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Trustworthiness is Distinct from Generosity in Children

Dorsa Amir[1], W. Shelby Parsons[1], Richard E. Ahl[1], Katherine McAuliffe[1]

1. Boston College, Department of Psychology, Chestnut Hill, MA 02467, USA

*Corresponding author: Dorsa Amir, dorsa.amir@bc.edu

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Open data & analysis scripts are available on OSF: https://osf.io/rwpd8/

Abstract:

Interpersonal trust is a key component of cooperation, helping support the complex social networks found across societies. Trust typically involves two parties, one who *trusts* by taking on risk through investment in a second party, who can be *trustworthy* and produce mutual benefits. To date, the developmental literature has focused primarily on the trustor, meaning we know little about the ontogeny of trustworthiness. Whereas trusting can be motivated by self-interest, one-shot trustworthiness is more squarely situated in the prosocial domain, involving a direct trade-off between self-interest and others' interests. However, this raises the question of whether trustworthiness is distinct from generosity. In this pre-registered study, we examine the origins of trustworthiness using an intuitive version of the Trust Game, in which a first party invests resources in a second party who can split the gains. We recruited N = 118 five-to-eight year-old American children (M_{age} = 6.94, n = 59 girls, 57% White, 88% of parents with Bachelor's degree or higher), split between the *Trustworthiness* condition, where another party's investment is instrumental for obtaining greater resources, and the *Generosity* condition, where the other party is a passive recipient. We found that children in the *Trustworthiness* condition shared significantly more resources than those in the *Generosity* condition. Further, children in the *Trustworthiness* condition predicted that the first party expected them to share a greater number of resources. Overall, these results demonstrate that trustworthiness is distinct from generosity in childhood, and suggest that children spontaneously grasp and engage in a key aspect of cooperation.

Keywords: *trust*, *generosity*, *child development*, *trust game*, *dictator game*

1. Introduction:

Interpersonal trust is a key component of cooperation. Through interactions built on trust, individuals can enter into reciprocal relationships that offer mutual benefits and can scale up to support complex cooperative networks, such as market economies (Bjørnskov, 2012; Humphrey & Schmitz, 1998). Broadly defined, interpersonal trust involves the acceptance of risk and vulnerability from one party in expectation of a positive result from another party's actions (Borum, 2010). Thus, interactions built on interpersonal trust involve one party choosing whether to engage in *trusting* behavior — to take on risk for the chance at a positive result — and another choosing to engage in *trustworthy* behavior — to produce the positive outcome one has been entrusted to produce. Despite the inherent uncertainty in these interactions, previous work suggests that most adults are both trusting of others and trustworthy in return (Johnson & Mislin, 2011), though there exist substantial differences in behavior between individuals (Evans & Revelle, 2008); for instance, past work suggests that women tend to be both more generous (Innocenti & Pazienza, 2006) and more trustworthy than men (Buchan et al., 2008).

In studies of interpersonal trust, much work has focused on the first party's trusting behavior. Indeed, one of the most widely used measures of trust comes from the World Values Survey, assaying responder's agreement with the phrase, "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" (Johnson & Mislin, 2012). While the decision to trust is clearly important for understanding interpersonal trust interactions, we argue that the second party's trustworthiness behavior is just as important. Indeed, how second parties behave when entrusted is likely to be particularly influential in shaping the first party's propensity to trust in the future (Alarcon et al., 2018). Further, an important contrast between trusting and trustworthy behavior may be related to upstream motivation. The decision to trust can be influenced by more selfish motives: the first party may believe that they can maximize their own reward by relying on the second

party to share with them. And indeed, previous research supports the notion that trusting behavior is primarily motivated by self-interest and expected reciprocity (Chaudhuri & Gangadharan, 2007). In contrast, the decision to act in a trustworthy manner sits more squarely in the prosocial domain as it involves a clear and direct trade-off between self-interest and the interest of others, particularly in one-shot games. Further, some have argued that while trustworthiness is a social norm, trusting is not; in a survey of adult participants, Bicchieri and colleagues find that most people do not behave as if trusting is a norm and tend not to punish those who don't trust (2011). However, they do behave as if trustworthiness is a social norm, with most people choosing to punish someone who failed to reciprocate another party's trust. Work with European children also suggests that 5-6 year olds also consider reciprocity to be a norm and actively enforce it (Wörle & Paulus, 2019). Taken together, this body of work suggests a need for more studies to focus explicitly on trustworthiness.

To measure interpersonal trust, many researchers have relied on an economic game known as the Trust Game (or, the Investment Game) (Berg et al., 1995). In this game, a player is typically endowed with a number of resources (e.g. two dollars) which they can choose to transfer to a second player. The amount transferred is typically interpreted as a measure of *trust*. On the way over, the investment is multiplied — typically by three — such that the second player receives a larger endowment (e.g. six dollars). The second player must then decide how much to share back with the first player. Here, we are operationalizing trustworthiness in terms of behavior in the Trust Game, quantified as the amount returned to the first playerDespite its ubiquity, there is still some debate as to whether or not interpersonal trust behaviors are distinct and separate from prosocial behaviors such as altruism or generosity (Brülhart & Usunier, 2012; Cox, 2004; V. L. Smith, 2003), which can be broadly defined as sacrificial acts that benefit others with no ulterior motives (Andreoni et al., 2010). Typically, generosity is studied with economic games such as the Dictator Game, in which one party must decide how to split a number of resources (e.g. six dollars) with a second party, who is simply a passive recipient.

Developmental work on this topic frequently documents an increase in generosity with age (Benenson et al., 2007) , though there is mixed evidence for this relationship (Gummerum et al., 2008; Ibbotson, 2014).

