Young Children Apply the Homophily Principle to Their Reasoning About Social Relationships

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Experiments and analyses were not pre-registered. Data files and R codes for all experiments are available on OSF at the following link (authors anonymized for review):

https://osf.io/yzefd/?view_only=1c1649b3c42a41269b3c2b63fb836df7

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Abstract

People who are in close relationships tend to do and like the same things, a phenomenon termed the "homophily principle." The present research probed for evidence of the homophily principle in four- to six-year-old children. Across two experiments, participants ($N = 327$; 166 girls, 161 boys; located in the Midwestern United States) were asked to predict the closeness of two people based on their preferences. Participants in Experiment 1 indicated that people with a shared preference or a shared dis-preference were more closely affiliated than people whose preferences diverged, suggesting inferences of homophily. Further, children were not only relying on the emotional valences expressed: They expected people with a shared preference to be closer than people who expressed positive emotions about different items and expected people with a shared dis-preference to be closer than people who expressed negative emotions about different items. Experiment 2 replicated and extended the main findings of Experiment 1 with more naturalistic stimuli. The present studies provide strong evidence that young children apply the homophily principle to their reasoning about social relationships.

Keywords: *Children; Homophily; Relationships; Friendship*

Public significance statement

This research tested whether four- to -six-year-old children expect people with similar preferences to be in close relationships (e.g., friends). Reflecting awareness of this phenomenon, children rated people who liked or disliked the same item as closer friends than people who 1) evaluated the same item differently or 2) evaluated different items. These findings are among the first to demonstrate children's awareness of the association between similarity and affiliation.

Young children apply the homophily principle to their reasoning about social relationships

Homophily – the phenomenon that "birds of a feather flock together" – is a guiding principle of human behavior (DellaPosta et al., 2015; Fu et al., 2012; Lazarsfeld & Merton, 1954; McPherson et al., 2001). At its core, the homophily principle describes that people who are in close relationships tend to do and like the same things (Boy & Uitermark, 2020; Kandel, 1978a; Lizardo, 2006; McPherson et al., 2001). Homophily operates as both a cause and a side effect of social relationships: People tend to initiate relationships with people who are like them (Byrne & Wong, 1962; Kandel, 1978b; Lott & Lott, 1965; Lydon et al., 1988; McPherson et al., 2001; Montoya et al., 2008; Sun & Taylor, 2020; Verbrugge, 1977), and they also tend to become more similar to one another over the course of a relationship (Boy & Uitermark, 2020; DellaPosta et al., 2015; Kandel, 1978b; Lizardo, 2006; McPherson et al., 2001).

The connection between similarity and social closeness in relationships emerges early in ontogeny; it has not only been observed among adults, but it is apparent among adolescents and young children as well. For instance, adolescents befriend peers with whom they share many preferences in common over peers with whom they share fewer preferences in common, and adolescents also tend to adopt the preferences and behaviors of their friends over time (e.g., drug use, academic achievement; Broxton, 1962; Cohen, 1977; Hamm, 2000; Haselager et al., 1998; Kandel, 1978a; Kandel, 1978b; Kupersmidt et al., 1995; Marks, 1959; Newcomb, 1952; see Laursen, 2017 for review). Young children also share more preferences in common with friends than with non-friends (Rozin & Vollmecke, 1986) and converge in their behavior with their friends and classmates over time (Barbu, 2009; Hanish et al., 2005; Rozin & Vollmecke, 1986).

Homophily can be used to describe known relationship patterns, but it can also be used by individuals to predict and reason about patterns of social affiliation. For instance, researchers

can predict people's closeness on Facebook via their aligned "likes" on the platform (e.g., for movies and books; Gilbert & Karahalios, 2009; Kosinski et al., 2013; Spiliotopoulos et al., 2014), and lay adults predict that they will be better friends with people who share their taste in jokes (DellaPosta et al., 2015). Further, adolescents recognize that they share more in common with their friends than with non-friend peers (Hymel & Woody, 1991; see Laursen et al., 2017 for review of adolescent literature). In the present research, we explore the developmental origins of children's use of the homophily principle to reason about social relationships.

Recent research does not paint a clear picture regarding children's use of homophily to infer social relationships. This lack of clarity stems from the fact that previous studies have pitted similarity (e.g., liking the same food) against other properties (e.g., spending time together). In a typical study, a protagonist shares one property with one target character (e.g., the protagonist and target A like the same food) and shares a different property with the other target character (e.g., the protagonist chooses to sit next to target B). Upon learning this information, participants must then indicate which target character (A or B) the protagonist is friends with (forced choice). When tested with this typical method, preschool-age children treat proximity, loyalty, shared group membership, and similarity as equally strong cues to friendship (Jordan & Dunham, 2021; Liberman & Shaw, 2019); treat some cues (e.g., coincidental encounters) as less important than similarity (Afshordi, 2019); and treat other cues (e.g., prosocial behavior) as more important than similarity (Afshordi, 2019). Unlike younger children in these studies, six- to 11-year-olds believe that loyalty and proximity trump similarity (Liberman & Shaw, 2019), and seven- to nine-year-old children believe that category labels are more indicative of friendship than shared preferences (Jordan & Dunham, 2021). However, because all of these studies pit similarity against other cues, they cannot provide strong evidence about (i) whether children consider

shared preferences to be diagnostic of friendship (apart from the relative strength of shared preferences vs. others cues); and (ii) the degree of relationship closeness that children associate with shared preferences. By investigating shared preferences as a friendship cue independently, the current research will be able to probe whether – and to what extent – children do indeed apply the homophily principle to their reasoning about friendship.

In addition to uncertainty concerning the robustness of children's homophily-based relationship inferences, open questions remain concerning the types of similarities children may attend to when reasoning about social relationships. First, the scope of prior work has focused only on positive similarities such as shared aptitudes (i.e., being good at the same things; Afshordi, 2019) and shared likes (i.e., liking the same things; Jordan & Dunham 2021; Liberman & Shaw, 2019). Yet, people not only like the same things as others – they also *dislike* the same things, and shared dislikes could also be a signal of a social affiliation. Indeed, prior work with adults suggests that dislikes may be even more socially relevant than likes, perhaps because dislikes are more diagnostic of an individual's qualities than their likes (Bosson et al., 2006; Gray, 2021; Weaver & Bosson, 2011; see also Newcomb, 1956). Second, past studies with young children have provided participants with only binary forced choices of whether people were or were not friends (e.g., Afshordi, 2019; Jordan & Dunham, 2021; Liberman & Shaw, 2019). However, social relationships are not all-or-nothing: It is possible to be friends with multiple people, but closer with some than others. We address these issues in the present research by (i) manipulating both shared likes and dislikes to determine whether shared dislikes are a signal of social affiliation to young children and, if so, how they compare to shared likes; and (ii) presenting participants with a continuous response measure to determine the degree of relational closeness young children associate with shared likes or dislikes.

The present research

In the present research, four- to six-year-old children were asked to predict the social closeness of two target people who both liked, both disliked, or had different evaluations (one liked and one disliked) of items; target people either evaluated the same item or different items. We expected children to rate people who agreed in their evaluation of the same item as more closely affiliated than people who disagreed in their evaluation of the same item, regardless of whether agreement consisted of a shared like or shared dislike. We also expected participants to rate people as closer when people agreed in their evaluations of the same item (whether shared likes or dislikes) than when people provided the same valance of evaluation (like or dislike) but evaluated different items.

