whereas the reverse was true for the other half of the children. Parents completed a form which asked for basic demographic information (as reported above) and were also asked to indicate whether their child had a sibling and estimate how many hours a week their child consistently attended preschool, daycare, classes, playgroups, or other social activities.

Design & Procedure.—Children sat in front of a table (41.5 × 48 in) facing a curtain. Two puppeteers sat behind the curtains so that children saw only the puppets and not the puppeteers (see Figure 1A). The four puppets were approximately 48 inches from the children and the positions of the puppets – whether brown shirt puppets were on children's left or right – were counterbalanced between children. If parents were present in the testing room, they sat 3 feet directly behind the children and were instructed to not talk or influence their children during the experimental session.

First, the experimenter waved hello to the puppets and introduced children to the puppets. The experimenter then said, "Why don't we play with the brown/black hippos first? Brown/black hippos, do you guys want to play a ball game with [child's name]?" After the puppets nodded, the experimenter gave the ball to the first puppet pair. Children played the ball game with one pair at a time. Which puppets (brown or black shirts) played first was counterbalanced across children.

Children experienced two ball games, one inclusive and the other exclusive. The order of the ball games (inclusion first or exclusion first) was counterbalanced across children. For both inclusion and exclusion games, the initial interaction was identical: The puppet who received the ball from the experimenter always passed the ball first to its partner puppet; then this partner puppet passed the ball to the children. Children were then encouraged to throw the ball back to the puppets. In the inclusion game, puppets continued to pass the ball equally to each other and to the children for another six tosses; children received the ball twice during this part of the game. In total, children received the ball three times in the inclusion game. In the exclusion game, puppets stopped tossing the ball to the children and only tossed the ball to each other for another six tosses. Thus, children received the ball only once in the exclusion game. Each game lasted approximately 40 seconds.

After children played with both pairs, a second experimenter who was blind to the puppets' roles entered the test room and asked children the *preference* question: "Now that you got to play with both pairs, which hippos do you like?" Children were encouraged to point to the pair they liked. Children were then asked the *identification* question: "Which ones did not want to play with you?" Children were again encouraged to point to indicate their answers. The preference question was always asked first and the identification question second to keep the identification question from influencing children's preferences. After children's choices, the exclusive pair apologized to the children and played a few tosses with the children to ensure they left on a positive note.

Results

Generalized linear mixed models (GLMM; Baayen, Davidson, & Bates, 2008) were conducted first as this method of analysis is well-suited for binary outcomes and allowed us to treat age as a continuous variable. Age in months, task type (preference vs. identification), and the interaction of task type and age were entered into the models as fixed effect predictors of children's binary responses. Random intercepts for participant ID were entered as random effects to the model to account for dependencies within participants. Preliminary analyses were conducted using the likelihood ratio tests (Dobson, 2002) to determine whether children having a sibling, number of social activity hours per week, order of the games (inclusion or exclusion first), shirt color (brown or black), positions of the puppets (left or right), or children's sex improved the fit of the model beyond the main hypothesized predictors. None of these factors improved the main model in this experiment or the subsequent experiment (see OSF supplementary analyses).

There was a significant main effect of age ($Z = 2.354$, $p = .019$), indicating that children were more likely to prefer the inclusive puppet and correctly identify the exclusive puppet with age. However, there was no main effect of task type ($Z = 1.207$, $p = .227$), suggesting children's performance in the preference and identification tasks did not differ. There was no significant interaction between task type and age ($Z = -1.611$, $p = .107$). See Table 1 for the β, standard errors, *Z*, *p,* odds ratios (OR), and 95% confidence interval OR values of the best-fit model.

Follow-up binomial tests were conducted to further clarify children's responses by age group. Because it was hypothesized that children should prefer inclusive over exclusive puppets and should correctly identify exclusive puppets above chance, the following binomial tests were conducted as one-tailed tests.

Preference.—Three-year-old children did not show a clear preference: 56.25% (18 out of 32) chose the inclusive puppets (one-tailed binomial test, $p = .298$). Four-year-old children also did not show a clear preference: 53.13% (17 out of 32) chose the inclusive puppets (one-tailed binomial test, $p = .430$). However, 5- to 6-year-old children showed a significant preference for inclusive puppets over exclusive puppets with 71.88% (23 out of 32) choosing the inclusive puppets (one-tailed binomial test, $p = .010$).

Identification.—Three-year-old children were unable to correctly identify the exclusive puppets above chance: Only 31.25% (10 out of 32) correctly identified the exclusive puppets (one-tailed binomial test, $p = .990$). Four-year-old children also could not accurately detect the exclusive puppets above chance: Only 56.25% (18 out of 32) correctly identified the exclusive puppets (one-tailed binomial test, $p = .298$). In contrast, 5- to 6-year-old children were above chance at correctly identifying the exclusive puppets with 68.75% (22 out of 32) correctly identifying the exclusive puppets (one-tailed binomial test, $p = .025$).

Discussion

Five- to six-year-old children significantly preferred puppets who included them over those who excluded them and correctly identified which puppets excluded them above chance. In

contrast, 3- to 4-year-old children did not show a clear preference for puppets who included them and were also unable to correctly identify which puppets excluded them, suggesting they had difficulty detecting and responding to implicit social exclusion.

To test whether 3- to 4-year-old children failed to show a significant preference for inclusive agents and correct identification of exclusive agents due to the nonverbal nature of implicit exclusion and the intentions of the puppets being more ambiguous in implicit exclusion, a subsequent study used the same puppet paradigm but with puppets verbally expressing their intention to exclude children. We predicted that when exclusion is verbal and explicit, even 3-year-old children would be sensitive to it and perform above chance in the preference task and potentially in the identification task.

Experiment 1b: Explicit Social Exclusion

Experiment 1b tested whether 3-year-old children would significantly prefer inclusive puppets and correctly identify exclusive puppets if exclusion was communicated verbally.

Method

Participants.—The final sample consisted of 32 3-year-old children (15 females, M_{age} = 3;5, range = 3;0–3;9). Two additional children were tested but excluded from the final sample due to failure to complete the study. Children were recruited from the same database and tested in the same laboratory as Experiment 1a. The racial and ethnic composition of the children were 87.5% White, 6.25% Black, and 6.25% bi- or multi-racial.

Procedure.—Children experienced the same procedure and design as in Experiment 1a, except in this experiment the puppets indicated their intention to include or exclude verbally. Specifically, after the first round of ball tosses (i.e., after receiving a ball toss from the children), the inclusive puppets each said, “Let’s keep playing together,” to the children and continued to pass the ball to the children as in Experiment 1a. In contrast, the exclusive puppets each said, “We don’t want to play with you anymore,” to the children and only passed the ball to each other and never to the children. This experiment again lasted around 40 seconds, identical to Experiment 1a.