A developmental perspective can provide important insights into the roots of cooperative behaviors — such as generosity and trustworthiness — by allowing us to assess how these behaviors manifest across age, and whether or not they are dissociable in early life. A growing body of research on the development of trust has led to a number of key findings. In a study examining Trust Game behavior in 8-year-olds, adolescents, and adults, Sutter and Kocher found that trusting behavior increased nearly linearly with age, with low levels of trust in middle childhood leading to higher and more constant levels of trust in adulthood (Sutter & Kocher, 2007). The researchers found similar patterns in trustworthiness behavior, such that 8-year-olds were less trustworthy — sharing on average 10% of their resources with the trustor — and that trustworthiness increased nearly linearly with age into adulthood. However, there is mixed evidence regarding the effect of age on interpersonal trust. Harbaugh and colleagues examined both trust and trustworthiness in third, sixth, ninth, and twelfth graders in the United States, between the ages of eight and seventeen, and found that trust and trustworthiness were relatively unaffected by age (Harbaugh et al., 2003). The authors went on to suggest that if there are indeed age-related effects, they would be present in children under the age of eight, which is the age range we focus on in this manuscript. As the methods utilized in the studies above rely on a relatively complicated pen and pencil version of the Trust Game unsuitable for younger children, in this study, we develop a child-friendly version of the task which allows us to investigate the development of trustworthiness at much younger ages. Further, looking at both the Harbaugh et al. and Sutter & Kocher studies, it is unclear whether or not children's behaviors were motivated by trust or trustworthiness, *per se*, or by generosity, as these studies did not have a control condition measuring generosity to compare behavior to. That is, older children could be sharing resources not because being

entrusted motivates more trustworthy behavior, but rather because they want to be generous and share with others.

Tackling the dissociation of generosity and trust more specifically in younger ages, a handful of recent studies with Western children as young as four years old suggest that first-party trusting behavior (i.e. contributions to another party where future reciprocity is possible) appears to be distinct from mere generosity (i.e. cases where reciprocity is not possible) (Evans et al., 2013; Rosati et al., 2019). These results are important in expanding our understanding of the early roots of interpersonal trust, and suggest that children are more likely to strategically trust when reciprocity is possible (Rosati et al., 2019). In line with the results, it is possible to interpret early trusting behavior as being motivated in part by strategic self-interest. An interesting and complementary question, from our perspective, is how children behave when they have been entrusted. To date, we know very little about early *trustworthiness* behavior and whether the decision to share with the trustor in a one-shot setting is motivated by a desire to match the trustor's expectations or whether it is motivated solely by generosity. In other words, we want to know: do children return benefits to those who have trusted them even when they have nothing to gain from doing so? And, critically, is this behavior in some way distinct from a desire to simply be generous?

In this pre-registered study, we investigated whether trustworthiness and generosity motivate distinct sharing behavior in young American children using a novel, child-friendly apparatus that mirrors the mechanics of the adult Trust Game. Our apparatus allows us to investigate the development of trustworthiness and generosity in children much younger than those previously tested in the literature. We predicted that the act of being entrusted would motivate children to share more resources, reflected in greater sharing in the *Trustworthiness* condition than the *Generosity* condition of our task (described below). To probe children's reasoning about trust versus generosity, we also measured how many resources participants thought the other player expected them to share in each condition.

2. Methods:

Our study design, hypotheses and analysis plan were preregistered and are available at: https://aspredicted.org/blind.php?x=fx73hi

2.1 Participants:

Our participants were 118 U.S. American children between the ages of 5 and 8 years old (*M* = 6.94, *SD* = 1.11, *n* = 59 girls). For two participants with incomplete or missing date-of-birth information, exact age was imputed as their reported age plus six months (e.g. if a parent reported their child's age as 7, their exact age was recorded as 7.5 years). The target sample size was determined by an *a priori* power analysis for a multiple linear regression which assumed an effect size of *d* = 0.15, an alpha of 0.05, and 95% power. This analysis suggested a minimum sample size of 107 participants. As specified in our pre-registration, we aimed for approximately 56 children in each of two conditions and across two age groups — 5-6 year olds and 7-8 year olds — with the rule that no single age within each group should represent more than two-thirds of the participants therein. We slightly exceeded the target sample size in order to complete our final day of testing. An additional 5 children were tested but excluded based on pre-specified criteria: participant did not want or could not have the resource (*n* = 2), neurodevelopmental disorder (*n* = 1), and participation in a separate study that also involved the exchange of resources immediately prior to this one (*n* = 3). The trust task was always run in testing sessions with additional decision-making tasks. The trust task was always second, following a task measuring children's first-party forgiveness decisions (Amir et al., 2021). We believe this order likely had no effect on our ability to compare between the two conditions of the trust task, as it was always upstream (see **Supplement** for more details).

Participants were recruited from the Boston area in the New England region of the United States, through in-person recruitment at local zoos, museums, and parks. We found no differences in condition assignment or behavior across locations (see **Supplement**). Study methods were approved by the institutional review boards at Boston College and adhere to international standards for ethical human subjects research. For all children, participation required written parental consent and children's verbal assent. Children older than seven also completed written assent forms. An optional demographic survey collected from parents (n = 48) at the time of the study suggests our participants were roughly 57% White, 13% Asian, 13% Other, 11% Black or African American, and 6% Hispanic. Approximately 88% of parents surveyed reported having a Bachelor's degree or higher.

2.2 Design

Participants were assigned to either the *Trustworthiness* or *Generosity* condition between subjects, with the exception of cases where the experimenter attempted to recruit a specific age group and gender to balance out the sample in line with our pre-registered recruitment strategy.

