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Secret to Friendship: Children Make Inferences About Friendship Based on Secret Sharing

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Secrets carry valuable social information. Because the content of secrets can be damaging to the secret-keeper’s reputation, people should only disclose their secrets to people whom they trust. Therefore, tracking which people know each other’s secrets can be used as cue of social relationships: If one person tells another person a secret, those people are likely friends. Here, in 5 studies with 3- to 12-year-old children (total N = 452), we examined the developmental trajectory of reasoning about secret sharing as an indication of third-party friendship. By age 6, but not before, children expected that a person would be friends with someone that she told a secret. We replicated this main finding across four studies by comparing secret sharing to other cues of affiliation. Children treated sharing a secret as a stronger cue to friendship than sharing a physical object (Study 1), sharing a fact (Studies 2–4), or sharing membership on the same sports team (Study 3). Although younger children did not understand that secret sharing indicated friendship, they did expect people to be more likely to disclose their secrets to friends than to nonfriends (Study 5). Taken together, our results indicate that children understand the social significance of sharing secrets and use secret sharing to make important predictions about the social world. Specifically, children infer social relationships based on which people know each other’s secrets and expect others to share secrets selectively with friends.

Keywords: affiliation, friendship, reputation, secrets, social cognition

Because secrets typically involve information that the secret keeper does not want many others to know, and that may be damaging to the secret keeper’s reputation, people must be careful when deciding whether to share a secret with someone else (e.g., Kelly, 1999; Norton, Feldman, & Tafaya, 1974). To ensure that the listener will indeed keep the secret, adults are typically selective in whom they reveal their secrets to: they are more likely to share secrets with people they feel emotionally close to, such as family, spouses, and close friends (e.g., Chelune, Waring, Vosk, Sultan, & Ogden, 1984; Finkenauer, Engels, & Meeus, 2002; Frijns & Finkenauer, 2009; Kelly & Carter, 2001; Petronio & Bantz, 1991; Vrij, Nunkoosing, Paterson, Oosterwegel, & Soukara, 2002). Indeed, the fact that people convey secrets to close (but not distant) others may mean that patterns of secret sharing can be used as a reliable cue of social relationships (DeScioli & Kurzban, 2009; Rotenberg, Michalik, Eisenberg, & Betts, 2008). In fact, secret sharing may play a particularly important role in friendship, such that patterns of confiding and withholding secrets may provide more information about social structure and intimate relationships than sharing other types of information (e.g., discussing facts; Bellman, 1984). We know that even young children can keep secrets (Bottoms, Goodman, Schwartz-Kenney, & Thomas, 2002; Bussey, 1999; Pipe & Wilson, 1994), but it is unclear if they understand that other people can glean social information about friendships based on how secrets are kept and disclosed. Here, we explore whether children can use patterns of how secrets are shared to make inferences about the social world. Specifically, we investigate whether children use secret disclosure as a reasonable cue for inferring friendship between two people.

Although there is as of yet no research about whether children understand that secret disclosure can indicate patterns of friendship, relationships do guide how children share their own secrets. Preschoolers selectively confide in friends and parents over acquaintances and strangers (Dunn, 2004; Rotenberg, 1986; Watson & Valtin, 1997). And, by age 6 or 7, children avoid spreading negative information about their friends (Kim, Harris, & Warmen, 2014) and are more likely to keep the secrets of their ingroup members (Misch, Over, & Carpenter, 2016). Thus, children are more likely to tell their own secrets to people they are close to, and are more likely to keep the secrets of these same people. Children in the early years of school also, rate people who keep secrets as more trustworthy than people who tell secrets (Rotenberg et al., 2008), and view the ability to trust someone to keep a secret as an important quality in deciding whether to be friends with that person (Furman & Bierman, 1984).

Indeed, it is possible that secret sharing is as (or even more) important to human friendship as other highly studied friendship properties, such as similarity. For example, in one study, DeScioli and Kurzban (2009) had adults make an ordered list of their top
friends and rate 10 properties of these friendships, including how much they engaged in secret sharing. Secret sharing was highly correlated with overall closeness, and this correlation was higher than the correlations between closeness and traits that might be desired in a friend (e.g., how intelligent or caring the friend was rated; DeScioli & Kurzban, 2009). Thus, secret sharing may be more indicative of friendships than highly studied properties, like traits of friends (e.g., kindness and intelligence; Lewis et al., 2011; Sprecher & Regan, 2002; Vigil, 2007) or similarity between friends (e.g., Byrne, London, & Reeves, 1968; McPherson, Smith-Lovin, & Cook, 2001; Verbrugge, 1977). Taken together, this work suggests that secret disclosure should be a powerful cue of social relationships.

Here, we investigate whether (and when) children understand the broader social significance of secrets. Although children keep their partner’s secrets and expect their partners to reciprocate (e.g., Bigelow, 1977), the fact that the vast majority of this research uses first-person measures (e.g., does a child tell a secret), means that the previous research does not (and cannot) reveal whether children use secret disclosure as a cue to discern third-party patterns of friendship. Children could selectively tell their friend (Person A) a secret without understanding that someone outside of that relationship (Person B) could use that behavior (secret sharing) to make an inference about the child’s friendship (with Person A). Third-party measures, on the other hand, which ask how children think about relationships outside of their own interactions, can reveal sophisticated reasoning about friendship early in development. For example, when asked what characteristics friends in general have, children note the importance of both traits (e.g., similarity) and behaviors (e.g., intimacy and loyalty; Bigelow, 1977; Furman & Bierman, 1984). In a recent study, children were told a short vignette and were asked which characters in the vignette were friends. Children expected the main character to be friends with someone whom he or she shared more resources with (Liberman & Shaw, 2017). Here, we take advantage of similar third-party measures to examine whether children use patterns of secret sharing as evidence about patterns of social relationships. Specifically, we asked whether 3- to 12-year-old children expect that people who have shared secrets with one another are more likely to be friends (Studies 1–4). In a final study, we conceptually replicate past research (Anagnostaki, Wright, & Papathanasiou, 2013) suggesting that children expect people to tell secrets selectively to friends, rather than to all people (Study 5). Across all studies we compare secret sharing to other cues of affiliation such as sharing physical objects (Study 1), sharing other pieces of nonsecret information (Studies 2–5), and/or sharing membership on a team (Study 3). These comparisons allow us to ask not only whether children use secret sharing as a cue to friendship, but also whether they see it as a particularly strong friendship cue and whether their importance of a friendship cue depends on the type of information that is shared.