Results

Preference & Identification.—GLMMs were constructed in the same manner as Experiment 1a. See Table 1 for the full results of the best-fit model. There was a significant main effect of age (Z = 2.575, p = .010), indicating that even within the 3-year-old age group, children were more likely to prefer the inclusive puppet and correctly identify the exclusive puppet with age. There was a marginally significant main effect of task type (Z = −1.866, p = .062), such that contrary to the hypothesis, children showed marginally better *verbal* identification of exclusive puppets than *preference* for inclusive puppets after explicit exclusion. There was no significant interaction between task type and age (Z = .984, p = .325).

Follow-up one-tailed binomial tests corroborated the marginally significant main effect of task type. Three-year-old children did not show a significant preference: Only 50% (16 out

of 32) preferred inclusive puppets (one-tailed binomial test, $p = .570$). However, they were above chance at correctly identifying the exclusive puppets: 71.88% (23 out of 32) correctly identified the exclusive puppets (one-tailed binomial test, $p = .010$).

Comparing Explicit vs. Implicit Exclusion.—We also compared whether children showed greater differentiation of inclusive and exclusive puppets after experiencing explicit exclusion compared to implicit exclusion. Comparison was limited to 3-year-old children as older children were not tested in explicit exclusion. GLMM was constructed with task type (preference vs. identification), exclusion type (implicit or explicit), age, and the interaction of task type and exclusion type as fixed effect predictors. Random intercepts for participant ID were entered as random effects to the model.

There was a significant interaction between task type and exclusion type ($Z = -2.638$, $p = .008$), but no other significant effects (see OSF supplementary analyses). Follow-up analyses indicated that 3-year-old children's preferences did not differ between explicit and implicit exclusion (two-tailed Fisher's exact test, $p = .595$), but 3-year-old children were significantly more likely to correctly identify exclusive puppets after explicit than implicit exclusion (two-tailed Fisher's exact test, $p < .001$).

Discussion

After experiencing explicit social exclusion, 3-year-old children correctly identified the exclusive puppets above chance and did so significantly more after explicit than implicit social exclusion. This finding is in line with previous research that find children as young as 3½ years of age can verbally report explicit, verbalized social exclusion is wrong and unfair (Rizzo & Killen, 2016; Theimer, Killen, & Stangor, 2001). However, 3-year-old children were *not* more likely to prefer the inclusive puppets over the exclusive puppets after exclusion and this preference did not differ between explicit and implicit social exclusion.

It is quite surprising that 3-year-old children did not prefer the explicitly inclusive puppets over the explicitly exclusive puppets, especially when they could correctly identify the explicitly exclusive puppets. This finding is contrary to our hypotheses based on previous research (e.g., Hamlin et al., 2007, 2011), in which even infants show a preference for prosocial agents over antisocial agents. It is possible that our preference question, which asked whom the children *liked*, caused children to respond more arbitrarily than a preference question about future partnership or playmate (e.g., "Which one do you want to play with?") that has been used in other preference-based studies (e.g., Hwang et al., 2017). Further, although puppets have been shown to be treated as agents by children (e.g., Johnson, Slaughter, & Carey, 1998), puppets are not the same as human agents, especially human peers. Another possibility is that younger children may have viewed the puppets as performing a show rather than processing the social interaction with the puppets as a personal experience. Thus, it is critical to establish whether children's performance observed in Experiments 1a and 1b extends and generalizes to human agents.

Another important limitation is that the preference question was always asked first and the identification question second in Experiments 1a and 1b. This ordering was done to prevent the identification question from influencing the preference responses, but it is feasible that

young children performed better on a question that was asked second due to practice effects or they simply alternated their answers from question to question. However, because 5- to 6-year-old children performed well despite the fixed task order suggests task order was not the sole cause of these different patterns. Experiments 1a and 1b also tested children on only one trial and the interaction between the puppets and children was relatively short (about 40 seconds); thus, this short time may have not been sufficient for younger children to fully feel excluded and may have limited children's opportunity to demonstrate their true understanding.

Another possible explanation for why 3-year-old children succeeded in explicit exclusion but not implicit exclusion is that they were simply repeating the statements of the exclusive puppets ("We don't want to play with you anymore") after explicit exclusion. Therefore, Experiment 2 tested whether the patterns observed in Experiments 1a and 1b are replicated with the methodological limitations addressed and extended to when children are responding to human agents.

We addressed these limitations in Experiment 2 by changing the social preference question from asking children which agents *they liked* to which agents *they would like to play with*. We also changed the identification question so that children were asked about which agents *did not share the ball* rather than which agents *did not want to play*. Additionally, we counterbalanced the task order and increased the ball game time and number of trials.

Another important extension in Experiment 2 was addressing the design of Experiments 1a and 1b that only allowed a direct comparison of exclusive versus inclusive individuals. In Experiments 1a and 1b, children's choice of an inclusive individual over an exclusive individual does not reveal whether this is due to a preference for inclusive individuals or avoidance of exclusive individuals. Comparing an exclusive individual to a neutral individual can determine whether children are actively avoiding exclusive individuals; similarly, comparing an inclusive individual to a neutral individual can clarify if children show a preference for inclusive individuals over a neutral individual. Therefore, in Experiment 2, children were asked to choose between exclusive versus neutral individuals and between inclusive versus neutral individuals. Experiment 2 also incorporated more measures of children's social behavior by adding a resource allocation task (which is closely aligned with preferences, see Renno & Shutts, 2015) and an evaluation task to further clarify the relation between identification and preference measures.

Experiment 2

Experiment 2 investigated whether 3- to 6-year-old children show different responses in preference and resource allocation tasks compared to identification and evaluation tasks after exclusion when the intentions of the agents are explicit versus implicit. We predicted that children should show more discernment in preference tasks and resource allocation tasks than in identification and evaluation tasks. Specifically, we hypothesized that 5- to 6-year-old children should significantly differentiate exclusive players from inclusive players in all the tasks and in both implicit and explicit conditions. We predicted that 3- to 4-year-old children would show more difficulty with implicit exclusion than explicit exclusion and

especially difficulty in the identification and evaluation tasks compared to preference and resource allocation tasks.