2.3 Procedure:

Across both conditions, the participant sat next to the experimenter and was told they would have the chance to participate in an activity to get some candy. The experimenter then introduced the participant to the trust apparatus. The trust apparatus was a plastic tray with high sides and a plexiglass sheet covering the top, with a divider inside separating two channels. Inside each channel was a metal dish. The shorter channel had a dish with two candies in it. The longer channel had a dish with six candies in it. The candies were individually wrapped fruit candies called Starbursts® (see **Figure 1**).

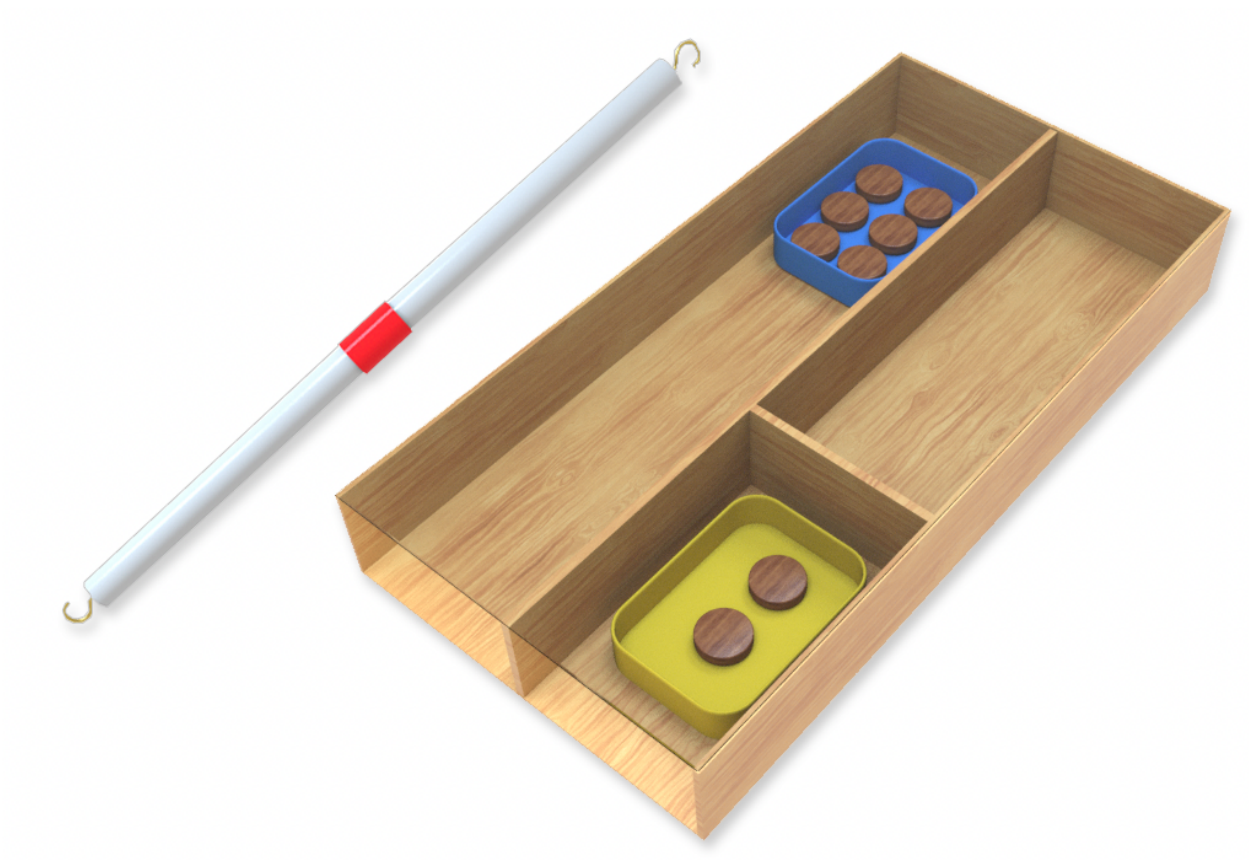

Figure 1: The trust apparatus, which consists of a tray with two channels and two dishes. The closer dish has two resources; the further dish has six. The further dish can only be reached through the joining of two short tools to create a longer tool using the red attachment piece.

The experimenter then explained that because the participant could not reach in from the top, the only way to obtain the candies was to pull a dish out using a hooked tool, which the experimenter placed near the apparatus. However, this tool could only reach the dish with two candies; it was too short to reach the dish with six. The experimenter then demonstrated that two short tools could be joined together using an attachment piece, creating one long tool that could reach the further dish.

In the *Trustworthiness* condition, the participant was told that another child who really liked Starbursts played this game before them and was given a choice: they could either use their short tool to reach the dish with two candies or they could give their tool to the participant so they could make a

long tool and reach the dish with six candies. The participant then learned that the previous child decided to give their tool to the participant instead of obtaining two candies, knowing they could share some of the six candies with them. Next, the participant was instructed to create the long tool and pull out the dish with six candies. They then decided how many of the candies to keep for themselves, and how many to give to the other child who gave them their tool, by placing the candies into two appropriately-marked paper bags, one for each child. The experimenter turned away and instructed the participant to ring a bell when they were finished making their decision. This was done to allow the participant more privacy and to decrease demand effects.

The protocol in the *Generosity* condition was identical to the *Trustworthiness* condition with the exception of two changes to when and how the absent child was described. Unlike in the *Trustworthiness* condition, the absent child had no role in the participant's acquisition of candies. The second tool was given to the participant by the experimenter, with no mention of the absent child. The absent child was mentioned only after the six candies were obtained. At that point, the participant was told that another child who couldn't be there that day also liked candy, and if they wanted to, the participant could share some of the six candies with them. The candy distribution procedure occurred as described above.