**General Methods**

Participants were tested onsite at a zoo in Santa Barbara, California (Study 1) or at a science museum in Chicago, Illinois (Studies 2–5). All participants had written consent before participating. All procedures were approved by the Institutional Review Board at University of California Santa Barbara (Protocol Number: 1–17-0996; “Understanding the Social World”) and at University of Chicago (Protocol Number: 15–1237: “Friendship and Alliances”). The studies took place between summer of 2015 and summer of 2017. We tested participants between 3- and 12-years old. We recruited children from this broad age range for a couple of reasons. The first reason is practical: Because we were set-up at a table in a main area of the museums, we tested all children who approached the table with interest in participating. The second reason is theoretical: Testing a broad age range allows us to investigate differences in social cognition across development. In all studies we first analyzed age continuously to examine whether there is a change in reasoning with age over time. We did not have predictions about the exact age at which children would expect secret sharing to indicate friendship, but we did expect this inference to get stronger with age. We then divided the sample into three age groups (3- to 5-year-olds, 6- to 8-year-olds, and 9- to 12-year-olds) to investigate the specific patterns of reasoning at different points of development. These particular age groups are theoretically motivated by research on children’s reasoning about disclosure, which finds differences in reasoning between preschoolers (4- to 5-year-olds) and slightly older children (7- to 8-year-olds; see Kim et al., 2014). We expected to find similar differences in our sample such that school-age children (6- to 8-year-olds and 9- to 12-year-olds) would be more likely to understand the importance of secret sharing than the youngest children (3- to 5-year-olds).

Due to variability in the daily number of visitors, we set our stopping criterion for data collection as the end of the day on which there were approximately 20 participants per age group per condition for each study. This stopping criterion was chosen based on the sample sizes in past research using similar methods (e.g., Liberman & Shaw, 2017). If the effect size for children’s inferences based on secret sharing is similar to the effect size seen for reasoning about resource sharing (average Cohen’s $d = 0.70$), then samples of this size should be high-powered enough to detect the effect. Because we designed the studies to be run quickly on the floor of the museum or the zoo, we did not have parents fill out detailed demographic forms, and instead only collected information about children’s birthdates (to divide the sample into age groups) and gender (to gender-match the characters in the study to the participant). Although we did not collect demographic information, demographics were reflective of the broader communities where the research was conducted.1

In the first four studies, we ask whether children understand that sharing a secret can serve as a cue of friendship. To do so, we present children with vignettes where a main character tells one character a secret, and interacts with a third character without sharing a secret. We ask which of the two characters children expect to be closer friends with the main character. If children use secret sharing as a cue of third-party friendship, then we hypothesize they will choose the person whom was told the secret as the main character’s closer friend.

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1 For example, in another study we conducted at the Santa Barbara Zoo, approximately 81% of participants were White and 27% were of Hispanic descent, which is close to the percentages seen in Census demographics (78% White and 38% Hispanic).
Study 1

In Study 1, we compared children’s reasoning about secret sharing to their reasoning about sharing of physical objects. Specifically, we asked whether children expected sharing a secret to be a better indicator of friendship than sharing a physical object. Past research indicates that young children clearly understand the link between sharing of objects and friendship: They expect people to share with friends (e.g., DeJesus, Rhodes, & Kinzler, 2014; Olson & Spelke, 2008), and they expect people who violate this norm to feel bad (e.g., Smetana & Ball, 2017). In fact, young children are more likely to share their own items with friends (Moore, 2009; Paulus, 2016; Paulus & Moore, 2014; Yu, Zhu, & Leslie, 2016), and they use resource distribution as a cue to friendship, predicting that someone is likely to be friends with a person whom she favored (Liberman & Shaw, 2017). Thus, as an initial test case of children’s expectations that secret sharing indicates friendship, we compared it with sharing of a valued physical resource: a cookie. We hypothesize that children will use secret sharing as a cue to friendship, and that they may use secret sharing as an even stronger cue to affiliation than sharing of a physical resource, particularly as children get older. That is, children may be more likely to expect a character is a friend of someone to whom she tells a secret, rather than someone to whom she gives a cookie.

Method

Participants. Seventy-one participants were tested in this study, including: 24 3- to 5-year-olds (M = 5 years, 0 months; SD = 8 months; 16 female), 31 6- to 8-year-olds (M = 7 years, 5 months; SD = 10 months; 17 female), and 16 9- to 12-year-olds (M = 10 years, 0 months; SD = 11 months; eight female). This study was run in Santa Barbara, CA.

Procedure. Children were introduced to three gender-matched characters, placed in a triangle with a central character on top and two characters on the bottom. Children were told that the top character (main character) shared a personal secret with one of the other two characters, and gave a cookie to the final character (see Appendix for script). The side of the character who was told the secret was counterbalanced across subjects. Children were then asked whom the top character was better friends with. Children’s choices were recorded as picking either the person who was told the secret or the person who was given a cookie. If participants use secret sharing as a stronger indication of friendship than sharing a cookie, then they should choose the person who was told the secret as the more likely friend.

Results

No gender differences were found in this study or any subsequent studies, so we collapse across gender for the remainder of this article. Additionally, all reported p values are two-tailed.

To ask whether children’s expectations about friendship changed across development, we conducted a binomial logistic regression modeling choosing the person who was told the secret as the more likely friend with age as the predictor variable. The results revealed a significant effect of age (β = 0.519, p = .002), indicating that the likelihood of choosing the person who was told the secret as the friend (rather than the person who was given a cookie) increased with age. Therefore, we next investigated the three age groups separately by conducting binomial probability tests on the number of children choosing the person who was told a secret in each age group.