Method

Participants.—The final sample consisted of 128 children: 64 3- to 4-year-old children (33 females, M_{age} = 3;10, range = 2;8–4;9) and 64 5- to 6-year-old children (33 females, M_{age} = 5;7 months, range = 5;0–6;8). Eight additional participants were tested but excluded from the final sample due to program error. Children were recruited and tested in a quiet area in the laboratory, their preschool, or a local science center in the same Midwestern city in the U.S. as Experiments 1a and 1b. In all locations, children were seated in front of a touch-screen laptop. If parents were present, they were seated behind their children and instructed not to influence them. The racial and ethnic composition of the children were 73.44% White, 10.16% bi- or multi-racial, 7.03% Black, 2.34% Hispanic, 3.91% Asian, 1.56% other, and 1.56% not reported.

Materials

Cyberball.—One of the most widely used experimental method to study adults' responses to social exclusion is Cyberball (Williams, Cheung, & Choi, 2000), and there has been great interest in using Cyberball with children (Scheithauer, Alsaker, Wölfer, & Ruggieri, 2013; Zadro et al., 2013). Cyberball has been used successfully with school age children, who report lower moods and more threats to their need to belong after an exclusive game than an inclusive game, replicating findings from adults (Abrams, Weick, Thomas, Colbe, & Franklin, 2011; Hawes et al., 2012; Watson-Jones et al., 2015). We developed an age-appropriate Cyberball paradigm for preschool age children on Psychopy (Peirce, 2007) that was presented on a touch-screen laptop; see Figure 1B. In this version of Cyberball, children saw pictures of two children, one on the left side and the other on the right side of the screen, each with an accompanying baseball glove. On the screen there was also a baseball glove in the center of the screen with children's names below. A ball appeared always in possession of the other two players at the beginning of the game. Children could only toss the ball to other players when the ball was in their glove. To toss the ball, children had to touch the picture of the player they wanted to toss the ball to.

Demographic Questionnaire.—Basic demographic information was collected using the same questionnaire as in Experiments 1a and 1b, with the exception that this questionnaire also asked the number of siblings each participant had.

Design.—Game type (exclusion vs. inclusion) was a within-subject factor. All children played two inclusion and two exclusion games. In the inclusion game, children received one third of the total ball tosses (3 out of 9 total tosses) throughout the game. In the exclusion game, children received only one ball toss throughout the game. The game order was counterbalanced across participants but designed to ensure the games alternated between exclusion and inclusion.

Condition (implicit vs. explicit) was a between-subject factor. Half of the children were randomly assigned to the implicit condition and the other half to explicit condition. In the

implicit condition, players did not talk to the children. In the explicit condition, players talked to the children. In the explicit inclusive games, after receiving the first ball toss, children heard the other players each say, “Let’s keep playing together!” twice (for a total of four times) to communicate that the other players wanted to include the children in the game. In the explicit exclusive games, children heard the other players say, “We don’t want to play with you!” four times to communicate that they wanted to exclude children from the game. Four 5- to 10-year-old children (two boys and two girls) recorded the voice clips for use in the study; each child recorded both the inclusive and exclusive voice clips so that the voices could be counterbalanced across the games. To prepare children for the explicit condition, children were told the other players will sometimes talk to them during the game. All other aspects of the procedure were identical between implicit and explicit conditions.

Procedure.—Children first played a warm-up Cyberball game with cartoon characters to familiarize them with the controls of the game. Children were tossed the ball twice out of five tosses in this familiarization game and practiced the preference, resource allocation, identification, and evaluation tasks with the cartoon characters. After the familiarization game, children were told they would be connected to other children players and would play four ball tossing games with different players. Children then saw photographs of two children, whom the experimenter introduced as other children who were going to play the game with them. The other players always matched the gender of the participating child. Each game lasted approximately 1 minute.

Immediately after playing the game, children saw four photographs: two photographs of the players children just played with (*previous players*) and two photographs of players children had not played with (*new players*). Photographs of the players were matched in attractiveness, emotional expressions, and friendliness by adult raters and were counterbalanced across participants. The experimenter reminded children which players they just played with and which ones were new players. The experimenter then administered the preference, resource allocation, identification, and evaluation tasks. The order of these tasks was counterbalanced across participants.

Preference Task.—Children were asked, “If you had a chance to play again, which ones do you to want to play with?” and to indicate their choice by touching the photographs of the players they would like to play with. After their choice, children were asked why they wanted to play with the pair they chose.

Resource Allocation Task.—Children saw three stickers appear on the screen and a basket in front of each pair. Children were instructed to distribute the stickers between the two pairs by touching the basket of the pair they want to give each sticker to. After children finished distributing the stickers, they were asked why they chose to give more stickers to one of the pairs.

Identification & Evaluation Tasks.—The experimenter pointed to the previous players and asked children the following questions. In the *identification* question, children were asked, “Did these players share or not share the ball with you?” For the *evaluation* question,

children were asked, “Were these players nice or mean?” The order of the words (whether “share”/”nice” or “not share”/”mean” came first) were counterbalanced across children.

Children then proceeded to the next game until all four games (two inclusion and two exclusion) were completed. For each game, children saw different players, with pictures of the players paired with game type counterbalanced across children. Results of children’s spontaneous comments during game play and justifications after the preference and resource allocation tasks can be found in OSF supplementary analyses.

Results

First, GLMMs were constructed to treat age as a continuous variable and to determine whether age and condition (implicit vs. explicit) affects how well children can discriminate exclusion from inclusion in each task. GLMMs were constructed for each task type. Binomial probability distributions were used to analyze preference, identification, and evaluation tasks. Poisson distribution was used for the resource allocation task because the dependent variable ranged from 0 to 3. The main hypothesized variables of condition (explicit vs. implicit), game type (inclusion vs. exclusion), children’s age (in months), and interaction of these terms were entered into the models as fixed effect predictors. Age was centered at the mean value of 58.06 months to help model convergence. As random effects, random intercepts were entered for participant ID nested within testing location to account for dependencies within participants and testing locations.

Second, Fisher’s exact tests were conducted for each task according to age group (3- to 4-year-old vs. 5- to 6-year-old) to compare whether in each age group children showed different patterns in exclusion games compared to inclusion games. Lastly, one-sample t tests were conducted per task and according to age group to determine whether children perform above chance in exclusion games and inclusion games.

Preliminary analyses were conducted to determine whether trial number, task order, children’s sex, number of siblings, and the number of social activity hours per week improved model fit beyond the hypothesized predictors (see OSF supplementary analyses for the full models); significant effects are mentioned in the individual task sections below.