Following the decision task in both conditions, the experimenter asked the participant three open response questions (see **Supplement**). The primary question of interest was how many candies the participant thought that the other child expected to receive from them.

Throughout the task, the experimenter asked the participant a number of questions — eight in the *Trustworthiness* condition, and six in the *Generosity* condition — to ensure comprehension (see **Supplement**). Success rates for comprehension questions were high — on average, 96% of responses were spontaneously correct on the first try. If a participant's response was not spontaneously correct, the experimenter repeated the correct information, then asked the comprehension question again. This

process was repeated once more. If the participant failed at all three attempts, the researcher read the correct information to the child and moved on. We did not exclude on the basis of comprehension failures, in line with our *a priori* plan to not exclude such cases. However, note that the average failure rate after three attempts on the comprehension questions was 0.001%.

2. 4. Coding

Data were coded from live coding worksheets by the experimenter and from videos of recorded sessions by a separate, independent coder. A comparison of video and paper coding revealed high consistency, with a 99% match rate for the dependent variable of interest (number of candies shared with the other child). In the small percentage of cases with coding conflict, a research assistant reviewed the worksheet and video and reconciled the discrepancy, which was then reviewed again and approved by the senior experimenter. Children's responses to the open response question regarding the other child's expectations were coded as a numeric variable only if the child specified one and only one integer in their response (see **Supplement** for a full breakdown of responses). Reliability between paper and video coding for children's responses to this question was high (99%).

2. 5. Analysis

We used R version 4.0.0 for all analyses (R Core Team, 2020). Following our pre-registered analysis plan, our primary analysis was a multiple linear regression predicting the number of candies shared (continuous, 0-6) by condition (factor with two levels: *Trustworthiness* or *Generosity*) and exact age (continuous). We predicted that sharing would differ between the two conditions. We also conducted exploratory analyses examining the interaction between age and condition, the interaction between condition and gender, and the main effect of gender on the number of candies shared (see **Supplement**). We further conducted an exploratory t-test to examine how children's predictions of the

other child's expected number of candies (continuous, 0-6) varied across the two conditions, and linear regressions predicting expected number of candies by exact age and gender. We also considered the difference between the number of candies children shared as compared to the number of candies they thought the other party expected them by conducting a mixed effects linear regression with subject ID as a random effect.

3. Results:

As predicted, we found that children shared significantly more candy in the *Trustworthiness* condition (M = 2.70, SD = 0.92) as compared to the *Generosity* condition (M = 2.12, SD = 1.07) (β = 0.58, SE = 0.18, p = 0.002) (**Figure 2**). We did not find a significant effect of age (β = 0.18, SE = 0.83, p = 0.83) nor a significant interaction with age (see **Supplement**). These results suggest that trustworthiness is distinct from generosity, independent of age, and that being entrusted motivates greater sharing behavior, perhaps as a result of concerns for reciprocity. When comparing across gender, we found that boys share significantly less than girls across both conditions (β = -0.55, SE = 0.177, p = 0.002) (see **Supplement**).

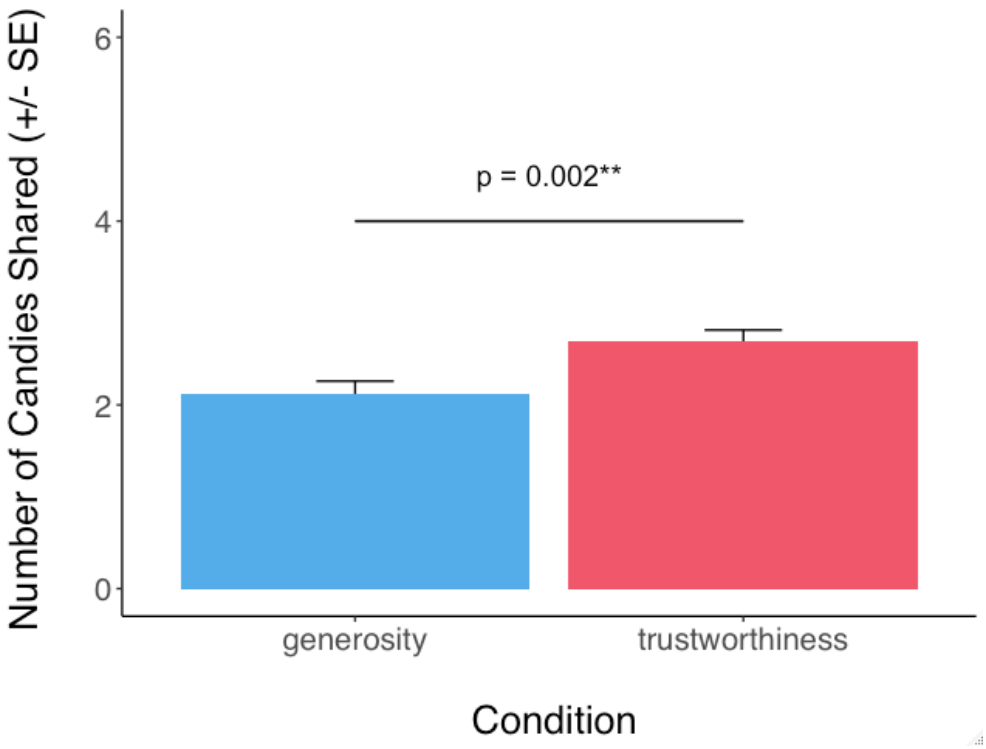

Figure 2: Number of candies shared by condition. Error bars are standard errors.