Whereas 3- to 5-year-olds were equally likely to choose the person who was told a secret (n = 12 out of 24, 50%) compared with the person who was given a cookie (n = 12 out of 24, 50%, p = 1.0), both 6- to 8-year-olds (n = 22 of 31, 71% chose the person who was told a secret, p = .029) and 9- to 12-year-olds (n = 15 of 16, 94% chose the person who was told a secret, p < .001) expected the top character to be more likely to be friends with the person to whom he told a secret (see Figure 1).

Discussion

We know from past work that children link sharing of physical items to friendship: They expect someone to be friends with the person to whom they give more resources (e.g., Liberman & Shaw, 2017). However, the results from Study 1 suggest that, at least for older children, sharing secrets may be an even better indication of friendship than sharing a physical resource. By 6 years of age, children expected someone to be better friends with a person she told a secret than with a person she gave a cookie.

We are not claiming that sharing a secret will always be a better indicator of friendship than resource sharing. Of course, if the resource is very valuable and/or the information shared is not, then we might observe a different pattern of results. Therefore, future research can investigate whether the type of resource shared (or the specific information of the secret shared) influences these judgments. Indeed, children at this same age, 6- to 8-year-olds, reason differently about sharing of necessary versus luxury items (Rizzo, Elenbaas, Cooley, & Killen, 2016), suggesting their inferences about the relative importance of sharing secrets or resources could vary based on the particular resource (or secret) in question. For example, in a case of extreme need and scarcity, sharing a resource may be more important than sharing a secret, even for older children.

Study 2

Our previous study found that children think that secret disclosure is a cue that two people are friends. However, it is unclear why children begin to see secrets as a powerful cue to friendship. Specifically, children could expect secret sharing to indicate friendship either because they use secret sharing as a proxy for spending time together (people who share any information must socially interact), or because they see secret sharing as a proxy for trust and intimacy (because they understand that secrets can have reputational consequences if shared and therefore should only be told to close others, see Chelune et al., 1984). To begin to address these issues, our next two studies compare secrets with another type of information, facts, to determine whether or not children think that secrets are particularly valuable pieces of information.

If the results in Study 1 were due to the fact that secret sharing implies that the two children talk regularly, then children might not differentiate their friendship predictions based on the content of the information shared, because they might expect sharing any information (which requires spending time together) to reflect friendship. On the other hand, if children expect secret sharing secrets in
particular to be a strong cue of friendship, then we hypothesize they will choose the person whom was told the secret as the main character’s closer friend.

Method

Participants. Seventy-eight participants were tested in this study, including: 26 3- to 5-year-olds (M = 4 years, 8 months; SD = 8 months; 14 female), 33 6- to 8-year-olds (M = 7 years, 4 months; SD = 10 months; 19 female), and 19 9- to 12-year-olds (M = 11 years, 0 months; SD = 13 months; nine female).

Procedure. As in Study 1, children were introduced to three gender-matched characters, placed in a triangle with a central character (main character) on top and two characters on the bottom. Children were told that the top character shared a piece of information with each of the bottom two characters. He told one of them a personal secret, and he told the other one a fact he learned in school (see Appendix for script). The side of the character who was told the secret was counterbalanced across subjects. Children were then asked whom the top character was better friends with. Children’s choices were recorded as picking either the person who was told the secret or the person who was told the fact.

Results

To ask whether children’s expectations about friendship changed across development, we conducted a binomial logistic regression modeling choosing the person who was told the secret as the more likely friend with age as the predictor variable. The results revealed a significant effect of age (β = 0.597, p = .001), indicating that the likelihood of choosing the person who was told the secret as the main character’s friend (over the person who was told a fact) increased with age. Therefore, we next investigated the three age groups separately by conducting binomial probability tests on the number of children choosing the person who was told a secret in each age group.

Whereas 3- to 5-year-olds were not more likely to choose the person who was told the secret (n = 15 of 26, 58%) than the person who was told a fact (n = 11 of 26, 42%; p = .557), both 6- to 8-year-olds, and 9- to 12-year-olds expected the top character to be more likely to be friends with the person to whom he told the personal secret (6- to 8-year-olds: n = 26 of 33, 79%, chose the person who was told a secret, p = .001; 9- to 12-year-olds: n = 18 of 19, 95%, chose the person who was told a secret, p < .001; see Figure 1).

Discussion

Children, at least by age 6, expected sharing a secret to indicate friendship more strongly than having shared knowledge about a fact. Although the top character interacted with both other characters equally, telling each character a piece of information, children in the middle and older age groups were sensitive to the content of the information. They expected that telling someone a secret was a better indicator of friendship than telling someone a

![Figure 1. Results of Studies 1, 2, and 4. The graph shows the percentage of children in each age group of each study who chose each character as the main character’s likely friend. For example, in Study 1 children chose between a person to whom the main character gave a cookie (white bars) or the person to whom the main character told a secret (dark gray bars). Asterisks indicate significant differences according to two-tailed binomial probability tests.](image-url)
fact. We suggest that this is because children understand the social significance of secrets: People are more likely to share secrets with close confidants, which means knowing that one person told another person a secret provides a cue that those two people are close. Younger children did not form a reliable expectation in this context. They may not have chosen the person who was told the secret because they did not understand that secret sharing is a cue to friendship or because they expected that sharing a secret and sharing a fact were equally good friendship cues. Perhaps children’s earliest views of friendship are based on time spent together, which is equated for sharing secrets and sharing facts. Indeed, some research suggests that children’s earliest expectations about friendship are based on shared activities and time spent in proximity (e.g., Bigelow, 1977), meaning any conversation could indicate friendship. Additionally, younger children’s secrets contain different content, and are less social than older children’s secrets (e.g., Last, & Aharoni-Etzioni, 1995), suggesting they might not expect secrets to refer to special types of information. Older children may be more likely to expect secrets to contain information that could damage the secret keeper’s reputation, and that might help them differentiate the sociality of disclosing different types of information.

**Study 3**

Taken together, Studies 1 and 2 suggest that by age 6 children use secret sharing as an indication of friendship, and that it might be a better cue of friendship than sharing a physical object (Study 1) or than sharing other types of information (Study 2). In Study 3, we test the strength of children’s expectations about the social value of secrets by comparing secret sharing to team membership.