Contrary to our hypotheses, there were no significant three-way interactions among age, condition, and game type in all the tasks (βs < .06, SEs < .11, Zs < .70; ps > .072). See Table 2 for the best-fit model results for each task, Figure 2 for the representation of best-fit models for each task, and Table 3 for means and standard deviations according to age group, game type, and exclusion type.

Preference Task.—There was a significant main effect of game type (β = 1.66, SE = .36, Z = 4.56, p < .001) indicating that children preferred previous players more than new players after inclusion games than exclusion games. This main effect was subsumed by a significant interaction between game type and age (β = .068, SE = .029, Z = 2.30, p = .021). Follow up analyses of this significant interaction using simple slope analyses indicated that with age, children were more likely to prefer previous players compared to new players after inclusive

games (β = .05, SE = .02, Z = 2.52, p =.01) but showed no age-related differences after exclusive games (β = −.04, SE = .03, Z = −1.23, p =.22).

Three- to four-year-old children chose new players regardless of game type (two-tailed Fisher's exact test, p =.048). However, 5- to 6-year-old children chose the previous players significantly more after inclusive games than exclusive games (two-tailed Fisher's exact test, p < .001). Comparing children's player preferences to chance (.5) indicated that children tended to avoid playing again with previous players overall. Three- to four-year-old children were below chance for preferring previous players after exclusion games (M_{prev} = .06; $t(62^1)$ = 22.27, p < .001, d = 2.81) and inclusion games (M_{prev} = .14; $t(62)$ = 11.04, p < .001, d = 1.40). Five- to six-year-old children were also below chance for preferring to play with previous players after exclusion games (M_{prev} = .05; $t(63)$ = 24.68, p < .001, d = 3.08) and inclusion games (M_{prev} = .25; $t(63)$ = 5.02, p < .001, d = .63). Overall 87.8% of children preferred new players in the preference task.

Resource Allocation Task.—There were significant main effects of game type (β = .41, SE = .08, Z = 5.01, p < .001) and age (β = −.01, SE = .003, Z = −3.22, p = .001) that were subsumed by a significant interaction between game type and age (β = .02, SE = .007, Z = 2.89, p = .004). Simple slope analyses indicated that with age, children gave fewer stickers to previous players compared to new players after exclusive games (β = −.02, SE = .01, Z = −4.26, p < .001) but showed no age-related changes after inclusive games (β < .001, SE < .001, Z = −.66, p = .51).

Both 3- to 4-year-old and 5- to 6-year-old children gave more stickers to previous players after inclusive games than exclusive games (two-tailed Fisher's exact test, ps < .003) suggesting that children at both age groups were able to allocate their resources according to whether previous players were inclusive or exclusive. Both age groups also gave less stickers to previous players than would be predicted by chance (i.e., less than 1.5 stickers out of 3 stickers) after exclusion games (3- to 4-year-old: M_{prev} = 1.23; $t(63)$ = 3.28, p = .002, d = .41; 5- to 6-year-old: M_{prev} = .79; $t(63)$ = 9.14, p < .001, d = 1.14). However, children's sticker distribution did not differ from chance after inclusion games (3- to 4-year-old: M_{prev} = 1.56; $t(62)$ = .50, p = .619, d = .06; 5- to 6-year-old: M_{prev} = 1.48; $t(62)$ = .32, p = .753, d = .04).

Additionally, there was a significant main effect of condition (β = .19, SE = .08, Z = 2.32, p = .020) indicating that children gave more stickers to previous players compared to new players in the implicit condition (M = 1.36; SD = .77) than explicit condition (M = 1.15; SD = .75). There was also a significant effect of number of siblings (β = −.13, SE = .05, Z = −2.44, p = .015) suggesting that children who had more siblings were less likely to give stickers to previous players compared to new players.

Identification Task.—There were again significant main effects of game type (β = 6.76, SE = .91, Z = 7.48, p < .001) and age (β = −.11, SE = .03, Z = −4.11, p < .001) that were subsumed by a significant interaction between game type and age (β = .26, SE = .06, Z = 4.37, Z = 4.37, p < .001). Simple slope analyses indicated that with age children were more

likely to report previous players did not share after exclusive games ($\beta = -.19$, $SE < .001$, $Z = -178.44$, $p < .001$) but showed no age-related changes after inclusive games ($\beta = .03$, $SE = .04$, $Z = .64$, $p = .52$).

Both 3- to 4-year-old and 5- to 6-year-old children showed a significant difference in responding based on game type (two-tailed Fisher's exact test, $ps < .001$). This pattern suggests that children in both age groups were significantly more likely to identify previous players did not share after exclusion games compared to inclusion games.

Three- to four-year-old children's responses were at chance (.5) at reporting previous players did not share after exclusion games ($M_{\text{not shared}} = .54$; $t(63) = .70$, $p = .49$, $d = .09$). Five- to six-year-old children were above chance (.5) at reporting that previous players did not share after exclusion games ($M_{\text{not shared}} = .91$; $t(63) = 11.61$, $p < .001$, $d = 1.45$). Both age groups were above chance (.5) at reporting previous players shared after inclusion games (3- to 4-year-old: $M_{\text{shared}} = .93$; $t(63) = 17.49$, $p < .001$, $d = 2.19$; 5- to 6-year-old: $M_{\text{shared}} = .94$; $t(63) = 21$, $p < .001$, $d = 2.63$). Notably, 3- to 4-year-old preschoolers were more likely to respond that previous players "shared" (69.4%) than "not shared" (30.6%) regardless of game type.

Additionally, there was a marginally significant effect of trial number ($\beta = -.31$, $SE = .16$, $Z = -1.90$, $p = .057$) such that children were marginally more likely to report previous players did not share in the later trials.

Evaluation Task.—There were significant main effects of game type ($\beta = 5.80$, $SE = .47$, $Z\,Z = 12.31$, $p < .001$) and age ($\beta = -.10$, $SE = .024$, $Z = -4.09$, $p < .001$) that were subsumed by a significant interaction between game type and age ($\beta = .31$, $SE = .06$, $Z = 5.589$, $p < .001$). Simple slope analyses indicated that with age, children were more likely to negatively evaluate previous players after exclusive games ($\beta = -.28$, $SE = .05$, $Z = -5.04$, $p < .001$), but no age-related changes after inclusive games ($\beta = .03$, $SE = .05$, $Z = .66$, $p = .51$).

Both 3- to 4-year-old and 5- to 6-year-old children showed a significant difference in responding based on game type (two-tailed Fisher's exact test, $ps < .001$) indicating that children in both age groups were significantly more likely to identify previous players as mean after exclusion games than inclusion games.