We next examined children's responses to the first open response question, which asked them to predict how many candies they thought the other player expected from them. The responses of children who indicated a range of answers or said they did not have a guess were excluded, resulting in a *n* of 83. Here, we also found a significant difference between conditions such that participants thought the other player expected significantly fewer candies in the *Generosity* condition (M = 2.67, SD = 1.56) than in the *Trustworthiness* condition (M = 3.70, SD = 1.62), $t(78) = -2.91$, $p = 0.005$. We did not find age or gender related differences in these predictions (see **Supplement**).

To explore children's knowledge of sharing versus their actual sharing behavior, we compared the number of candies children actually shared to the number they thought the other party was expecting from them. Interestingly, despite recognizing that the other player expected them to share an average of 3.7 candies in the *Trustworthiness* condition and 2.7 candies in the *Generosity* condition,

children rarely actually shared this amount. We found that children share significantly fewer resources than they predicted the other party expected of them ($\beta = -0.88$, $SE = 0.18$, $t = -5.00$, $p < 0.001$). In other words, children shared nearly one candy less than their predictions, giving away an average of 2.7 candies in the *Trustworthiness* condition and 2.1 candies in the *Generosity* condition. However, we also found that children who thought there was a higher expectation of sharing actually shared more ($\beta = 0.22$, $SE = 0.06$, $p = 0.0007$).

4. Discussion:

In this study, we examined the development of trustworthiness in children using an intuitive, apparatus-based version of the Trust Game that allowed us to test children across a wide age range, starting with children as young as five. Our findings suggest that children act prosocially when entrusted by another party, even in a situation where they can be selfish with impunity. Critically, we find that trustworthiness in children is distinguishable from generosity, suggesting that children are sensitive to social interactions based on interpersonal trust.

In contrast to an earlier study by Sutter et al. (2007), who found that 8-year-olds shared about 10% of their resources when entrusted, we found that children in the *Trustworthiness* condition shared a relatively higher proportion of their resources — nearly 50%. One possible explanation for this difference may be methodological in nature. The Sutter et al. experiment involved a paper and pencil decision task where participants had to indicate their choices on a decision form (Sutter & Kocher, 2007). It may be that our methods made both the presence of the other player and the resources more salient, as participants had to divide up the actual resources themselves into two paper bags.

When examining children's reasoning about the other player's expectations, we also found that children believed the other player expected fewer resources from them in the *Generosity* condition than in the *Trustworthiness* condition. This finding further supports the point that trustworthiness is treated

differently than generosity in that it generates significant differences in predictions of expected behavior. This finding also suggests the presence of a *knowledge-behavior gap* (Blake et al., 2014), such that children's knowledge of expected behavior does not align with their actual behavior. As is the case in similar social dilemmas, children's actual behavior tends to be more self-interested. For instance, in a study with 3-8 year-old American children, when asked how many of four stickers one *should* share with another child, most children say it should be evenly split; however, children's actual sharing behavior often falls short of that norm (C. E. Smith et al., 2013). These results dovetail with our own, which suggest that children think the other party expects around 3 candies — an even split — in the *Generosity* condition.

Turning to individual differences, we further find that girls share more resources than boys, on average, independent of condition. This finding aligns with some previous work on gender differences in prosocial behavior, which has sometimes found that girls are more likely to behave in an egalitarian manner than boys (Benenson et al., 2019; Benozio & Diesendruck, 2015), though there are mixed findings regarding this relationship. We also found that age was not significantly correlated with either trustworthiness or generosity. While some previous studies have found that children tend to behave more prosocially with age (Benenson et al., 2007; Ibbotson, 2014), others have found no evidence for a strong effect of age (Harbaugh et al., 2003).

There are a number of limitations to this work and avenues for future research. First, it is possible that children in our task interpreted the first player's decision to trust as an act of collaboration in addition to a trusting one, and as past work suggests children share more equally with collaborators (Hamann et al., 2011), this perception could have influenced children's sharing behaviors. Second, as our pre-registered study was focused primarily on condition differences, it is certainly possible that the relationship between age and sharing behavior, and interactions between condition and age, both have a small effect size that we were underpowered to detect. It is also possible that the distinction between

trustworthiness and generosity comes online at even younger ages. As such, we suggest that future work focus more specifically on age-related changes in trustworthiness behavior, extend out to children under the age of five, and more closely examine interactions between condition and age. We also suggest that future work more closely examine how these behaviors could vary across diverse societies, given that behavior in the trust game shows significant cross-cultural variation in adults (Johnson & Mislin, 2008). Future work can also benefit from a mixed-methods approach that brings together behavioral experiments with more qualitative methods to better explore children's understanding of trustworthiness and generosity.

The relationship between trustworthiness and reciprocity merits further discussion. It is possible to interpret children's trustworthiness behavior as seeking to promote *positive reciprocity* — or, returning positive actions in kind. That is, acting in a trustworthy manner opens the door to the establishment and maintenance of long-term reciprocal relationships that can be mutually beneficial when repeated. As such, trustworthiness can be interpreted as the proximate behavior that enables efficient, reciprocal relationships to unfold. In previous developmental studies, researchers have demonstrated that children show a marked tendency to respond contingently to prosocial actions (Fujisawa et al., 2008; House et al., 2013) in ways that appear to be human-specific (Yamamoto & Tanaka, 2009). Typically, these studies tend to focus on repeated interactions and how others' behaviors in the past influence subsequent decisions (Beeler-Duden & Vaish, 2020). Our task, centered on a one-shot interaction, builds on this work by suggesting that these same prosocial motivations may be spilling over into interactions with no chance for short-term reciprocity. It is also possible that the features of trustworthiness conveyed in the current study produce behavior that is distinct from behavior motivated by reciprocity alone. For instance, recent research by Chernyak and colleagues (2019) found that children between the ages of 4 and 8 generally fail to show positive reciprocity targeted toward their benefactors and instead distribute rewards indiscriminately to others. Perhaps

children would selectively target prosocial actions to those who showed trust in them, in ways that may not occur when the component of trust is missing.