A large and growing body of work suggests that children like people in their own group (e.g., Aboud, 2003; Bigler, Jones, & Lobliner, 1997), expect people to choose friends from their own social group (e.g., Shutts, Pemberton Roben, & Spelke, 2013) and see members of a group as socially obligated to one another (e.g., Rhodes & Chalik, 2013). Therefore, choosing to be members of the same team should indicate friendship. Thus, to ask about the strength of children’s inferences about the social value of secret sharing, we compared sharing a secret with team membership. We used chosen sports team as a cue to group membership because people tend to be highly affiliated with their sports teams (e.g., Murrell & Dietz, 1992; Wann & Branscombe, 1995) and the role of actively choosing to be part of a group may be important for forming ingroup social preferences even early in development (e.g., Wynn, 2016). In line with our previous experiments, we expected as children got older they would show an increasing likelihood to use secret sharing rather than team membership as a cue to friendship. We ran a control condition comparing team membership to fact sharing, to confirm that in the absence of valuable social information (e.g., sharing a secret), children in our sample were sensitive to the importance of team membership. In the control condition (fact vs. team membership), we expected children to select the team member as the friend. Because children use group membership to reason about social behaviors starting from 3 years of age (e.g., Rhodes & Chalik, 2013), we expected this pattern to be seen even for the youngest children.

**Method**

**Participants.** One-hundred and 25 participants were tested in this study. Participants were randomly assigned to the fact versus team membership condition (N = 59) or the secret versus team membership condition (N = 66). The fact versus team condition included: 20 3- to 5-year-olds (M = 4 years, 7 months; SD = 11 months; 12 female), 20 6- to 8-year-olds (M = 7 years, 5 months; SD = 11 months; 11 female), and 20 9- to 12-year-olds (M = 10 years, 3 months; SD = 10 months; 10 female). The secret versus team condition included: 21 3- to 5-year-olds (M = 4 years, 9 months; SD = 9 months; 12 female), 24 6- to 8-year-olds (M = 7 years, 5 months; SD = 12 months; eight female), and 20 9- to 12-year-olds (M = 10 years, 3 months; SD = 10 months; nine female).

**Procedure.** In both conditions, the methods were similar to Study 2, except that instead of comparing sharing a secret to sharing a fact, we compared sharing one of these pieces of information (a secret or a fact, depending on condition) to choosing to be members of the same sports team (see Appendix for scripts). Children were asked whom the top character was better friends with, and their choice was recorded as the person whom the top character told a piece of information (the secret in the secret vs. team membership condition or the fact in the fact vs. team membership condition) or as the teammate. We predicted that in the fact versus team membership condition, children would choose the teammate as the friend. On the other hand, if children expect secret sharing to also be a good indication of friendship, then we predict children in the secret versus team membership condition might be at chance, or might even pick the person who was told a secret as the friend over the teammate.

**Results**

To ask whether children’s expectations about friendship changed across development, we conducted a binomial logistic regression modeling choosing the person on the main character’s team as the more likely friend with age as the predictor variable, for each condition separately. The results revealed a significant effect of age for both conditions. However, the effect of age was in different directions in the two conditions: In the secret versus team condition, children became less likely to choose the team member with age (β = −0.292, p = .014), whereas in the fact versus team condition older children were more likely to choose the team member with age (β = 0.376, p = .011). Therefore, we next investigated the three age groups separately by conducting binomial probability tests on the number of children choosing the team member in each age group (see Figure 2).

Three- to 5-year-olds’ friendship choices were random regardless of the type of information being shared, and their patterns of responses did not differ across the conditions, χ²(1, N = 41) = 0.02, p = .890. Specifically, in the secret versus team condition they were equally likely to choose the team member or the person who was told a secret (n = 9 of 21, 43%, chose the person who was told a secret, p = .662). Similarly, in the fact versus team condition they were equally likely to choose the team member or the person who was told a fact (n = 9 of 20, 45%, chose the person who was told a fact, p = .824).

On the other hand, 6- to 8-year-olds responses to the secret versus team condition differed significantly from their responses in
the fact versus team condition, $X^2(1, N = 44) = 5.37, p = .020$. As hypothesized, in the fact versus team condition, they were more likely to select the teammate as the likely friend ($n = 16$ of $20, 80\%$, chose the teammate, $p = .012$). However, in the secret versus team condition they chose randomly between the teammate and the person who was told a secret ($n = 13$ of $24, 54\%$, chose the person who was told a secret, $p = .838$). The difference between conditions suggests that when the piece of information was a personal secret, children were less likely to rely on team membership as the only cue for friendship. The null result in the secret condition may suggest that children of this age see both secret sharing and team membership as good cues to friendship.

The oldest children, 9- to 12-year-olds, also had significantly different responses across the two conditions, $X^2(1, N = 44) = 5.37, p = .020$. As hypothesized, in the fact versus team condition they were significantly more likely to select the teammate as the main character’s friend ($n = 19$ of $21, 90\%$, chose the teammate, $p < .001$). In contrast, in the secret versus team condition they were significantly more likely to choose the person who was told a secret (only $n = 4$ of $20, 20\%$, chose the teammate, $p = .012$), suggesting they expected secret sharing to be an even more powerful cue of friendship than being on the same team.

**Discussion**

Again, we found that children became more likely to use secrets as a cue to friendship as they got older. Indeed, replicating Study 2, whereas 3- to 5-year-olds in our sample do not reason differently about sharing personal secrets and objective facts, there is evidence that 6- to 8-year-olds and 9- to 12-year-olds do. Further, 6- to 8-year-olds appear to see secret sharing as an equally good friendship cue as shared team membership, and by 9- to 12-years-old, children expect secret sharing to surpass team membership in its importance for determining whether people are likely to be friends. Thus, children understand that some types of information (e.g., secrets) provide clearer cues about social relationships and social structure than others (e.g., facts), and they think that disclosing socially important information can be as good of a cue, or even a better cue, for understanding social structure compared to highly relevant cues to coalition, such as team membership.