Three- to four-year-old children's responses were at chance (.5) after exclusion games ($M_{\text{mean}} = .50$; $t(63) < .001$, $p = 1.00$, $d < .001$). Five- to six-year-old children were above chance (.5) at reporting previous players were mean after exclusion games ($M_{\text{mean}} = .88$; $t(63) = 10.03$, $p < .001$, $d = 1.25$). Both age groups were above chance (.5) at reporting that previous players were nice after inclusion games (3- to 4-year-old: $M_{\text{nice}} = .88$; $t(63) = 11.627$, $p < .001$, $d = 1.45$; 5- to 6-year-old: $M_{\text{nice}} = .92$; $t(63) = 16.58$, $p < .001$, $d = 2.07$). Overall, 3- to 4-year-old children were more likely to respond that previous players were "nice" (69 %) than "mean" (31%) regardless of whether players were exclusive or inclusive.

Additionally, there was a significant interaction between condition and game type (β = −2.24, SE =1.14, Z = −1.97, p = .049). Follow-up analyses revealed that children were more likely to report exclusive players as mean in the explicit condition than implicit condition (two-tailed Fisher's exact tests, p = .042), but did not show a difference in their evaluation of inclusive players according to condition (two-tailed Fisher's exact tests, p = .675). There was also a significant main effect of trial number (β = −.33, SE = .16, Z = −2.10, p = .036) that indicated children were more likely to report previous players were mean in the later trials.

Discussion

As expected, a consistent improvement with age was observed across all tasks. This age-related development supports previous research showing that older preschool age children are better at identifying relationally aggressive individuals than younger preschool age children (Card et al., 2008; Monk & Smith, 2006). In the resource allocation, identification, and evaluation tasks, children showed more discernment with age after exclusive games, whereas there was no effect of age after inclusive games. In the preference task, the reverse was true, with children showing more discernment with age after inclusive games, but no effect of age after exclusive games.

This different pattern of results for the preference task compared to other tasks may be due to children's preference for novelty. Children had a strong tendency to choose the new players over the previous players to play with next regardless of game type or age. This novelty preference may not have allowed children to avoid the previous player and choose the new player more after exclusion games due to the ceiling effect of preferring new players (see Figure 2 preference task; the red line indicates responses after exclusion games). However, children still showed a significant age-related change in preference to play with previous players over new players after inclusion games suggesting that older children were clearly able to change their preference behaviors according to the game they experienced. On the other hand, 3- to 4-year-old children did not show a significantly different response pattern between exclusion and inclusion games, suggesting that younger children show no difference in preference behaviors according to whether they experienced inclusion or exclusion.

In the resource allocation, identification, and evaluation tasks, children were more likely to act negatively toward previous players after exclusion games with age but showed no age-related changes after inclusion games. Such a response pattern may be due to younger preschoolers showing a positivity bias: Younger preschoolers were more likely to respond with positive ("shared" or "nice") than negative answers ("not share" or "mean"). This pattern can be clearly seen in Figure 2, in which younger children tend to choose "shared" and "nice" regardless of game type. Preschoolers – especially 3 to 4-year-old children – tend to show a positivity bias when assessing individuals (see Boseovski, 2010 for a review). Preschoolers also tend to distribute resources equally if possible (e.g., Olson & Spelke, 2008). These tendencies may explain why there were no age-related changes in children's treatment of inclusive players in the resource allocation, identification, and evaluation tasks. Nonetheless, the Fisher's exact test results show that despite these tendencies, both younger

and older children showed significantly different responses when responding to exclusion games compared to inclusion games in the identification and evaluation tasks.

Further, it was expected that children would be better at detecting explicit exclusion than implicit exclusion, yet there was little difference in children's responses according to whether exclusion was explicit or implicit. Children did evaluate exclusive players more harshly after explicit exclusion than implicit exclusion. This result may be because they felt more justified in negatively evaluating players who verbalized exclusionary intentions. The only other implicit versus explicit differences were found in the resource allocation task. Children overall gave more stickers to previous players in the implicit than explicit conditions. Because players' intentions were more ambiguous in implicit games than explicit games, children may have been more open to giving stickers to individuals in the implicit condition than explicit condition.

Contrary to our hypothesis that 3- to 4-year-old children will perform better in preference and resource allocation tasks compared to identification and evaluation tasks, we found that 3- to 4-year-old children actually had more difficulty with the preference task than identification and evaluation tasks. Surprisingly, 3- to 4-year-old children significantly differentiated exclusive players compared to inclusive players in the resource allocation, identification and evaluation tasks, but did not show differentiation in the preference task. This pattern of results replicates the findings of Experiment 1b, in which 3-year-old children were able to identify exclusion but did not show differential preferences for exclusive agents over inclusive agents.

It is important to note that 3- to 4-year-old children were below chance at correctly identifying and evaluating the previous players after exclusion games, whereas 5- to 6-year-old children performed above chance in these tasks. These results support the idea that there is critical age-related development in children's ability to report social exclusion from younger to older preschool age. Taken together, our results indicate that although 3- to 4-year-old children's performances are not as robust as 5- to 6-year-old children's (as indicated by the one sample *t* tests), 3- to 4-year-old children nonetheless significantly differentiate between exclusive and inclusive agents in identification and evaluation tasks (as indicated by the Fisher's exact tests).

In sum, Experiment 2 showed that there are age-related improvements in children's responses to social exclusion across all tasks. As hypothesized, older preschoolers were able to robustly differentiate exclusion from inclusion in all tasks and across explicit and implicit conditions. In contrast to our hypotheses, younger children were not better at identifying explicit exclusion than implicit exclusion and showed worse performances in preference than identification and evaluation tasks, replicating Experiment 1b findings.

General Discussion

The present study investigated young children's responses to exclusionary behavior, and specifically sought to clarify whether children's ability to identify social exclusion develops in tandem with their preference for socially inclusive agents over socially exclusive agents.

Although understanding of exclusionary behavior has been observed to improve across the preschool years (Crick et al., 1997; Killen & Rutland, 2011; Card et al., 2008), more recent findings suggest that even infants are able to demonstrate their understanding of positive and negative social interactions from preference behaviors (Hamlin et al., 2007, 2011). Thus, jointly investigating children's ability to identify social exclusion and social preferences addresses at what point in development sensitivity to social exclusion emerges and provides an opportunity to assess whether children's social preferences for agents are related to the ability to identify the social behaviors of agents.