We also compared similarities and dissimilarities in people's evaluations between two domains of items: foods and artifacts (here, depicted as toys). We chose to compare foods and toys because prior work has established that shared food experiences may be particularly relevant to friendship across the lifespan. For instance, adult strangers who are randomly assigned to eat similar foods become closer over the course of a meal than strangers who are assigned to eat different foods (Wooley & Fishbach, 2017), and infants expect people who affiliate with one another to share food (but not object) preferences in common (Liberman et al., 2016). Evidence has been ambiguous regarding the relative strength of foods versus artifacts in guiding young children's social decision-making: Preschoolers choose playmates who share either their food or toy preferences in common over playmates with whom they share only arbitrary similarities, suggesting that both foods and toys may be socially meaningful to young children (Fawcett & Markson, 2010a). Nevertheless, we were interested in whether similarities

or differences in food preferences would be more potent in guiding children's reasoning about friendship than similarities or dissimilarities in toy preferences.

The present research focuses on four- to six-year-old children for several reasons. First, past work that pitted similarity against other friendship cues observed considerable change in children's thinking between the ages of three and six years old. For example, with age children come to prioritize social category labels (Jordan & Dunham, 2021) and loyalty (Liberman & Shaw, 2019) over similarity when making inferences about friendship. However, five- to six-year-old children do not distinguish between category labels and similarity as cues to friendship (Jordan & Dunham, 2021), and three- to five-year-old children do not distinguish between loyalty and similarity cues (Liberman & Shaw, 2019). Therefore, including four- to six-year-old children in the present work should capture a developmental window in which children's thinking about the role of similarity in friendship shifts. Additionally, the null results among young children in these past studies could be due to younger children generally not understanding the tasks (e.g., choosing randomly), *or* they could be due to young children thinking similarity is an important friendship cue – one that is equally important to the other cues studied. The present studies will disambiguate these competing possibilities by examining the degree of relational closeness children associate with shared preferences. Finally, although these prior studies also included three-year-old children in their samples, we chose to start collecting data at age four years to ensure that children would understand our five-point relationship scales.

Experiment 1

In Experiment 1, four- to six-year-old children were asked to predict the social closeness of pairs of characters. The characters either both liked their item, both disliked their item, or one character liked their item and the other disliked their item. On half of trials, the two characters

evaluated the same item; on remaining trials, they evaluated different items. These features were presented orthogonally and within-subjects. Items were either depicted as foods or toys (between subjects).

Method

Participants. The participants were 128 children (64 girls, 64 boys; M_{age} = 5.51 years; SD_{age} = 0.83 years; $range_{age}$ = 4.01–6.89 years) in the Midwestern United States. This sample size was selected based on past studies of children's friendship inferences (e.g., Jordan & Dunham, 2021; Liberman & Shaw, 2019) and provided sufficient (80%) power to detect an effect size of Cohen's d = .25 or greater for pairwise comparisons. Four additional children were tested but excluded from data analyses because they did not complete the experiment (n = 1), or the experimenter made an error (n = 3). Participants' demographic information as provided by their guardians was as follows: 81.25% of participants were White, 5.47% were multiracial, 2.34% were Black, and 2.34% were Asian; an additional 8.59% of guardians did not provide information about race. Of the 91.41% of children whose guardians provided education information, 71.79% had one or more parents with at least a four-year college degree.

Materials, procedure, and design.

A female experimenter tested all participants in a quiet, private room at their school or in a university laboratory. Participants first learned how to use the closeness scale, which was printed on laminated cardstock attached to the table in front of the participant. Participants learned that they could indicate how closely affiliated they thought two characters were by pointing to one of five images on the closeness scale: "strangers", indicated by two stick figures on opposite sides of a card with a line between them; "kind of know each other", indicated by two stick figures on opposite sides of a card; "okay friends", indicated by two stick figures

slightly closer together; “good friends”, indicated by two stick figures standing even closer together; or “best friends”, indicated by two stick figures standing closest together. See Figure 1. After learning the meaning of each scale point, participants completed three practice trials in which they were asked to indicate which scale point depicted people described as strangers, best friends, and okay friends. Participants received corrective feedback for incorrect responses.

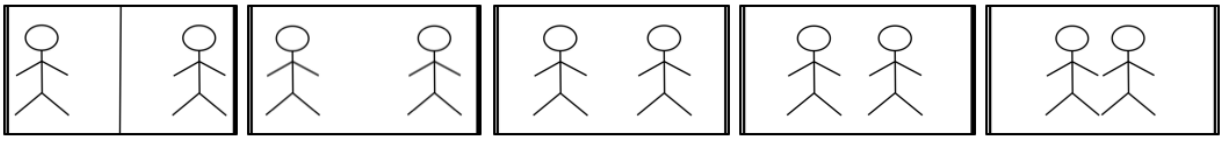

Figure 1. Experiment 1 closeness scale.

Participants then viewed six trial types (within-subjects) about the food or toy (between-subjects, randomly assigned, $n = 64$ per condition) preferences of the paired characters. These stimuli were presented to children on a computer monitor. For each trial, participants saw two animated child-like characters on either side of the screen and an animated monster in the bottom middle of the screen. Each character had a food or toy below them, depending on participant condition assignment. Foods were depicted on a plate with a fork and knife on either side, whereas toys were depicted on a play mat with a pen and pencil on either side. See Figure 2 for example displays.

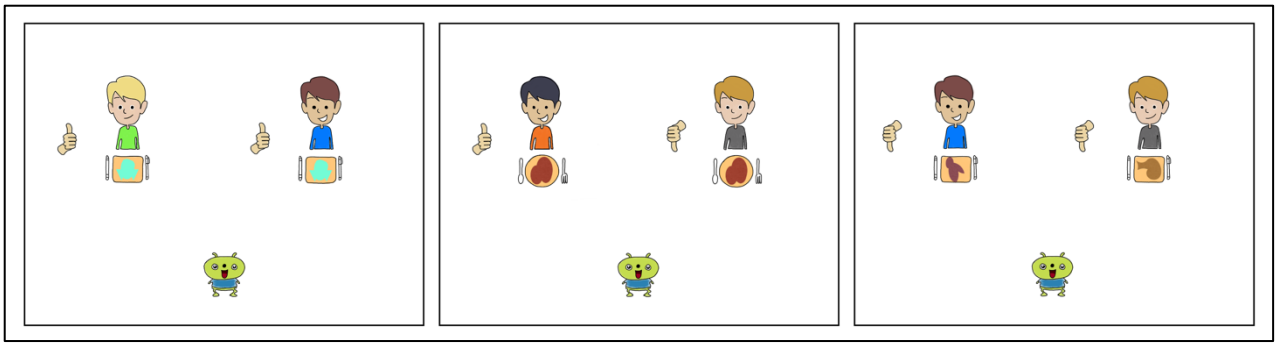

Figure 2. Experiment 1 example trial displays. Left: *Shared Likes* trial (toy condition); Middle: *Pointed Disagreement* trial (food condition); Right: *Different Dislikes* trial (toy condition). Because we do not have permission to publish some of the images of animated characters used in this task, this figure shows an artist’s rendition of the task displays.

At the start of each trial, the animated monster slid into a position directly underneath the left character and named the left character's item using a novel label and their evaluation of the item (like or dislike). Next, the animated monster slid directly underneath the right character and named the right character's item (either the same as the left character's item, or different) and evaluation of the item (like or dislike; also marked visually by a thumbs-up or thumbs-down symbol). Finally, the animated monster slid back to its starting position at the bottom middle of the screen and said, "How close do you think they are?", at which point the experimenter opened a lid covering the closeness scale to allow the participant to point to their answer.

We counterbalanced the following: trial type order, which characters were presented with which items, the novel-word labels associated with each item, and the side of the screen each item was presented on. Every participant saw one of each of the following six trial types:

Shared Likes. Both characters liked the same food or toy. For each character, participants heard "this kid likes this [food/toy] called [name]". For example, a participant may have heard "this kid likes this food called borg (Left), and this kid likes this food called borg (Right)."