Although it was somewhat surprising that the youngest children were at chance in the fact versus team membership condition (rather than picking the teammate), there are a few possible reasons for this null pattern of results. First, because testing takes place on the floor of the museum, young children may have been more easily distracted and failed to follow the story. Second, young children may expect friendship be based mostly on social interaction (e.g., Bigelow, 1977), in which case they may see sharing a fact (which involves communicating) as a cue of friendship. Finally, young children may have less experience with sports teams than older children, and may be more likely to make inferences about the importance of group membership for groups with which they have more experience.

Additionally, in the current study we did not provide information about why the main character chose to be on the team of one of the other characters. It is possible that he did so because he wanted to spend time with that person (which might be a good cue of friendship), because he thought that person was better at basketball (which would be less likely to indicate friendship), or for any other number of reasons. Additionally, we did not say anything about the group membership of the person who was told the secret. Therefore, it is possible that children expected these two people to both be members of the same (not discussed) social
group. Future research could incorporate check questions to confirm that children understand the story, could explicitly state that the secret sharer is not in the same group as the keeper, and could use other cues of group membership (e.g., gender) to further probe children’s understanding of how both group membership and secret (and fact) sharing can be used to reason about patterns of friendship.

**Study 4**

Our previous studies have found that, at least by age 6, children strongly use secret sharing to make predictions about friendship. We have suggested that children might expect secret sharing to indicate friendship because they understand that people are only likely to share sensitive information that they do not want others to know (which may contain negative information about the holder of the secret) with people who are close to them. In fact, privacy is central to the definition of “secret,” suggesting people would only share personal secrets with others whom they preferentially trust. If secrets were shared outside of this close social circle, then they could have more potential to do damage to reputation of the person who has the secret, since more distant people might be less likely to keep the information private. Thus, telling someone a private piece of information should be reveal that the two people are closer.

Of course, it is possible that children have merely heard the word secret associated with friendship in some way (“secrets are things you tell your friends”), without any deeper understanding of why one only tells secrets to friends. However, if children truly understand the underlying social dynamics, then they should infer friendship based on people sharing private information (information one does not want others to know) even if the word “secret” is never used. In order to explore whether children’s responses are based on understanding that sharing private information (which may have reputational costs) is a reliable cue to social closeness, we ran a study that investigates if children can make these sophisticated social inferences in situations not involving explicit mention of the word “secret.”

**Method**

**Participants.** Seventy-eight participants were tested in this study, including: 35 3- to 5-year-olds (M = 4 years, 9 months; SD = 11 months; 25 female), 29 6- to 8-year-olds (M = 7 years, 6 months; SD = 11 months; 17 female), and 20 9- to 12-year-olds (M = 10 years, 3 months; SD = 11 months; 14 female).

**Procedure.** The methods were identical to Study 2, except that instead of using the words “secret” and “fact” we used the terms “information he doesn’t want anyone else to know,” which we refer to as public information (see Appendix for scripts). We recorded whether children expected the main character to be better friends with the recipient of private information or of public information. We hypothesize that participants’ use of secret sharing as an indication of friendship in Study 2 was not due to using the particular word, “secret,” so we expected that children would choose the recipient of private information as the closer friend, which would conceptually replicate the results of the previous study.

**Results**

To ask whether children’s expectations about friendship changed across development, we conducted a binomial logistic regression modeling choosing the person who was told private information as the more likely friend with age as the predictor variable. As expected, the results revealed a significant effect of age (β = 0.395, p < .001), suggesting older children were more likely to choose the person who was told private information as the main character’s friend (over the person who was told public information). We next ran binomial probability tests within each age group to further understand the effect of age.

Although numerically more 3- to 5-year-olds chose the character who was told public information (n = 22 of 35, 63%) than the character who was told private information (n = 13 of 35, 37%), the difference was not statistically significant (p = .176). However, both 6- to 8-year-olds and 9- to 12-year-olds expected the top character to be more likely to be friends with the person to whom he told private information (6- to 8-year-olds: n = 21 of 29, 72%, p = .024; 9- to 12-year-olds: n = 18 of 20, 90%, p < .001; see Figure 1). These results conceptually replicate Study 2: children treated secrets equivalently to private information, and facts equivalently to public information. Indeed, there were no differences between the patterns of results in these two studies at any of the age groups (Fisher’s exact tests ps > .13).

**Discussion**

By 6-years-old, children expected that sharing private information indicated friendship. In fact, the results of this study conceptually replicated Study 2 and further suggest that children understand that sharing secretive information is a good cue to friendship. Specifically, children understand that sharing different types of information provides different cues about social relationships: sharing something that you do not want other people to know suggests intimacy, closeness, and friendship, but sharing something that you want everyone to know does not.

Replicating the results from Studies 1 through 3, children in the youngest age group did not show a significant pattern of response in Study 4. As suggested previously, these null results seen across the first four studies for 3- to 5-year-olds could be due to one of two reasons. First, young children may not understand the social value of secret sharing. This could be due to children not understanding that information in secrets could be important for the secret keeper’s reputation, meaning there would not be a clear reason why they should not be shared widely. Second, young children may understand the social value of secret sharing, but may weigh it equally to other forms of sharing (sharing of physical objects and sharing of facts) in terms of its predictive potential for patterns of friendship. For example, previous research suggests that children in this younger age range understand that giving someone (more) of a physical resource indicates friendship (Liberman & Shaw, 2017). Therefore, the null result in Study 1 could be due to children thinking that the main character would be friends with both the person he told a secret and the person he gave a cookie.

Similarly, young children in Studies 2–4 could think that information sharing in general is a good cue of friendship. In particular, because sharing a fact (or public information) requires a social interaction, young children may expect that people like the people
they approach and talk to. In this case, young children may have expected the main character to be friends with both the person he told a secret and the person he told a fact. Although this would still mean that younger children do not see secret sharing as a stronger friendship predictor than other cues to friendship, they may understand that secret sharing is somehow linked to friendship. Future research could compare secret sharing to a trivial similarity using a design similar to ours in order to test this possibility. We took another route to investigate younger children’s understanding of the sociality of secrets. In a final study, we designed a simpler task to ask whether 3- to 5-year-old children understand that secrets should be shared selectively with friends.