Three major findings emerged across the two experiments in the present study. First, across different paradigms and tasks, preschool age children showed consistent improvement with age in their ability to detect and respond to exclusion. Five- to six-year-old children were better than 3- to 4-year-old children at identifying exclusive agents and directing their preference and resource allocation behaviors toward inclusive agents. These results are in line with previous findings that older preschoolers are better at processing relational bullying (Crick et al., 1999; Killen & Rutland, 2011; Monks & Smith, 2006) and show more advanced reasoning about group-related norms than younger preschoolers (Misch et al., 2014).

Second, children did *not* show better identification of verbalized, explicit exclusion than nonverbalized, implicit exclusion. Contrary to our hypothesis that children would have more difficulty recognizing implicit exclusion than explicit exclusion, children overall showed no difference in identifying implicit social exclusion compared to explicit social exclusion. Five- to six-year-old children performed above chance in both the identification and preference tasks after implicit exclusion in Experiment 1a. They also showed robust positive behaviors toward inclusive players and negative behaviors toward exclusive players, regardless of whether exclusion was implicit or explicit in Experiment 2. Such findings suggest that 5- to 6-year-old children can robustly detect and respond to implicit social exclusion. Three- to four-year-old children showed more difficulty with implicit exclusion in Experiment 1a, but in Experiment 2 (which improved the methodological limitations of Experiments 1a and 1b), whether exclusion was implicit or explicit did not affect their identification of the players.

Younger children may have shown no difference between explicit and implicit social exclusion in the present study because social exclusion was communicated via a ball game in the current set of experiments. Not receiving the ball was directly linked to exclusion; thus, children had a physical cue to help recognize that they were being left out. It is possible that differences in implicit versus explicit exclusion may be more prominent in other social activities, such as conversations, in which results of exclusion may be less tangible. However, a recent study found that 3-year-old children preferred individuals who were left out from a conversation at the same rate as those who were left out from a ball game, suggesting young children may be sensitive to social exclusion even without a clear physical consequence (Hwang et al., 2017). This tendency to robustly detect implicit exclusion is in line with findings from the priming literature, in which preschoolers demonstrate more affiliative behavior after being primed with exclusion than inclusion (e.g., Over & Carpenter, 2009). It is also important to note that the paradigms used in the

current study are not as rich in contextual information as naturalistic interactions (e.g., no demonstrations of emotions) and continued research is needed to investigate how different social exclusion paradigms influence children's responses.

The third major finding was that younger preschoolers' awareness of social exclusion did not directly correspond to their social preference responses. Although younger preschoolers could correctly identify the socially exclusive agents, they did not prefer socially inclusive agents over socially exclusive agents. In Experiment 1a, children did not show a preference for inclusive puppets over exclusive puppets after implicit exclusion until 5 to 6 years of age. In Experiment 1b, 3-year-old children correctly identified the explicitly exclusive puppet, but did not show a clear preference for explicitly inclusive puppets. This pattern was replicated in Experiment 2, in which 3- to 4-year-old children differentiated socially exclusive agents from socially inclusive agents in the identification and evaluation tasks, but did not show the same differentiation in the preference task.

This divergence in identification and social preference is surprising, because preference tasks have been used successfully in even preverbal infants (Bloom, 2013). The present results suggest that social preferences in younger preschoolers may be tapping a different reasoning process than identifying socially exclusive behavior. When younger preschoolers were asked to justify their preferences, they were less likely to reference past behaviors of the players (e.g., "the players did not share") and more likely to give uninformative justifications (e.g., "I like their hair") compared to older preschoolers who were more likely to reference the players' past behaviors (see supplementary analyses). Thus, it may be that preference toward inclusive and exclusive agents require children to become more skilled at accurately weighing relevant factors (e.g., past behavior) over irrelevant factors (e.g., physical characteristics).

Another possibility is that for younger preschoolers, exclusion does not modulate their preference as much as it does for older preschoolers. Perhaps younger preschoolers do recognize exclusion, but do not think that a singular exclusionary act is sufficient to peg individuals as antisocial or requiring of retribution as do older children. Younger children may have less sophisticated social information processing abilities than older children (e.g., Crick & Dodge, 1994) and may need to see several negative behaviors to judge an agent as mean, whereas they need only one positive behavior to judge an agent as nice (Boseovski & Lee, 2006; Boseovski, 2010). Thus, multiple exposures to an individual committing exclusionary actions may be necessary for younger preschoolers to interpret such behavior to be serious enough to alter their preferences.

It is important to note that our preference task could be construed as a verbal task because it included a verbal instruction component that asked children to choose one out of two pairs. It is possible that asking 3- to 4-year-old children to verbally process a social choice (e.g., who do you want to play with?) is more difficult than a straight-forward identification question (e.g., which ones did not share?). Thus, although our preference task was modeled after tasks used with infants (Hamlin et al., 2007, 2011), it is possible that a preference task that more closely matches those administered to infants with less emphasis on responding verbally could better capture 3- to 4-year-old children's preferences. Interestingly, 3- to

4-year-old children showed above chance performance in the resource allocation task suggesting an allocation task may better capture young children's nonverbal discernment than preferences when distinguishing between exclusive and inclusive individuals. Future research should explore other ways of capturing young children's preferences, such as looking or reaching behavior, to elucidate why children's identification of an agent's past behavior may not necessarily dictate their social preferences.

Another way to better understand the relation between children's social preferences for agents and the ability to identify agent's past behaviors is to explore how individual differences in cognitive and social abilities affect young children's responses to social exclusion. Depending on whether children with social difficulties, such as Autism Spectrum Disorder and Williams Syndrome, show more impaired performance in the identification or social preference measures may illuminate the relation between these two types of measures. For instance, if children with social difficulties perform worse in preference measures but comparably in the identification measures to typically developing children, this would indicate preference measures are tapping a different social skill that is beyond identifying social exclusion.

An additional measure of individual differences is rejection sensitivity – a disposition to expect, readily perceive, and overreact to social rejection. School age children with higher rejection sensitivity have been found to show higher distress responses after ambiguous exclusion than those with low rejection sensitivity (Downey, Lebolt, Rincón, & Freitas, 1998; Rubin, Bukowski, & Bowker, 2015). Thus, it is possible that preschoolers who exhibit higher rejection sensitivity may be more discerning in their preference toward socially exclusive individuals than children who exhibit low rejection sensitivity.

Relatedly, the amount of peer and group play experience may also predict children's response to social exclusion. Measure of such social experience in the current study was limited and revealed no significant relations with responses to social exclusion, with the exception that number of siblings affected children's resource allocation behavior in Experiment 2. A more comprehensive measure of social experiences and social capacities will help better capture individual differences in responses to social exclusion.