Shared Dislikes. Both characters disliked the same food or toy. For each character, participants heard "this kid doesn't like this [food/toy] called [name]". For example, a participant may have heard "this kid doesn't like this toy called fep (Left), and this kid doesn't like this toy called fep (Right)."

Pointed Disagreement. Both characters had the same food or toy, but they disagreed in their evaluations. For example, a participant may have heard "this kid likes this food called riz (Left), and this kid doesn't like this food called riz (Right)."

Different Likes. Each character liked a different food or toy. For example, a participant may have heard "this kid likes this toy called toma (Left), and this kid likes this toy called blicket

(Right)."

Different Dislikes. Each character disliked a different food or toy. For example, a participant may have heard "this kid doesn't like this food called riz (Left), and this kid doesn't like this food called fep (Right)."

Different Evaluations of Different Items. Each character had a different food or toy, and the characters provided different evaluations. For example, a participant may have heard "this kid doesn't like this toy called toma (Left), and this kid likes this toy called riz (Right)."

The experiments in this paper were approved by the [masked for review] IRB [Protocol #s masked for review]. The experiments and analysis plans for this paper were not preregistered, but sample size and hypotheses were predetermined. Data files, R codes, and materials (when possible) for the experiments are available on OSF via the following link: https://osf.io/yzefd/?view_only=ed347eca96504db69bc109c5277d4b54

Results

Analyses were conducted in R and marginal means were estimated using the emmeans package version 1.7.2 (Lenth, 2022). See Figure 3 for a graph of Experiment 1 individual participant responses, means, and standard deviations by trial type.

We tested our hypotheses by fitting a linear mixed-effects model estimating closeness ratings (numeric, range 0–4; 0 = strangers, 1 = kind of know each other, 2 = okay friends, 3 = good friends, 4 = best friends) from condition (food or toy; between-subjects factor), valence (both like, both dislike, or one likes and one dislikes; within-subjects factor), item (same or different; within-subjects factor), participant ID (random effect), and all possible interactions between condition, valence, and item. See Table 1 for means and standard deviations of each condition and trial type combination.

There was a main effect of valence such that participants rated characters closest when they both liked an item (M = 2.67, SD = 1.31), followed by when they both disliked an item (M = 2.06, SD = 1.58), and least close when characters provided different evaluations (M = 1.36, SD = 1.23), $F(2, 630) = 60.71$, $p < .001$, $\eta_p^2 = 0.14$. All pairwise differences were significant, ps

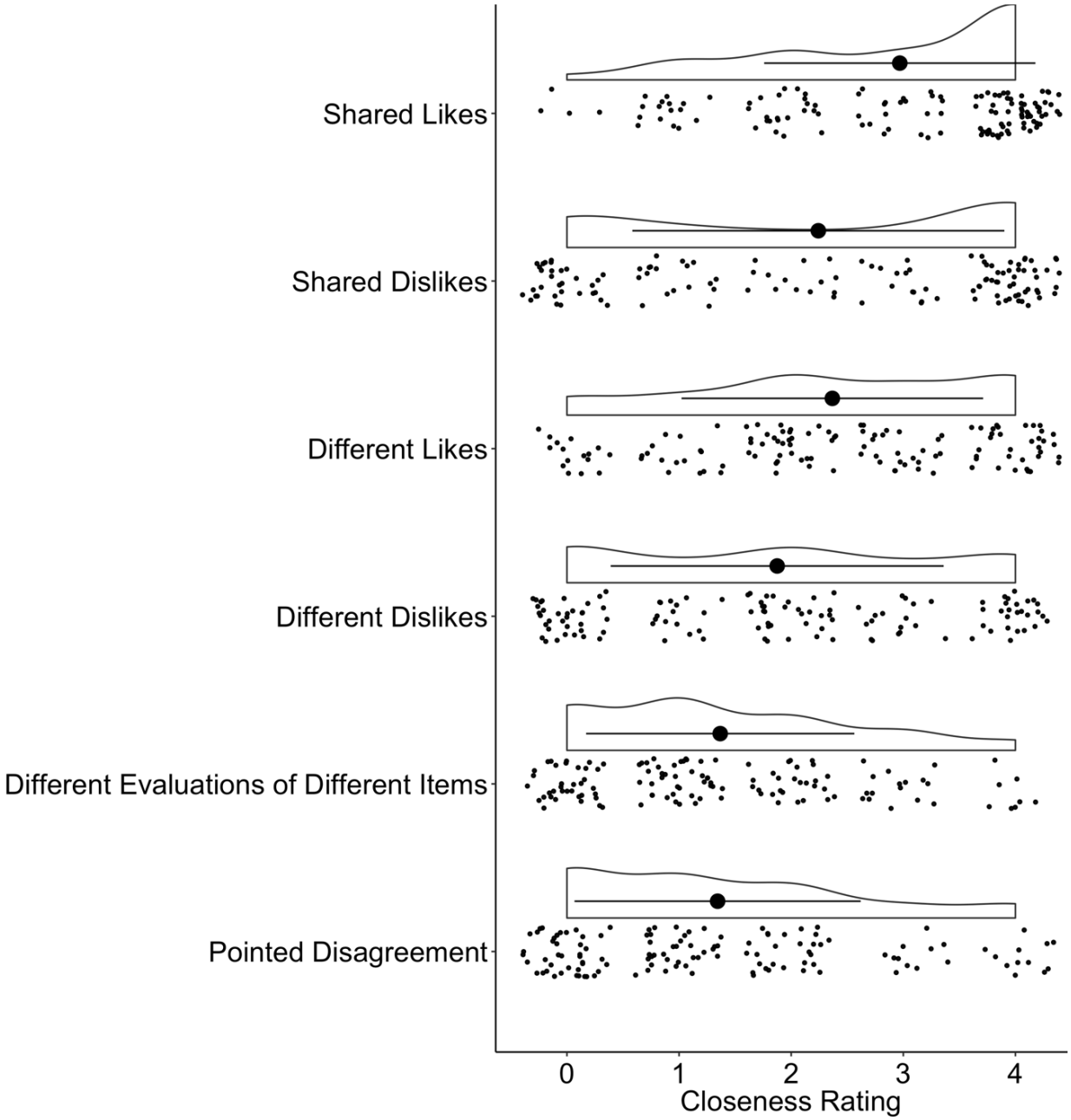

Figure 3. Experiment 1 closeness ratings by trial type. Large black dots represent mean ratings. Lines represent one standard deviation above and below the mean ratings. Small black dots represent individual participant responses. Fills represent the distribution of ratings. Since there were no effects of condition, Figure 3 data are collapsed across condition.

< .001. Additionally, participants rated characters who evaluated the same item (M = 2.18, SD = 1.54) as closer than characters who evaluated different items (M = 1.87, SD = 1.40), $F(1, 630)$ = 10.48, p = .001, η_p^2 = 0.01.

Table 1

Means and Standard Deviations by Experiment, Condition, and Trial Type

	Experiment 1		Experiment 2	
	Food	Toy	Together	Separate
Shared Likes	2.86 (1.27)	3.08 (1.15)	2.91 (1.42)	2.07 (1.64)
Shared Dislikes	2.28 (1.63)	2.20 (1.70)	N/A	N/A
Different Likes	2.41 (1.33)	2.33 (1.37)	N/A	N/A
Different Dislikes	2.02 (1.42)	1.73 (1.55)	N/A	N/A
Different Evals of Different Items	1.47 (1.30)	1.27 (1.09)	1.65 (1.55)	1.97 (1.71)
Pointed Disagreement	1.41 (1.38)	1.28 (1.17)	1.69 (1.49)	1.64 (1.62)

Note. Means (standard deviations). Ratings ranged from 0 (strangers in Experiment 1; not friends in Experiment 2) to 4 (best friends).