In sum, building on previous work with the Trust Game among children (Evans et al., 2013; Rosati et al., 2019), we explored the developmental origins of trustworthiness using an intuitive version of the Trust Game. Our findings suggest that children behave prosocially when entrusted by another party, even in one-shot interactions where they can choose to behave selfishly with few consequences. Importantly, we also find that trustworthiness and generosity are dissociable, motivate different sharing behaviors, and bring to mind different expectations of sharing. Our results further suggest that framing prosocial actions in terms of trust has the potential to boost children's prosocial behavior. Taken together, the emerging body of literature on children's prosocial behavior highlights the special role of interpersonal trust in shaping early decision-making and contributes to a growing understanding of the developmental roots of our cooperative abilities.

5. Open Data:

Raw data and analysis scripts can be found in our OSF repository: https://osf.io/rwpd8/

6. Acknowledgements:

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SUPPLEMENTARY INFORMATION

Trustworthiness is Distinct from Generosity in Children

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1. Additional Information

1.1. Location Information

Participants were recruited and tested across three locations: at the Boston Common, the Boston Children's Museum, and the Boston Zoo. We do not find evidence of location-based differences in condition assignment.

Table S1: Breakdown of sample across locations.

Location	Discovery Museum	Boston Common	Boston Zoo
N	48	60	10

Table S2: Number of children in each condition across locations.

	Discovery Museum	Boston Common	Boston Zoo
Generosity	24	29	6
Trustworthiness	24	31	4

1.2. Free Response Coding & Tally

To better understand children's predictions for the number of candies they thought the other player expected, we coded their free responses to the question "How many Starbursts do you think the kid who couldn't be here today expected to get from you?". If the participant mentioned a specific integer (e.g. "five candies") or a phrase that was interpretable as a specific integer (e.g. "half of them" equating to three candies), those responses were coded as an integer and included in the analysis. A breakdown of all participants' responses can be found in **Table S3**.

Table S3: Tally of children's free responses by category

Response	Zero	One	Two	Three	Four	Five	Six
N	6	5	11	31	13	4	13

Response	Implausible number given	Multiple numbers given	Uninterpretable response	Unsure
N	1	5	5	24

1.3. The Preceding Forgiveness Task

As mentioned in the main text, all participants always played the trust task after completing an initial task measuring forgiveness (Amir et al., 2021). Prior to participating in either task, the participant was told that they would be participating in a number of activities with different kids who could not be there that day. Each child was assigned a paper bag with a different color (brown for the participant, white for the child in the forgiveness task, black for the child in the trust task). That is, the participants were aware that the child in the forgiveness task was different than the child in the trust task.

In the forgiveness task, the participant learned that the child with the white-marked bag has committed a small transgression: they have used a resource intended for the participant. The resource used was a "magic color scratch sheet": a small sheet of colorful paper covered in carbon film that could be scratched off to reveal the colors underneath. The participant then had to decide how many of these sheets to return to the transgressor and how many to throw away.

While we cannot definitively conclude that the forgiveness task did not influence children's behaviors in the trust task, we believe the fact that all children participated in the same task prior to the trust task can still allow us to make comparisons between the *Trustworthiness* and *Generosity* conditions.

2. Additional Analyses

2.1. Behavior Across Locations

We also do not find evidence for a significant effect of location on children's behavior. We compared the final model reported in the manuscript with an identical model that also had location as a covariate. Model comparison using Chi-square revealed no significant differences ($p = 0.71$).

2.2. Age Across Locations

An ANOVA revealed a significant difference in age across locations [$F(2, 115) = 4.55$,$p = 0.01$], such that younger children were recruited more frequently from the Boston Zoo. However, we find no effects of age or location on children's decisions, as reported in the manuscript.

2.3. Gender Differences

To examine the effects of gender, we first built a multiple regression model predicting the number of Starbursts shared by the interaction between age and gender. We find no evidence for a two-way interaction (LRT $X2(1) = 1.25$, $p = 0.24$). We then built a model predicting the number of Starbursts shared by gender and age. We find evidence for a main effect of gender, such that boys share significantly less than girls across both conditions ($\beta = -0.55$, $SE = 0.177$, $p = 0.002$). This effect can be visualized in **Figure S1.**