The present findings are the first to show a developmental difference in children's ability to detect social exclusion using both preference measures and interview measures. As expected, 5- to 6-year-old children correctly identified socially exclusive agents and showed robust preference for socially inclusive agents over exclusive agents. In contrast, 3- to 4-year-old children were able to identify socially exclusive agents, but did not show clear preferences for socially inclusive agents over exclusive agents, contrary to expectations from previous research. The present study suggests that 3- to 4-year-old children do not show a one-to-one correspondence in their identification of social exclusion and their preference for socially inclusive agents over exclusive agents. Whether similar divergence exists in other social domains (e.g., whether identifying physically harmful agents also result in social avoidance of these agents) should be further explored. Investigating the developmental trajectory of young children's social preferences in diverse social situations and how social

preferences relate to interview-based responses are imperative to better understand young children's developing social cognitive abilities in context.

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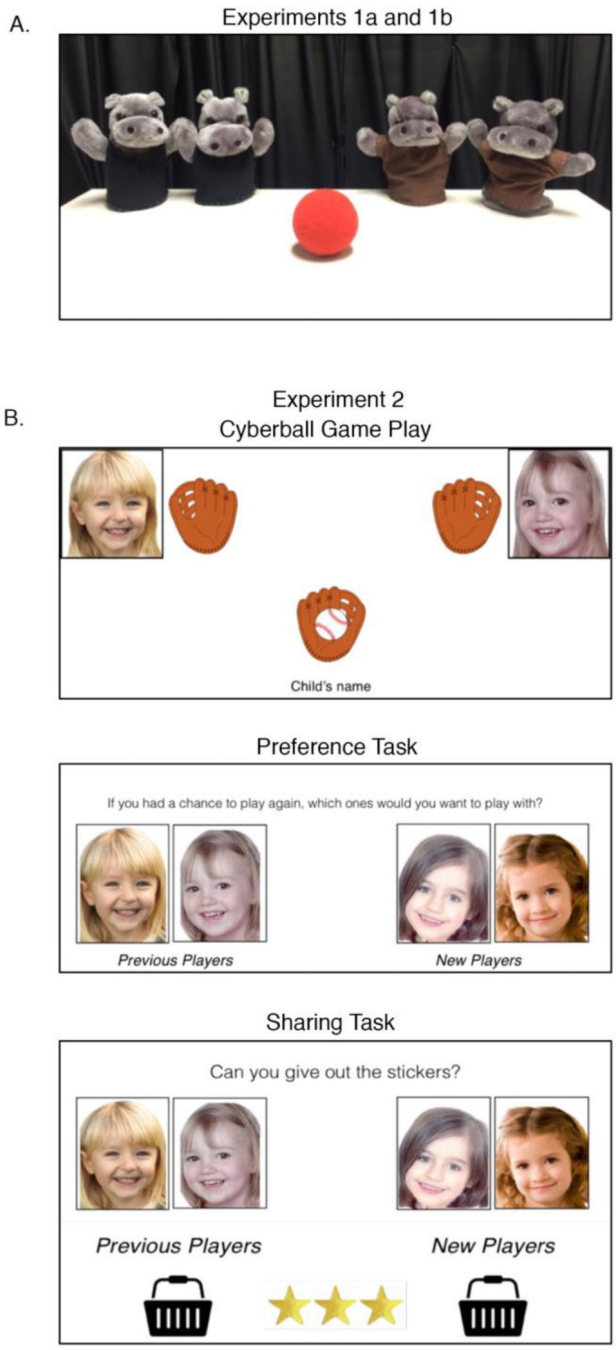

Figure 1.
Example of Experiments 1a and 1b set up (A) and Experiment 2 set up (B).

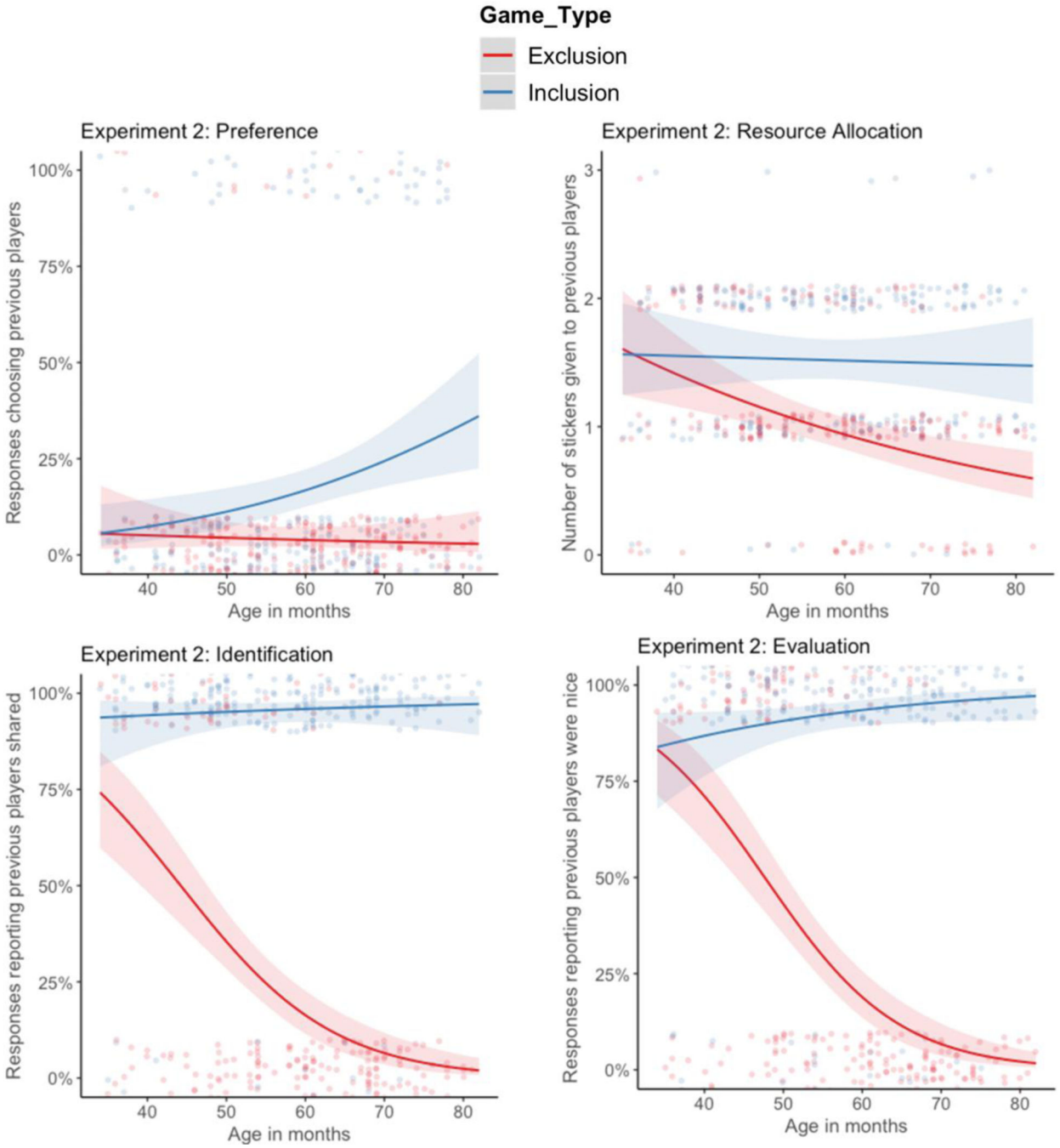

Figure 2.