These main effects were qualified by the predicted significant item X valence interaction, $F(2, 630)$ = 3.51, p = .031, η_p^2 = 0.01. To address whether the nature of the interaction aligned with our hypotheses, we tested the comparisons relevant to our predictions. First, we expected people who agreed (*Shared Likes & Shared Dislikes*) to be rated as closer than people who disagreed (*Pointed Disagreement*). As hypothesized, targets in *Shared Likes* trials (M = 2.97, SD = 1.21) were rated as closer than targets in *Pointed Disagreement* trials (M = 1.34, SD = 1.28), $t(630)$ = 9.64, p < .001 and targets in *Shared Dislikes* trials (M = 2.24 SD = 1.66) were also rated as closer than targets in *Pointed Disagreement* trials, $t(630)$ = 5.33, p < .001.

Second, we expected participants to rate people as closer when targets agreed in their evaluations of an item than when targets merely used the same valence to rate different items (*Shared Likes* > *Different Likes* and *Shared Dislikes* > *Different Dislikes*). This hypothesis was also supported. When both characters liked their item, they were rated as closer when they both liked the same item (M = 2.97, SD = 1.21) than when they each liked different items (M = 2.37, SD = 1.34), $t(630) = -3.57$, $p < .001$, and when both characters disliked their item they were rated as closer when they both disliked the same item (M = 2.24, SD = 1.66) than when they each disliked different items (M = 1.88, SD = 1.48), $t(630) = -2.18$, $p = .03$. In contrast, when one character liked their item and the other character disliked their item, they were rated similarly regardless of whether they were evaluating the same item (*Pointed Disagreement* trials; M = 1.34, SD = 1.28) or different items (*Different Evaluations of Different Items* trials; M = 1.37, SD = 1.20), $t(630) = 0.14$, $p = .89$. Other pairwise comparisons (i.e., those not identified as relevant to the hypotheses) are provided in Supplemental Materials.

Finally, although we expected ratings to vary between the food and artifact conditions, this hypothesis was not supported. There was no main effect of condition ($F(1, 126) = 0.71$, $p = .40$, $\eta_p^2 = 0.001$), and no interactions involving condition were significant, ps > .32, $\eta_p^2 < .003$.

Age Effects. We did not have specific hypotheses based on participant age. However, we conducted exploratory analyses to examine how participant age may be related to the effects observed in the primary model of interest described above. To do so, we fit a second linear model identical to the first but with age (continuous) as an additional predictor, and we examined all possible interactions involving age.

First, no interactions involving age and condition were significant (ps > .07, η_p^2s < .03) and there was no significant interaction between age and item, $F(1, 620) = 3.06$, $p = .08$, η_p^2

< .005. There was, however, a significant interaction between age and valence, $F(2, 620) = 12.44$, $p < .001$, $\eta_p^2 = .04$ and a significant interaction between age, valence, and item, $F(2, 620) = 4.93$, $p = .008$, $\eta_p^2 = .02$. To examine the nature of the highest-order interaction further, we examined the simple slopes of the interaction between item and valence at the mean age (5.51 years; "mean-age children"), one standard deviation above the mean age (6.33 years; "older children", and one standard deviation below the mean age (4.68 years; "younger children").

The analyses revealed that the predicted interaction between item and valence was significant among mean-age and older children (mean-age children: $F(2, 620) = 3.65$, $p = .026$; older children: $F(2, 620) = 8.54$, $p < .001$), but not among younger children, $F(2, 620) = .05$, $p = .95$. That is, mean-age and older children rated targets in *Shared Likes* trials as closer than targets in *Different Likes* trials (ps < .001) and rated targets in *Shared Dislikes* trials as closer than targets in *Different Dislikes* trials (ps < .03), but they did not rate targets differently between the *Pointed Disagreement* and *Different Evaluations of Different Items* trials (ps > .30). Younger children instead seemed attentive to valence alone, $F(2,620) = 15.85$, $p < .001$: They rated characters who both liked their items as closer than characters who both disliked their items ($t(620) = 4.28$, $p < .001$) and characters who provided different evaluations of their items ($t(620) = 5.31$, $p < .001$). Younger children did not provide different closeness ratings of characters who either both disliked their items or provided different evaluations of their items, $t(620) = 1.02$, $p = .56$.

Discussion

As hypothesized, participants in Experiment 1 responded in accordance with the homophily principle, indicating that people who agree in their evaluation of an item are closer than people who disagree in their evaluation of an item. Cases of agreement in Experiment 1

included both shared likes *and* shared dislikes. Shared dislikes are signals of affiliation among adults (Bosson et al., 2006; Gray, 2021; Weaver & Bosson, 2011), but have not received attention in prior work with children. We found that children expected shared dislikes to indicate friendship: Participants rated people who agreed as closer than people who disagreed both when agreement consisted of shared likes as well as when agreement consisted of shared dislikes. Participants also indicated that people who shared the same preferences (e.g., *Shared Likes* trials) were closer friends than people with shared valence alone (e.g., *Different Likes* trials).

Children's responses did not differ between the food and toy conditions of Experiment 1. The decision to compare foods and toys was based primarily on infant research suggesting that evaluations of foods may be perceived as more socially meaningful than evaluations of artifacts. For instance, Liberman and colleagues (2016) found that infants expect people who affiliate with one another to express similar food evaluations but do not expect people who affiliate to express similar object evaluations. Research with older participants has often observed similarity between foods and artifacts. For example, both food and artifact preferences spread along adults' social networks (Christakis & Fowler, 2012; DellaPosta et al., 2015; Rozin & Vollmecke, 1986), and children like people with whom they share either food or toy preferences more than people with whom they share only arbitrary similarities (Fawcett & Markson, 2010). It is possible that young children think differently about the roles of food and artifact preferences in friendship, but that the present experiment did not reveal these differences. It is also possible that infants assign greater social significance to food preferences than artifact preferences, but that this difference dissipates over development as children come to acquire and reason about artifact preferences of their own. In Experiment 2 we focus on food preferences alone since children's responses did not diverge between foods and toys in Experiment 1.

Although we expected that children's inferences could change across the age range tested here (given work on attention to similarity as a friendship cue; see Liberman & Shaw, 2019), we did not have specific hypotheses about the exact age at which children would infer homophily. However, incorporating age into the model revealed that the youngest participants in Experiment 1 responded primarily based on valence rather than shared preferences per se, choosing targets who both liked their items as closer than targets in the other trial types. That is, unlike the older children in our sample, the younger children did not rate targets who shared the same preferences (e.g., *Shared Likes* trials) as closer than targets who shared the same valence but not the same preferences (e.g., *Different Likes* trials). We return to the discussion of differences based on participant age in Experiments 1 and 2 in the General Discussion.

Overall, the results of Experiment 1 provide initial evidence that children, at least by five years of age, apply the homophily principle to their social reasoning. In a second study we probe whether these inferences about friendship are based on similarity alone, or whether they also require characters to have knowledge of their similarity to one another. For example, children may have indicated that those with divergent evaluations were not close because they believe it is rude to say you dislike something that someone else has just indicated that they like. Thus, children's low ratings of social closeness on *Pointed Disagreement* trials may have been driven by expectations regarding how friends usually behave toward one another (i.e., politely rather than rudely). Indeed, young children (of the same ages tested here) prioritize politeness in other contexts. For instance, five- to seven-year-old children prefer telling white lies (e.g., about liking a gift) to telling the truth in cases where it is rude to be honest (Talwar & Crossman, 2011; Warneken & Orlins, 2015). Thus, it is possible that children's responses in Experiment 1 reflect beliefs about rudeness and politeness rather than an understanding of the homophily principle.