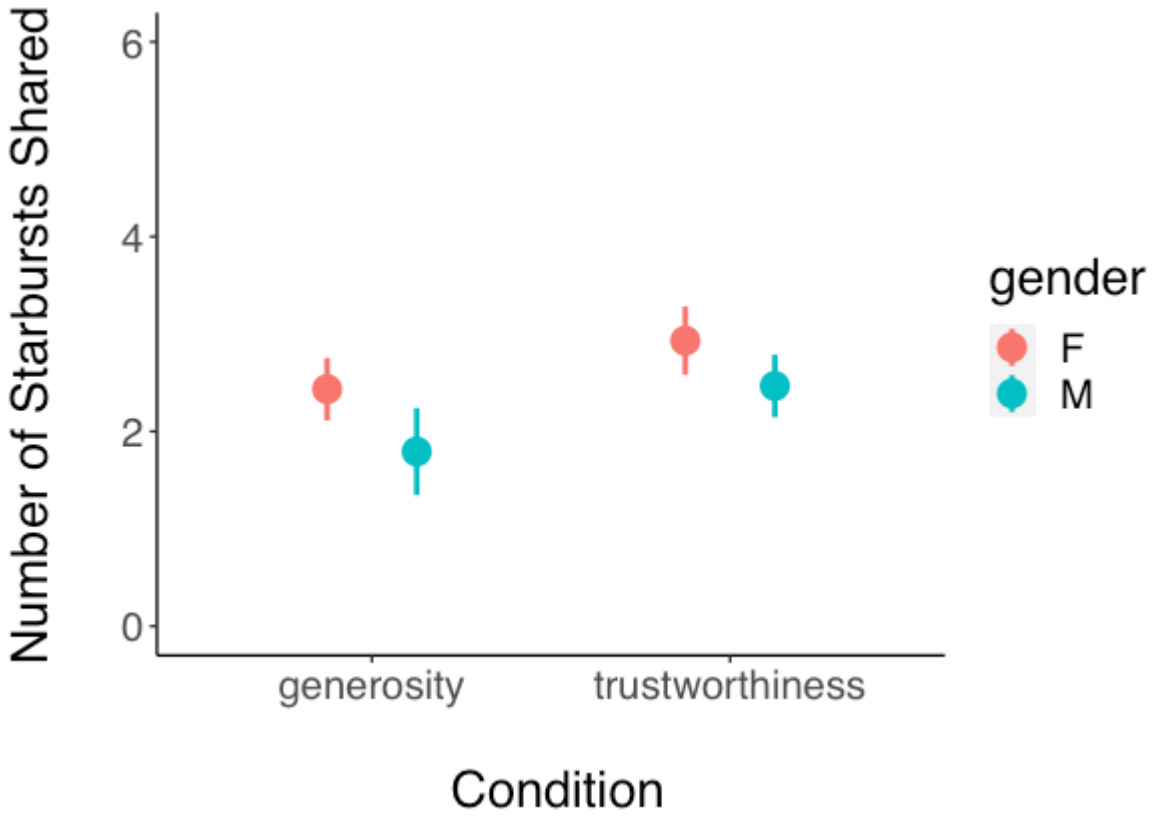

Figure S1: Mean number of Starbursts shared by condition and gender. Error bars represent 95% confidence intervals.

2.4. Age and Condition Interaction (Or Lack, Thereof)

To examine whether there was a significant interaction between age and condition, we built a multiple regression model predicting the number of Starbursts shared by the two-way interaction between age and condition. We find no evidence for a significant two way interaction (LRT $X2(1) = 0.77$, $p = 0.37$) (**Figure S2**).

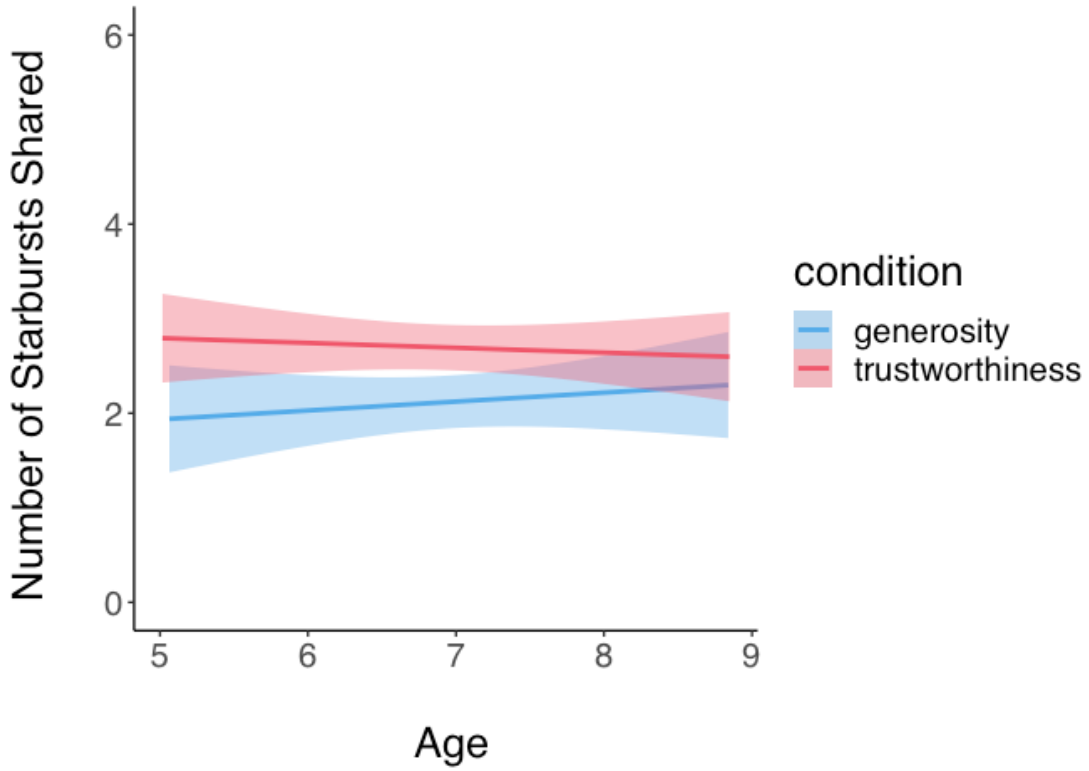

Figure S2: Number of Starbursts shared by condition and age. Shaded regions represent 95% confidence intervals.

2.5. Number of Candies Other Expected by Condition

After following the categorization scheme outlined in section 1.2, we next compared children's responses to the first free response question in the *Trustworthiness* condition versus the *Generosity* condition. Participants thought the other player expected significantly fewer candies in the Generosity condition (M = 2.67, SD = 1.56) than in the Trustworthiness condition (M = 3.70, SD = 1.62) than , t(78) = -2.91, p = 0.005.