### Study 5

In Study 5 we asked whether the youngest children tested (3- to 5-year-olds) understand anything about the link between friendship and secret sharing by conceptually replicating past research investigating whether children expected secrets to be shared selectively with friends (see Table 1). In particular, Anagnostaki, Wright, and Papathanasiou (2013) told children about a character, Zinc, who had various types of information (secrets, surprises, and other facts), and asked whether he would tell each piece of information to a friend, a nonfriend, both characters or neither character. They found that 5-year-olds expected Zinc to be more likely to conceal surprises (e.g., that there was a surprise party) than to conceal facts (e.g., that the classroom had a window). Here, we extend these results by testing even younger children and asking whether they expect a character to share two pieces of personally relevant information (a previously untold secret, and that she had won an award) with a friend and a nonfriend. Based on the results from past research, and the results in Studies 1–4, we hypothesized that young children would expect the main character to be less likely to share the secret with a nonfriend. Because we provide children with information about both the relationships between all of the characters (e.g., which characters are friends vs. not friends) and with information about what is being shared (e.g., a personal secret or a fact about winning an award), we hypothesized that even the younger children might be able to evidence some understanding of the link between secret sharing and friendship in this study. In this case, we expected even 3- to 5-year-olds to choose the friend as the more likely recipient of a secret than the nonfriend or than both characters.

### Method

#### Participants

One-hundred participants were tested in this study, including: 44 3- to 5-year-olds (M = 4 years, 11 months; SD = 8 months; 30 female), 31 6- to 8-year-olds (M = 7 years, 3 months; SD = 8 months; 17 female), and 25 9- to 12-year-olds (M = 10 years, 2 months; SD = 11 months; 10 female).

#### Procedure

As in the previous studies, children were introduced to three gender-matched characters who were placed in a triangle with a central character on top and two characters on the bottom. Then, children were told about the top character’s relationship to each of the other two characters: One was described as a friend of the top character, and the other was described as not being friends with the top character (see Appendix for scripts). Then, children were told that the top character had two pieces of information: (a) a personal secret that he had never told anyone before, and (b) that he had won a prize at school. Children were then asked whom the top character would tell each piece of information. Children’s choices were recorded as picking: the friend, the nonfriend, or both bottom characters. Whether participants were asked about the secret first or were asked about the award first was counterbalanced across subjects. If participants expect people to share secrets selectively, then we hypothesize that they will choose only the friend when asked about the secret. If children understand people are more likely to withhold secrets than other pieces of personal information, then they may be more likely to choose the nonfriend or to choose both characters when asked about the award.

### Results

First, to look at age effects, and whether they differed based on the type of information being shared, we conducted a binomial logistic regression on whether children expected the main character would share the information (outcome: yes or no), using age (continuous), type of information (secret vs. award), and person being told (friend vs. nonfriend) as predictor variables. We also included subject as a random effect in the model, because each subject answered questions about both the secret and the award. In the model, children who chose “both” were scored as saying “yes” for the main character telling the friend, and “yes” for the main character telling the nonfriend (to keep the outcome variable binomial). The model revealed a significant effect of age (β = 0.403, p = .021), a significant interaction between age and person being told the information (β = −0.386, p = .050), and a marginal three-way interaction between age, the person being told the information, and the type of information being shared (β = −0.827, p = .058). These interactions suggest that the effect of age is different based on who is being told the information and on what the person is being told. Therefore, we did follow-up nonparametric analyses for each condition and age group separately to further understand the pattern of children’s reasoning.

First, we present the results for trials in which children were asked about how a secret would be shared. In these trials, children expected the top character to be more likely to only share the information with a friend. In fact, children in all three age groups were significantly more likely to choose the friend than the nonfriend (3- to 5-year-olds: p < .001; 6- to 8-year-olds: p < .001) or than both characters (3- to 5-year-olds: p = .04; 6- to 8-year-olds: p < .001). In fact, this pattern got stronger with age: all 9- to

### Table 1

<table>
<thead>
<tr>
<th>Age group</th>
<th>Friend</th>
<th>Nonfriend</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secret question</td>
<td>3- to 5-year-olds</td>
<td>61%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>6- to 8-year-olds</td>
<td>84%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>9- to 12-year-olds</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

| Award question  | 3- to 5-year-olds | 46% | 27% | 27% |
|                 | 6- to 8-year-olds | 52% | 3% | 45% |
|                 | 9- to 12-year-olds | 40% | 8% | 52% |
likely to choose the friend, the nonfriend, or both characters, different pattern of responses. Three- to 5-year-olds’ responses were not significantly different from chance, they were equally likely to choose the friend, the nonfriend, or both characters, $\chi^2(2, N = 44) = 2.91, p = .233$. On the other hand, both 6- to 8-year-olds and 9- to 12-year-olds were less likely to choose the nonfriend than either the friend (6- to 8-year-olds: $p < .001$; 9- to 12-year-olds: $p = .04$) or than both characters (6- to 8-year-olds: $p < .001$; 9- to 12-year-olds: $p = .007$). However, children did not differentially select between the friend option and the both characters option at any age (binomial $ps > .21$), suggesting children expected that someone might be likely to share positive personal news (e.g., winning an award) more broadly, either with their friend, or with both their friend and nonfriend.

Discussion

This work conceptually replicates Anagnostaki et al. (2013) who find that children expect people to be less likely to disclose secrets and surprises than other facts. Children understand that people will share some types of information selectively, and other types more broadly. Specifically, although the tendency for children to indicate that a secret would be shared with a nonfriend decreased with age, even the youngest children as a group expected secrets to be shared more with friends than nonfriends (or than with both characters). However, children were not as selective when asked about whom a character would tell about winning an award. Thus, children’s responses in the secret case are not due to children thinking that that people will only interact with friends or will only share information with friends. In fact, children expected that a character would be just as likely to share positive news with friends as with both friends and nonfriends. Thus, children seem to realize that different types of information are shared with different types of people, and that personal secrets are less likely to be shared with nonfriends than positive facts.