Experiment 2 aimed to replicate the effects of Experiment 1 using more ecologically valid stimuli – videos of two live actors evaluating foods – while also addressing the possibility that participants in Experiment 1 responded based on beliefs about rudeness rather than shared preferences. To differentiate between these two possible accounts, Experiment 2 participants rated the closeness of people who stated their preferences in front of one another (seated in the same room at the same table) versus privately (seated in separate rooms). Inferences about rudeness should be applied primarily when two people are together and aware of one another's behavior; it may be rude to say you dislike apples after someone else has just declared that they love apples, but it is certainly not rude to express a dislike of apples when apple-lovers are not present. On the other hand, the homophily principle should be applied similarly regardless of whether two people are together or immediately aware of one another's preferences: If sharing preferences is a signal of social closeness, it should not matter whether two people are stating their shared preferences in each other's company or privately. Thus, if participants in Experiment 2 provide similar ratings regardless of whether actors state their preferences in front of one another, then this would suggest that participants are not responding based on beliefs about rudeness.

As an additional measure of children's thinking about rudeness, participants in Experiment 2 rated the niceness of each actor. If participant responses stem from condemnation of rudeness, then we would expect participants to rate people as particularly mean in situations involving disagreement – where two actors are together, aware of one another's behavior, and have different evaluations of the same item.

Experiment 2

Experiment 2 provides a stronger test of the homophily principle by examining whether the Experiment 1 results replicate across two conditions: In the *Together* condition participants viewed actors who were sitting together in the same room while stating their preferences, and in the *Separate* condition participants viewed actors who were sitting alone in separate rooms while stating their preferences. Participants rated the closeness of the actors from not friends to best friends, and then rated the niceness of each actor. To more clearly depict whether two people were sitting together in the same room versus sitting apart in separate rooms, we used videos of real people in Experiment 2 rather than cartoons. As a result of this change, the Experiment 2 stimuli were also more ecologically valid than the Experiment 1 stimuli. Experiment 2 also tested only the critical Experiment 1 trial types in a between-subjects manner: *Shared Likes*; *Pointed Disagreement*; and *Different Evaluations of Different Items* trials.

Method

Participants. The participants were 199 children (102 female, 97 male; M_{age} = 5.49 years; SD_{age} = 0.81 years; $range_{age}$ = 4.02–6.95 years) in the Midwestern United States. The planned sample size was 200 participants. However, during data analysis it was discovered that one of the participants initially included in the sample had completed the experiment twice; thus, after excluding this child's second participation from the data, the final sample consisted of 199 participants. The planned sample size was once again selected based on past studies of children's friendship inferences (e.g., Jordan & Dunham, 2021; Liberman & Shaw, 2019) but increased from the Experiment 1 sample size to account for differences in design between the experiments (i.e., the change from a within-subjects to between-subjects design). The planned sample size provided sufficient power (80%) to detect an effect size of Cohen's d = .29 or greater for pairwise comparisons. In addition to the 199 participants included in data analyses, 24 additional

children were tested but excluded from data analyses because they did not complete the experiment (n = 9), they had already participated in the experiment (n = 4), there was a technology failure (n = 7), or the experimenter made an error (n = 4). Participants' demographic information was provided by their guardians; 84.92% of participants were White, 9.55% were Multiracial, 2.51% were Asian, 0.50% were Black, 0.50% were Hispanic, and 2.01% did not provide information about race. Of the 97.49% of children's guardians who provided education information, 78.35% had one or more parents with at least a four-year college degree.

Materials, procedure, and design. Experiment 2 differed from Experiment 1 in the following ways. First, Experiment 1 featured cartoon characters with cartoon foods or toys, whereas Experiment 2 featured videos of women eating and reacting to real foods. The videos featured two women seated face-forward at a table with bowls of food in front of them. Participants watched one woman taste and react to her food, then watched the other woman taste and react to her food. Reactions were either a positive facial expression and "mmm" sound (indicating liking), or a negative facial expression and "eww" sound (indicating disliking). The transition to video stimuli of real people in Experiment 2 allowed us to provide more accurate spatial depictions of the two novel between-subjects conditions used in Experiment 2: Together or Separate. Participants who were randomly assigned to the Together condition were told that the two women in the videos were in the same room together and could see what each other were doing, and these participants saw one video containing both women sitting next to each other. Participants in the Separate condition were told that the two women in the videos were in different rooms and could not see each other; these participants saw two videos, each showing one of the women eating her food alone. See Figure 4.

Figure 4. Experiment 2 example video still-frames from *Different Evaluations of Different Items* trials in the Together and Separate conditions. The woman in orange is trying the food in the yellow bowl, and the woman in blue is trying the food in the green bowl. Because we do not have actor permission to publish the videos used in this task, this figure displays images from the videos with faces blurred.

After viewing the video(s) once, participants were asked to describe what happened in the video(s) to determine whether they understood the messages portrayed by the actors (i.e., that actors liked or disliked their foods; that actors were eating the same food or different foods). Participant responses were rated by coders who were unaware of condition assignment. The responses revealed that participants understood the messages (e.g., children were more likely to mention that actors were each eating different foods in *Different Evaluations of Different Items* trials than in *Pointed Disagreement* or *Shared Likes* trials). These data are available on OSF for further analysis. After providing a verbal description, participants watched the video(s) again before rating the closeness of the actors.

The closeness scale used in Experiment 2 also differed slightly from the closeness scale used in Experiment 1. Experiment 2 implemented a scale ranging from “not friends” to “best

friends" rather than "strangers" to "best friends" because we expected the continuum from "not friends" to "best friends" to be more easily interpretable by young children, who likely do not tend to hear about strangers in the context of friendship. Further, to limit the possibility that participants would simply align their scale responses to the physical closeness of the actors (who were physically closer on the screen in the Together condition than the Separate condition), the new version of the closeness scale depicted line-drawn faces ranging in valence from negative to positive rather than stick figures varying in closeness from distant to close. When responding to the scale, participants in Experiment 2 were asked "how good of friends do you think they are?" rather than "how close do you think they are?" as was the case in Experiment 1. Scale points were described as follows: "not friends", indicated by a frowning face; "a little bit friends", indicated by a slightly frowning face; "friends", indicated by a neutral face; "good friends", indicated by a slightly smiling face; or "best friends", indicated by a smiling face. See Figure 5.

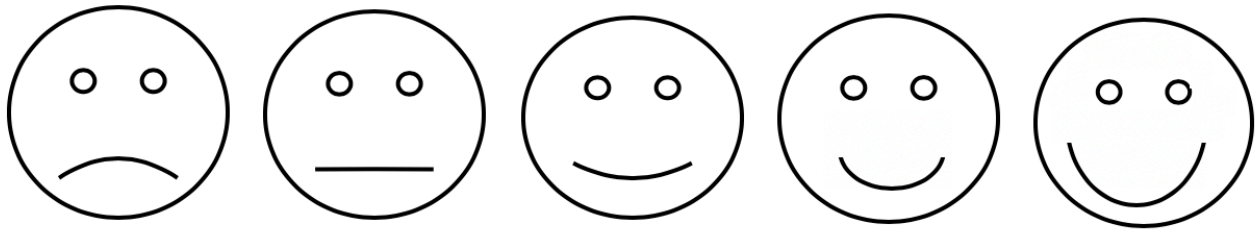

Figure 5. Experiment 2 closeness scale.