Responses of children in each task. Red represents responses from exclusion games and blue represents responses from inclusion games. Each dot represents the choice made by children on each trial. The lines represent the best-fit lines from best-fit models of 3- to 6-year-old children's performances. The shaded area around each line represents 95% confidence intervals calculated based on the predicted values and their standard errors.

Table 1

Fixed effects of generalized linear mixed models predicting the probability of children's preference and identification after implicit exclusion (Experiment 1a) and explicit exclusion (Experiment 1b).

Exclusion Type	**Predictors**	**β**	***SE***	***Z***	***p***	***Odds Ratio (OR)***	***95% Confidence Intervals (CI) for OR***
Implicit (Exp1a)	Task Type	.371	.307	1.207	.227	1.449	[.793, 2.647]
	Age	.033	.014	2.354	.019*	1.033	[1.006, 1.062]
	Task Type x Age	−.043	.027	−1.611	.107	.958	[.909, 1.009]
Explicit (Exp1b)	Task Type	−1.061	.569	−1.866	.062	.346	[.113, 1.055]
	Age	.200	.078	2.575	.010*	1.222	[1.049, 1.423]
	Task Type x Age	.154	.157	.984	.325	1.167	[.858, 1.586]

Table 2

Fixed effects of generalized linear mixed models predicting the probability of children's preference, resource allocation, identification, and evaluation in Experiment 2

Task	Predictors	β	*SE*	Z	*p*	*OR*	*95% CI for OR*
Preference	Game	1.659	.364	4.559	< .001*	5.253	[2.574, 10.717]
	Age	.028	.015	1.848	.065	1.028	[.998, 1.059]
	Condition	.105	.365	.287	.774	1.110	[.543, 2.273]
	Age × Condition	.006	.032	.196	.845	1.006	[.944, 1.073]
	Game × Condition	−1.088	.747	−1.455	.146	.337	[.078, 1.458]
	Game × Age	.068	.029	2.303	.021*	1.070	[1.010, 1.134]
	Game × Age × Condition	−.121	.067	−1.801	.072	.886	[.777, 1.011]
Resource Allocation	Game	.410	.082	5.013	< .001*	1.506	[1.283, 1.768]
	Age	−.011	.003	−3.221	.001*	.989	[.983, .996]
	Condition	.188	.081	2.320	.020*	1.207	[1.030, 1.415]
	Siblings	−.129	.053	−2.444	.015*	.879	[.793, .975]
	Age × Condition	−.010	.007	−1.497	.134	.990	[.977, 1.003]
	Game × Condition	−.194	.166	−1.170	.242	.824	[.595, 1.140]
	Game × Age	.020	.007	2.894	.004*	1.020	[1.006, 1.034]
	Game × Age × Condition	−.005	.014	−.355	.723	.995	[.969, 1.022]
Identification	Game	6.763	.905	7.476	< .001*	865.252	[146.913, 5095.96]
	Age	−.106	.026	−4.107	< .001*	.899	[.855, .946]
	Condition	−.079	.546	−.145	.885	.924	[.317, 2.692]
	Trial	−.309	.162	−1.903	.057	.734	[.534, 1.009]
	Age × Condition	−.004	.088	−.043	.966	.996	[.838, 1.185]
	Game × Condition	.122	1.309	.093	.926	1.130	[.087, 14.701]
	Game × Age	.258	.059	4.369	< .001*	1.294	[1.153, 1.453]
	Game × Age × Condition	.063	.090	.701	.483	1.065	[.893, 1.269]
Evaluation	Game	5.803	.471	12.309	< .001*	331.387	[131.53, 834.925]
	Age	−.100	.024	−4.090	< .001*	.905	[.863, .949]
	Condition	.739	.567	1.303	.193	2.093	[.689, 6.361]
	Trial	−.334	.159	−2.098	.036*	.716	[.525, .978]
	Age × Condition	−.004	.089	−.046	.963	.996	[.837, 1.186]
	Game × Condition	−2.242	1.140	−1.966	.049*	.106	[.011, .993]
	Game × Age	.309	.055	5.587	< .001*	1.362	[1.222, 1.519]
	Game × Age × Condition	−.004	.111	−.036	.971	.996	[.801, 1.238]

Table 3

Means and standard deviations of children choosing the previous players (preference task), number of stickers given to previous players (resource allocation task), reporting previous players shared (identification task), and reporting previous players were nice (evaluation task) according to age group and exclusion type.

Condition	Task Types	3- to 4-year-old children		5- to 6-year-old children	
		Exclusion *M* (*SD*)	Inclusion *M* (*SD*)	Exclusion *M* (*SD*)	Inclusion *M* (*SD*)
Explicit	Preference	.05 (.22)	.10 (.30)	.02 (.12)	.30 (.46)
	Resource Allocation	1.03 (.69)	1.42 (.71)	.70 (.59)	1.49 (.75)
	Identification	.50 (.50)	.95 (.22)	.08 (.27)	.92 (.27)
	Evaluation	.45 (.50)	.90 (.30)	.05 (.21)	.92 (.27)
Implicit	Preference	.06 (.24)	.17 (.38)	.08 (.27)	.21 (.41)
	Resource Allocation	1.41 (.77)	1.68 (.69)	.88 (.75)	1.47 (.67)
	Identification	.42 (.50)	.91 (.29)	.11 (.31)	.95 (.21)
	Evaluation	.55 (.50)	.86 (.35)	.19 (.39)	.92 (.27)

Note. Preference, identification, and evaluation tasks are composed of a binary choice in each trial. In the resource allocation task children had three stickers to distribute in each trial. There were two trials of exclusion and two trials of inclusion.