Interestingly, young children think that people are truthful when discussing their own positive traits (whereas older children are more skeptical; Heyman, Fu, & Lee, 2007; Heyman & Legare, 2005). Therefore, it is possible that even the youngest children in our study expected the main character to share his positive news broadly, so that more people would believe that he had positive traits. This is in line with an early developing attention to reputation management. Indeed, 5-year-old children already actively manage reputation (e.g., positive news) should be shared more broadly than things that may damage reputation (e.g., secrets) before they understand how information is shared can be used to infer patterns of friendship.

General Discussion

Our results provide the first evidence that children understand that secrets carry important social information about others’ affiliations. Across four studies we found that, by age 6, children use secret sharing as an indication of friendship, and expect that secret sharing can be a better indication of friendship than sharing a physical item (Study 1), sharing a fact (Study 2), or sharing membership on a sports team (Study 3). Further, we found that children understand that the important part of a secret that makes it a reliable cue for shared friendship is that it contains information that one does not want others to know (Study 4). Children younger than 6-years-old did not use secret sharing as a cue to friendship, though children at all ages tested predicted that people were more likely to tell a friend a secret than a nonfriend (Study 5). Taken together, our results indicate that children understand the social significance of sharing secrets: they expect others to share secrets selectivity with friends and infer social relationships based on which people know each other’s secrets.

Our results reveal that, in addition to sharing their own secrets selectively with important social partners (e.g., Rotenberg, 1986; Watson & Valtin, 1997), children can use patterns of secret sharing to predict social relationships. These third-party inferences indicate advanced, abstract reasoning about the social importance of secrets, which cannot be revealed through first person differences. Children could share their secrets more with close social partners due to familiarity, availability, and general positivity. They spend more time with these people, and may be more likely to tell them a secret, tell them a fact, or to share an object with them. Thus, their own first-person behaviors do not reveal whether they understand that knowing someone’s secret in general indicates a close social relationship. On the other hand, third-person reasoning can reveal this link, and we found that by age 6 children indeed do use secrets to glean important social information about others’ social affiliations. These third-person expectations can be useful for children: Understanding the social world more efficiently may allow children to use their knowledge of other people’s friendships in order to determine who to interact with and whom to avoid, without facing the potential for large personal costs (see Liberman, Woodward, & Kinzler, 2017 for further discussion on how first- vs. third-person methods provide different types of evidence).

Importantly, we conceptually replicated our main finding across all studies. In particular, although the middle and older age groups expected secret sharing to indicate friendship, the youngest children we tested (3- to 5-year-olds) did not (Studies 1–4). Although we cannot currently say exactly why this age difference exists, or what exactly develops, there are a few interesting possibilities to be investigated in future research. One possibility is that these age differences are due to maturation and increases in general cognitive abilities. For example, many 3- and 4-year-olds fail executive functioning tasks that older children can pass (see Zelazo et al., 2003), suggesting that reasoning abilities and sorting through multiple pieces of information, which may be relevant for our task, develop during the preschool years. In this case, perhaps the youngest children fail to associate secret sharing with patterns of friendship because of the task complexity.

However, we instead expect that the development is more social in nature and is at least partly dependent on children’s experiences navigating social situations. In line with these broad social hypotheses, previous research indicates that the topics of children’s secrets and their reasons for keeping secrets from people become more socially embedded with age (Last, & Aharoni-Ezioni, 1995), suggesting age differences in reasoning about secrets might be due to differences in sociality and social structure. Additionally, children in this age group are able to make some inferences about the link between friendship and social behaviors (e.g., Liberman &
Shaw, 2017; Pietraszewski & German, 2013), suggesting domain general processes might not be the limiting factor.

Even within a social–cognitive framework, there are many possibilities for the precise nature of age related changes in reasoning about secret. One is that developments in theory of mind reasoning could impact the ability to think about the sociality of secret sharing. Because secrets are ideas, understanding who knows them requires source monitoring (e.g., whose secret is it) and tracking knowledge transfer (e.g., who did the person tell the secret to). Thus, increases in theory of mind abilities, which are dramatic during the 3- to 5-year-old age period (e.g., Wellman & Liu, 2004) may lead to greater understanding of how secrets can provide important social information. To test this, future work could include a theory of social mind measure (e.g., Abrams, Rutland, Pelletier, & Ferrell, 2009) to look at relationships between individual differences in younger children’s theory of mind reasoning and their understanding of secret sharing (see Fitzy & Rutland, 2010; Nesdale, Zimmer-Gembeck, & Roxburgh, 2014, for examples). In this case, children with higher theory of mind and social perspective taking abilities may be better at understanding how information sharing is linked to friendship.

It is also possible that the age-related changes in reasoning about secrets are due to differences in children’s actual social environments and social relationships. Children may start out with an initial theory that spending time together and interacting socially indicates friendship (see Bigelow, 1977). Then, as children start attending school full time in kindergarten (when they are around 5- to 6-years-old) they might realize that they spend significant amounts of time with classmates with whom they are not friends. By engaging in these new types of “acquaintance” social relationships, children could start to understand that they are not equally interpersonal with everyone in their social environment. This realization could help them understand that they (and other people) might want to share certain information, such as secrets, selectively. Along these lines, it is possible that individual differences in how many groups or activities a child belongs to (rather than age per se) could impact the child’s understanding of various social relationships, and how these relationships guide behavior (see Abrams et al., 2009, e.g., of coding individual differences in children’s social groups).