Prior to beginning the study trials, participants completed practice trials in which they were asked to indicate the correct scale point for people described as best friends, not friends, and a little bit friends. Participants received corrective feedback for incorrect responses on practice trials. After selecting their answer on the closeness scale for study trials, participants were also asked to explain their choice ("why do you think they are [closeness scale response, e.g., best friends]?").

Finally, Experiment 2 included a niceness ratings measure. After explaining their response for the characters' closeness, participants were asked to indicate whether each actor was nice or mean ("were they being nice or mean?", starting with the actor on the left). After indicating that a particular actor was nice or mean, participants were asked to specify whether each actor was a little nice/mean or really nice/mean (e.g., "how nice were they being – a little nice, or really nice?"). Then, participants were asked to explain their choice in a free-response manner ("why do you think they were being [niceness scale response, e.g., a little nice]?").

Finally, we also transitioned from depicting trial types within-subjects in Experiment 1 to between-subjects in Experiment 2. The switch from static images to videos, the addition of a dependent measure (i.e., niceness ratings), and the addition of free-response explanation opportunities in Experiment 2 resulted in longer testing durations per trial. Piloting revealed that multiple-trial versions of Experiment 2 resulted in high rates of dropout prior to study completion due to the increased length of the study session. Thus, to minimize participant dropout due to excessive study length, we moved to a between-subjects design in Experiment 2 such that all participants were randomly assigned to only one social condition (Together condition or Separate condition) and only one trial out of three possible trial types:

Shared Likes. Each woman had a bowl containing a food in front of her. Both women had identical bowls of food (both green or yellow; counterbalanced across participants). Participants saw one woman take a bite of her food, say "mmm", and smile to indicate that she liked the food, then saw the second woman do the same thing.

Pointed Disagreement. Each woman had a bowl containing a food in front of her, and both women had identical bowls of food (both green or yellow; counterbalanced across participants). Participants saw one woman take a bite of her food, say "mmm", and smile to

indicate that she liked the food, and participants saw the other woman take a bite of her food, say "eww", and frown to indicate that she did not like the food (order counterbalanced across participants).

Different Evaluations of Different Items. One woman ate from a bowl of food (green or yellow, counterbalanced across participants) and liked or disliked the food. The second woman then ate from the opposite bowl and provided the opposite evaluation.

Because participants were randomly assigned to one social condition and one trial type, each individual participant viewed only one of the following scenarios (between-subjects): *Shared Likes*, Together (n = 32); *Shared Likes*, Separate (n = 30); *Disagreement*, Together (n = 35); *Disagreement*, Separate, (n = 33); *Different Evaluations of Different Items*, Together (n = 34); or *Different Evaluations of Different Items*, Separate (n = 35).

Results

Analyses were conducted in R and marginal means were estimated using the emmeans package version 1.7.2 (Lenth, 2022). See Figure 6 for a graph of Experiment 1 individual participant responses, means, and standard deviations by trial type.

In their free-response explanations of closeness and niceness, participants tended to either repeat information presented to them in the trials (e.g., "one of them doesn't like that, and one of them does") or provide nonsense explanations (e.g., "I forgot"; "I don't know"; "drink lemonade"), so we did not code these responses since participants seldom offered interpretable information beyond what was shown in the videos. These responses are provided on OSF.

Closeness Ratings. We assessed the impact of condition and trial type on participants' closeness ratings via a linear model estimating closeness ratings (numeric, range 0–4; 0 = not friends, 1 = a little bit friends, 2 = friends, 3 = good friends, 4 = best friends) from condition

(Together or Separate; between-subjects factor), trial type (*Shared Likes*; *Pointed Disagreement*; or *Different Evaluations of Different Items*; between-subjects factor), and the interaction of condition and trial type. See Table 1 for means and standard deviations of each condition and

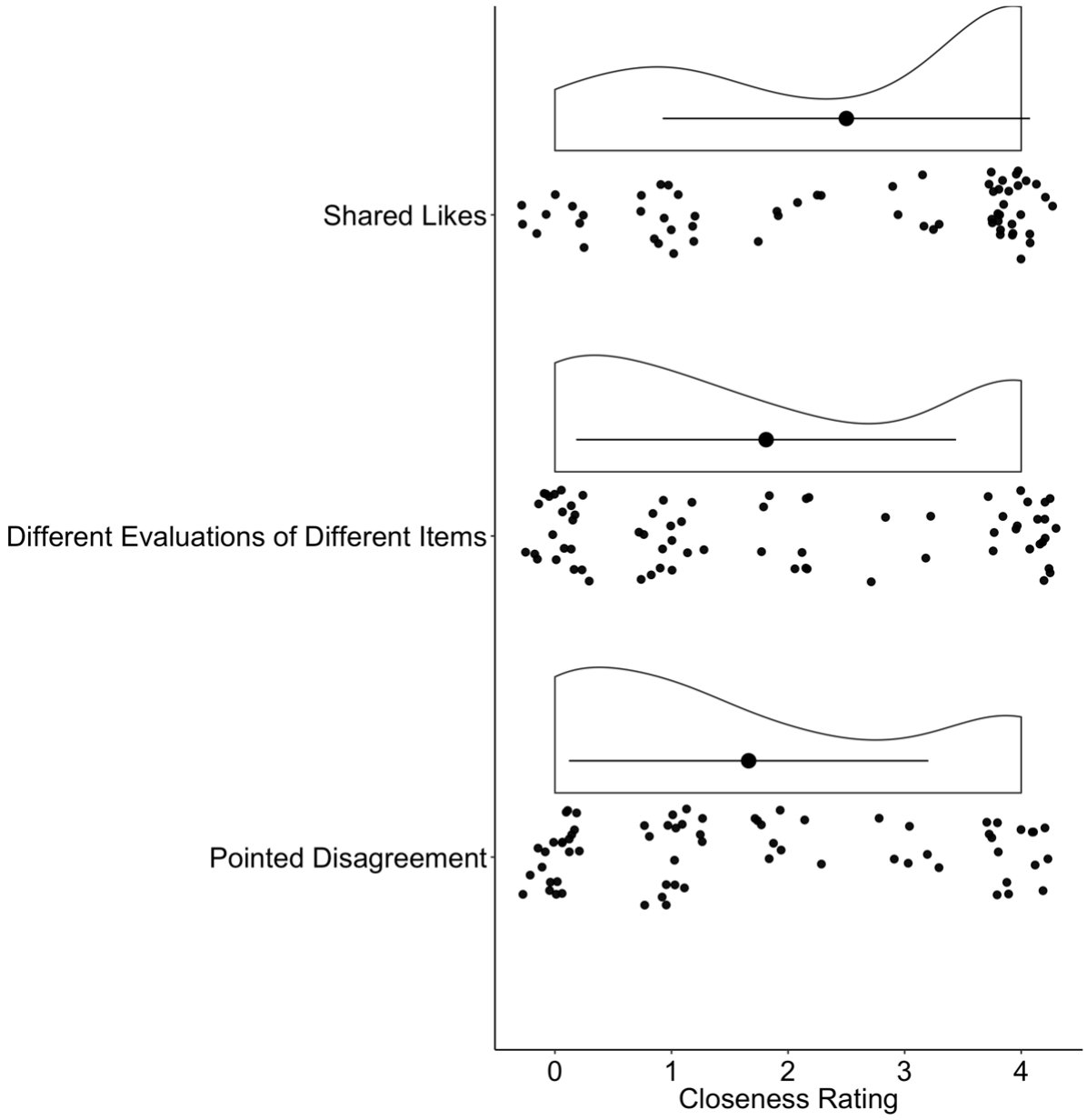

Figure 6. Experiment 2 closeness ratings by trial type. Large black dots represent mean ratings. Lines represent one standard deviation above and below the mean ratings. Small black dots represent individual participant responses. Fills represent the distributions of ratings. Since there were no effects of condition, Figure 6 data are collapsed across condition.

trial type combination.

There was no main effect of condition ($F(1, 193) = 0.55$, $p = .46$, $\eta_p^2 = .003$) or condition X trial type interaction ($F(2, 193) = 2.30$, $p = .10$, $\eta_p^2 = .02$), suggesting that children responded similarly regardless of whether the actors were depicted as together or separate. Replicating the Experiment 1 results, there was a main effect of trial type, $F(2, 193) = 5.09$, $p = .007$, $\eta_p^2 = .05$. Participants rated actors as closer friends when they both liked the same item ($M = 2.50$, $SD = 1.58$) than when they provided different evaluations, regardless of whether the diverging evaluations were towards the same item (*Pointed Disagreement* trials; $M = 1.66$, $SD = 1.54$, $t(193) = 3.01$, $p = .008$) or towards different items (*Different Evaluations of Different Items* trials; $M = 1.81$, $SD = 1.63$, $t(193) = 2.49$, $p = .036$). In fact, replicating Study 1, when one character liked their item and the other character disliked their item, they were rated similarly regardless of whether they were evaluating the same or different items, $t(193) = 0.54$, $p = .85$.

Niceness Ratings. We assessed the impact of condition and trial type on participants' niceness ratings via a second linear model estimating niceness ratings (numeric, range 0–3; 0 = really mean, 1 = a little mean, 2 = a little nice, 3 = really nice) from condition (Together or Separate, between-subjects factor), trial type (*Shared Likes*; *Pointed Disagreement*; or *Different Evaluations of Different Items*; between-subjects factor), and the interaction of condition and trial type. One participant declined to rate either actor, and a second participant declined to rate one of the two actors; thus, these three cells were omitted from niceness ratings analyses. Niceness ratings did not differ between the Together ($M = 2.14$, $SD = 1.02$) and Separate ($M = 1.95$, $SD = 1.10$) conditions ($F(1, 389) = 3.12$, $p = .08$, $\eta_p^2 = .008$), and there was no significant interaction between trial type and condition on niceness ratings, $F(2, 389) = 2.08$, $p = .13$, $\eta_p^2 = .01$.

Age Effects. We did not have hypotheses related to the relation between participant age and closeness ratings in Experiment 2. However, the presence of participant age effects in Experiment 1 raised the possibility that the youngest participants in Experiment 2 may also show weaker effects than other participants. To examine this possibility, we again conducted exploratory analyses to examine how participant age may relate to the effects observed in the primary model of interest. To do so, we fit a third linear model identical to the first but with age (continuous) as an additional predictor, and we examined all possible interactions involving age.

There was no interaction between participant age and trial type, $F(2, 187) = 0.27$, $p = .76$, $\eta_p^2 = .005$. However, there was a significant interaction between participant age and condition, $F(1, 187) = 3.97$, $p = .048$, $\eta_p^2 = .02$ and a significant interaction between participant age, condition, and trial type, $F(2, 187) = 3.38$, $p = .036$, $\eta_p^2 = .03$. To examine the nature of this highest-order interaction further, we examined the simple slopes of the interaction between condition and trial type at the mean participant age (5.49 years; "mean-age children"), one standard deviation above the mean age (6.30 years; "older children"), and one standard deviation below the mean age (4.68 years; "younger children").

Replicating the hypothesized effects observed in our primary analyses, the mean-age children and older children did not rate actors in different trial types differently between the Together and Separate conditions (ps > .10). However, there was a significant trial type X condition interaction among younger children, $F(2, 187) = 4.92$, $p = .008$. The effect of trial type observed among mean-age and older children was also observed among younger children in the Together condition (*Shared Likes > Different Evaluations of Different Items*, $p = .01$; *Shared Likes > Pointed Disagreement*, $p = .007$; *Different Evaluations of Different Items* vs. *Pointed Disagreement*, $p = .97$) but not the Separate condition (ps > .66).

Discussion

The results of Experiment 2 provide additional evidence that children apply the homophily principle to their reasoning about social relationships. Replicating the results of Experiment 1 in a new context, participants indicated that people whose food preferences align are better friends than people whose food preferences diverge. In particular, actors in *Shared Likes* trials were rated as closer than actors in the remaining two trial types, and this pattern of results emerged in both the Separate and Together conditions.

Following Experiment 1, it remained plausible that children's closeness ratings hinged on beliefs about rudeness rather than shared preferences. In particular, children may believe that it is rude to say you dislike something that someone else has just indicated that they like (and vice versa) and that friends are not rude to one another; if so, these beliefs could have explained the results of Experiment 1 rather than beliefs about similarity. However, the results of Experiment 2 minimize the plausibility of this explanation: It is not likely interpreted as rude to state an opinion in private, yet overall participants' responses in the Separate condition (where actors provided their evaluations of foods in private) mirrored the responses observed in the Together condition (where actors provided their evaluations of foods in front of one another). Indeed, participants did not rate actors as nicer in either condition, further suggesting that participants were not interpreting actors whose evaluations of foods diverged as particularly rude. Taken together, these results suggest that beliefs about similarity, rather than beliefs about rudeness, are a more plausible primary mechanism underlying children's reasoning about friendship in Experiments 1 and 2.

As seen in Experiment 1, the responses of the youngest children in the present sample differed from the responses of other participants. Whereas four-year-old participants in the

Together condition responded similarly to older children (i.e., they rated targets in *Shared Likes* trials as closest), four-year-old participants in the Separate condition did not rate any trial types differently. Thus, although five- and six-year-old participants' responses (and the overall patterns observed in the data) align with the homophily principle, four-year-old participants' responses are less clearly aligned with the homophily principle (and may instead require that people *know* about their similarity in order for that similarity to be relevant for friendship). We return to the discussion of age-related changes across both experiments in the General Discussion.

General Discussion

The social world is incredibly complex. People relate to one another in myriad ways, but these relationships – and the expectations of those engaged in them – are seldom defined explicitly. Children therefore face the difficult task of determining how people relate to one another and the behaviors associated with those relationships. The present research reveals one strategy young children apply to begin carving out the social world: the homophily principle.

Experiment 1 tested whether children's inferences about patterns of affiliation aligned with the homophily principle. Indeed, we found that children rated characters who liked (or disliked) the same item as closer than characters who disagreed in their opinions of an item. These results were not due to the shared valence of the evaluations alone: Children rated characters who both liked the same item as closer than characters who each liked a different item. These results align with the homophily principle, which describes that similar people are more likely to engage in social relationships than dissimilar people.

Experiment 2 largely replicated the results of Experiment 1. Participants again expected people who provided the same evaluation of the same item – a shared preference – to be closer than people who (i) provided different evaluations of an item (pointed disagreement) or (ii)

evaluated different items. The same pattern of results was seen when the evaluators were presented together and when they were presented separately, suggesting that expectations about friendship were likely due to similarity per se, and not based on the fact that it may be rude to express a difference of opinion in front of a social partner. Thus, in addition to replicating Experiment 1, Experiment 2 extended our initial findings by using new stimuli and including a condition where individuals indicated their evaluations in private, thereby ruling out an additional alternative explanation for the results seen both in the present work and prior studies (e.g., Jordan & Dunham, 2021; Liberman & Shaw, 2019).