Or, increases in children’s understanding of the social role of secrets could be linked to their intuitions about reputation management. Indeed, understanding children’s developing intuitions about secrets may provide some unique insights into children understanding of reputation, and vice versa. Secrets typically contain information that could damage the secret keeper’s reputation (e.g., Kelly, 1999). And, people use information sharing to manage their reputations: They spread information to make themselves look better or to make other people look worse (e.g., Fine, 1977). Some evidence suggests children’s reasoning about reputation develops at generally the same time as their ability to reason about the social significance of secrets, around 5- or 6-years of age. At this age, children evaluate other people based on their reputations (e.g., Herrmann, Keupp, Dare, Vaish, & Tomasello, 2013; Shaw, Li, & Olson, 2013; Silver & Shaw, 2018), and attempt to manage their own reputations (Engelmann, Herrmann, & Tomasello, 2012; Engelmann, Over, Herrmann, & Tomasello, 2013; Leimgruber et al., 2012; Shaw et al., 2014). Slightly later in development, around age 7, children indicate that people should not share information about a friend that might damage the friend’s reputation (Kim et al., 2014) and they negatively evaluate people who lie to improve their own reputation at the expense of others (Fu, Heyman, Chen, Liu, & Lee, 2015; Shaw & Olson, 2015). Future research should investigate whether children’s appreciation of reputational consequences is linked with their understanding that secrets are indicative of friendship. For example, understanding the importance of reputation management may lead children to the insight that people would only want to share their secrets with people who would keep them, rather than people who would spread the secret and potentially damage their reputation.

Future research should also consider the type of information that people keep secret. It is possible that children expect secrets to contain negative (potentially damaging) information about the secret keeper. In fact, in our studies children treated “secrets” and information that a person “doesn’t want anyone to know” equivalently. However, not all secrets are necessarily negative: A person may keep a secret about a positive life event, such as a pregnancy or moving to a new location. Therefore, researchers should investigate whether inferences connecting secret sharing to friendship are based on a drive to keep negative information only among close confidants, or whether people expect sharing positive secrets can also illuminate patterns of social relationships. To do so, future studies could tell children specific secrets (or facts) that were shared to investigate whether knowing the content of the information (e.g., varying the valence of these secrets) changes inferences. It is possible that use of the valence of the information contained in a secret also changes with age, as children’s understanding of reputation management (and the types of information that can be damaging) grows.

Indeed, the connection between understanding the social importance of secret sharing and reputation management could potentially have important consequences for children’s developing social competence. For example, popular, more socially connected children may be more likely to gossip (McDonald, Putallaz, Grimes, Kupersmidt, & Coie, 2007). And, although gossip can be a source of power for those who spread it, it can be damaging for those who are gossiped about (Hamman & Kruger, 2017). Additionally, people are known as gossipers are rated less positively (Farley, 2011), and are more likely to rotate through friends rather than be able to maintain strong ties (e.g., Ladd, 1999; Parker & Seal, 1996). This suggests that in order to be socially competent, children may have to learn when (and with whom) to share versus withhold information in order to increase their social connections without alienating others. Our results provide initial evidence for children’s developing understanding of the social importance of information transfer and how information sharing is tied to social allegiances, which can be built on by future research.

Another interesting open question concerns the breadth of social value that secrets might have. Here, we studied whether children used secret sharing as a cue to one important type of social relationship: friendship. However, tracking which people know each other’s secrets may give insights into numerous types of social relationships. Children are able to reason about many social relationships, including dominance, social categories, and kinship (e.g., Brey & Shuts, 2015; Gülgoo & Gelman, 2017; Spokes & Spelke, 2016). Do children think that secrets play a role in how these other types of relationships are formed or maintained? For example, do children think that people in power are more likely to know other people’s secrets, or that sharing a secret can be a good
bargaining to gain influence? Additionally, children tend to generalize properties (e.g., preferences) across members of a social group (e.g., Liberman, Woodward, Sullivan, & Kinzler, 2016; Taylor, Rhodes, & Gelman, 2009). Are they also likely to generalize secrets? A truly sophisticated understanding of the social value of secrets would require that children understand that sharing, keeping, and revealing secrets likely plays a role in some types of human social relationships (e.g., friendship, power) but not others (e.g., strangers from the same social category).

Overall, children evidence an understanding that secrets mark social structure: They expect people to share secrets selectively with friends, and use patterns of secret sharing to infer friendship. Future work can investigate children’s broader understanding of the social value of secrets by looking at children’s expectation about the contents of secrets and at their expectations about the implications of secret keeping versus disclosing for other types of social relationships.

References

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SECRET TO FRIENDSHIP


Appendix

Study Scripts

In all studies characters were gender-matched to participants critical features were counterbalanced (see article). Here, we present one version of each script. Bolded terms reference how the experimenter would point to the character on the bottom left.

Study 1: Sharing Cookie Versus Sharing Secret

These boys (all) go to school together. I’m going to ask you which one of these boys (bottom) is better friends with this boy (top). This boy (top) gives this boy (left) a cookie to eat right now. This boy (top) tells this boy (right) a personal secret he has never told anyone before. Who is he (top) better friends with?

Study 2: Fact Versus Secret

These boys (all) go to school together. I’m going to ask you which one of these boys (bottom) is better friends with this boy (top). This boy (top) told this boy (left) something about himself that he doesn’t want anyone else in their class already knows. This boy (top) chose to be on the same basketball team as this boy (right). Who is he (top) better friends with?

Study 3: Secret Versus Sports Team Condition

These boys (all) go to school together. I’m going to ask you which one of these boys (bottom) is better friends with this boy (top). This boy (top) chose to be on the same basketball team as this boy (left). This boy (top) told this boy (right) something about himself. He (top) tells this boy (left) something about himself that he wants everyone else in their class to know. Who is he (top) better friends with?

Study 4: Public Versus Private Information

These boys (all) go to school together. I’m going to ask you which one of these boys (bottom) is better friends with this boy (top). This boy (top) is going to tell each of these boys (bottom) something about himself. He (top) tells this boy (left) something about himself that he doesn’t want anyone else in their class already knows. He (top) tells this boy (right) something about himself that he wants everyone else in their class to know. Who is he (top) better friends with?

Study 5: Sharing Information with Friends Versus Non-Friends

These boys (all) go to school together. This boy (top) hangs out with this boy (left) because their teacher makes them sit next to each other in class, but they (point between top and left) are not friends. This boy (top) hangs out with this boy (right) because they really like to play together, and they (point between top and right) are friends. This boy (top) has a personal secret that he has never told anyone before. Who will he tell his secret to? This boy (left)? This boy (right)? Or both of these boys (bottom)? This boy (top) also won an award for being a great student! Who will he tell about the award? This boy (left)? This boy (right)? Or both of these boys?

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