Examining the results of Experiments 1 and 2 based on participant age clarified that five- and six-year-old children make inferences about friendship based on the homophily principle, but these results provided less clarity about younger children. Across both experiments, the effects observed among five- to six-year-old participants largely mirrored the overall results, but results differed for younger children (i.e., four-year-old children). In Experiment 1, younger children responded primarily based on the valence presented in each trial type, rating targets who both liked their items as closest regardless of whether they liked the same item (homophily) or liked different items (not homophily). In Experiment 2, younger children rated actors who liked the same items as closest only when actors were depicted sitting together (versus separately). The patterns of results observed among younger children could reflect a weak understanding of the homophily principle; if so, this may suggest that children's understanding of homophily lacks robustness and flexibility until around five years of age. Alternatively, these age differences could stem from varying priorities in the cues children consider most relevant to friendship at the different ages tested here. For instance, four-year-old children understand physical proximity as a cue to friendship (Liberman & Shaw, 2019) and may have prioritized proximity over shared

preferences as a cue to friendship in Experiment 2. That is, younger children may have assumed that actors in the Separate condition were not friends, regardless of information about shared preferences, because the actors were depicted as physically distant from one another. These possibilities raise exciting new questions about the origins of children's awareness (and prioritization) of the homophily principle in their reasoning about social relationships.

It will be important for future research to continue outlining the developmental origins of humans' understanding of homophily. Here, five- and six-year-old children (and possibly four-year-old children) expected similarity to indicate closeness, but it is possible that the seeds of this ability are present even earlier in development. For instance, infants and young children prefer individuals who share their own preferences (e.g., food or toy preferences; Fawcett & Markson, 2010a; Hamlin, et al., 2013; Mahajan & Wynn, 2012; Yeong Tan & Singh, 1995), and young children also prefer items that are endorsed by similar versus dissimilar others (Fawcett & Markson, 2010b). These past results suggest that infants and toddlers may use shared preferences to guide their own interactions with other people, which could contribute to the later emergence of the homophily principle in children's reasoning about friendship by early childhood. To address these possibilities more directly, future work could implement longitudinal strategies or use methods appropriate for both infants and older children to facilitate more direct comparisons between results obtained with children of different ages.

The present research was the first to ask whether young children, like adults (Bosson et al., 2006; Gray, 2021; Weaver & Bosson, 2011), associate shared *dislikes* with friendship. We found that dislikes are also relevant to children's application of the homophily principle: Children expect people with a shared dislike to be socially closer than people who dislike different items or disagree in their evaluation of an item. Children's association between shared

dislikes and friendship generates many novel possibilities. First, although children used shared dislikes to infer friendship, these inferences were not as strong as their inferences about shared likes in Experiment 1. Future work should continue to consider the role of shared dislikes in children's application of the homophily principle to determine how dislikes compare to other types of similarities in terms of children's friendship expectations. Although we did not examine shared dislikes in Experiment 2, the incorporation of this trial type could have enhanced the design by replicating children's inferences of homophily from similar dislikes using different stimuli, and by further demonstrating that negative affect (e.g., rudeness) was not a primary factor underlying children's responses. Future research could investigate whether children differentiate shared likes from shared dislikes in first-person contexts, or whether in these cases children are equally likely to choose to befriend someone who shares their dislikes versus theirs likes. Additionally, future work could address whether dislikes are more meaningful in some domains (e.g., dislike of a music genre) than others (e.g., dislike of a color) at various ages.

The two experiments presented here each used a more sensitive measure of children's attention to homophily than has been used in past work. Prior work used forced-choice paradigms that pitted shared preferences against other attributes, such as category labels (Jordan & Dunham, 2021), loyalty (Liberman & Shaw, 2019), and coincidental encounters (Afshordi, 2019). From such studies, it was unclear whether children view shared preferences as a signal of friendship in their own right and, if so, how strong a signal. Using two distinct five-point scale measures – one without cues to valence (Experiment 1) and another without cues to spatial proximity (Experiment 2) – we found converging evidence that children make graded judgments with regard to the meaning of shared preferences to social relationships: On average, participants rated people with shared likes as friends (Experiment 2) or good friends (Experiment 1), but

rated people with dissimilar preferences as only kind of knowing one another (Experiment 1) or just okay friends (Experiment 2). Thus, the present work is the first to reveal that children make fine-grained distinctions about people's relationships based on whether they like the same things, and these judgments are not constrained to one particular type of stimulus or outcome measure.

Despite the fact that our dependent measures allowed for more fine-grained observations than forced-choice paradigms, there are also important caveats to consider when interpreting Likert scales. For example, responses to scaled measures are inherently constrained by the answer options provided – the scale labels, number of scale points, and accompanying images. Interestingly, although we used two different five-point scales, each scale produced similar results, providing converging evidence that participants rated people with shared preferences as closer friends. Using additional variations of these scales would be useful in future work in order to determine children's beliefs about the actors' interest in being friends with one another (which does not assume they already know one another) or children's estimates of the amount of time people spend together (to understand inferences about the types of behaviors that friends tend to engage in). As with other measures, Likert scales are prone to demand characteristics: It is possible that children in the present research felt pressured to use the information provided (i.e., about shared or unshared food preferences) to make inferences about friendship even if they did not believe shared preferences are particularly relevant to friendship. Future research could consider adding additional response options – such as the option to say "I don't know" – in order to provide additional clarity regarding children's confidence in their responses.

Importantly, although children in the present work expected share preferences to indicate social closeness, they did not necessarily believe that disagreement was a signal of a poor relationship. For instance, participants in Experiment 2 rated actors who disagreed as "okay

friends" on average. This could represent a general tendency for children to provide positive ratings of people – to like people, believe people are nice, or assume people are friends – without sufficient evidence to the contrary. Alternatively, children's middling responses on average for actors with different preferences (i.e., "okay friends") may be reasonable considering that real friendships are comprised of individuals with many likes and dislikes, some of which will not align even among the closest of friends (for review see Laursen et al., 2017). It is possible that children believe one shared preference is sufficient to infer a positive relationship, but they do not interpret one differing preference as sufficient evidence of a negative or nonexistent relationship. Thus, the graded measures used in the present work illuminate the relative weight children attach to shared or unshared preferences, but also reveal that children do not necessarily believe that people with unshared preferences cannot be friends.

The data presented here suggest that young children appreciate the homophily principle, laying a foundation for future research on children's understanding of the interaction between closeness and similarity over time. Togetherness breeds similarity (e.g., Boy & Uitermark, 2020; DellaPosta et al., 2015; Laursen et al., 2017; McPherson et al., 2001) and similarity brings people together (e.g., Kandel, 1978b; Sun & Taylor, 2020), but it remains unclear whether children's lay theories of homophily privilege a similarity-first or closeness-first account of its origins. It is possible that children believe people initiate relationships regardless of similarity, but that over time people who are close become more alike. Alternatively, children may believe that similarity drives people to initiate relationships in the first place. Yet another alternative is that children understand the reciprocal nature of closeness and similarity over time – that people become closer over the course of a relationship, thus becoming more similar, and thus becoming even closer still. By asking children to estimate the closeness of people whose relationships vary

systematically by time and similarity, future research could begin to disentangle children's lay theories of the mechanisms underlying the homophily principle.

The present research contributes to our developing understanding of how children perceive and reason about the structure of the social world. The data presented here demonstrate that children make inferences about social relationships based on their observations of other people's behavior: Participants in the present experiments did not require explicit explanation to determine who was friends with whom, but instead made inferences about friendship based only on information about people's likes and dislikes. Children's ability to make sense of people's social relationships based on limited information likely helps them understand other people's behaviors as they navigate the social world, and this ability may also help guide children's behaviors as they engage in social relationships of their own.

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