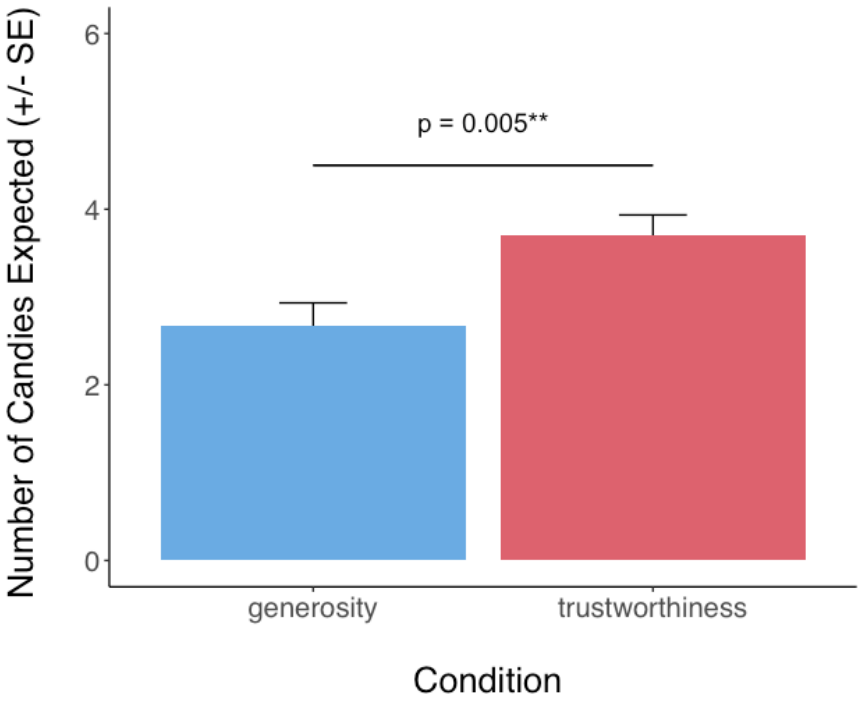

Figure S3: Mean predictions for number of candies participants thought the other player expected by condition. Error bars are standard errors.

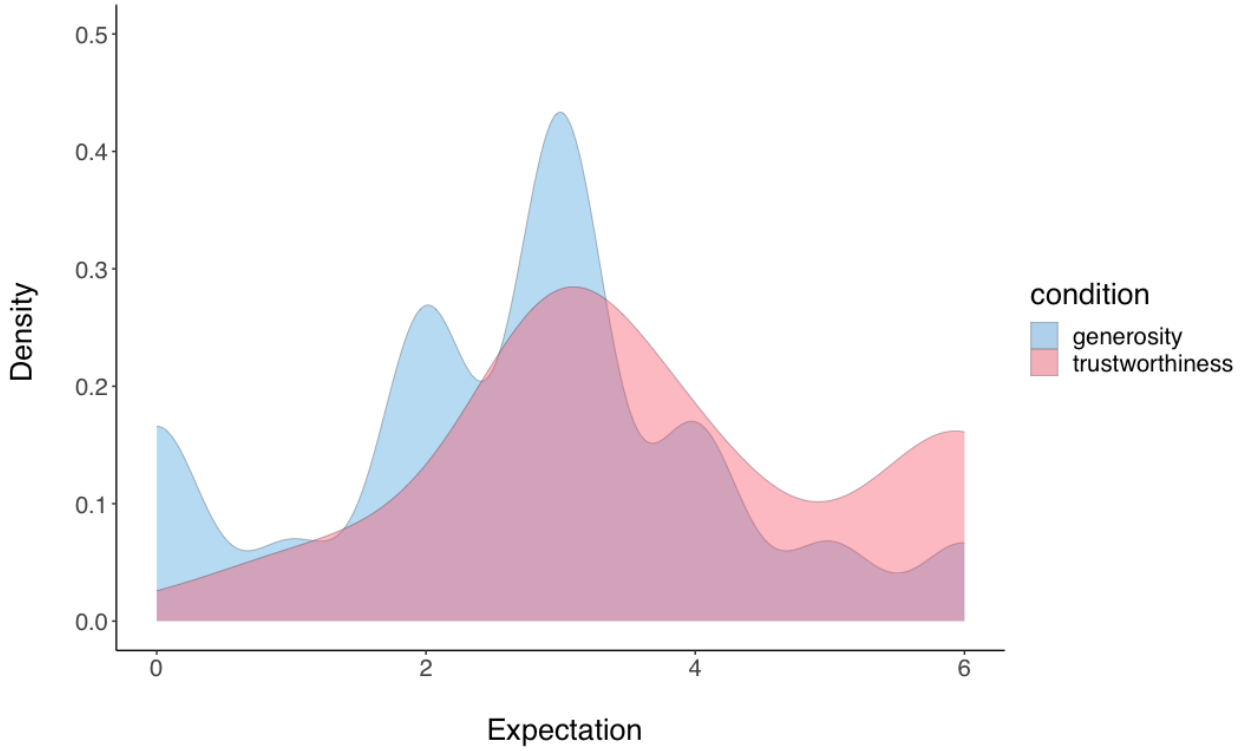

Figure S4: Density plot showing distributions of children's predictions for the number of candies they believed the other player expected, grouped by condition.

2.6. Number of Candies Other Expected by Gender and Age

We did not find any significant differences in children's predictions of the other party's expectations across gender (β = -0.09, *SE* = 0.37, *p* = 0.81) (see **Figure S5**) or age (β = 0.08, *SE* = 0.17, *p* = 0.62)(see **Figure S6).**

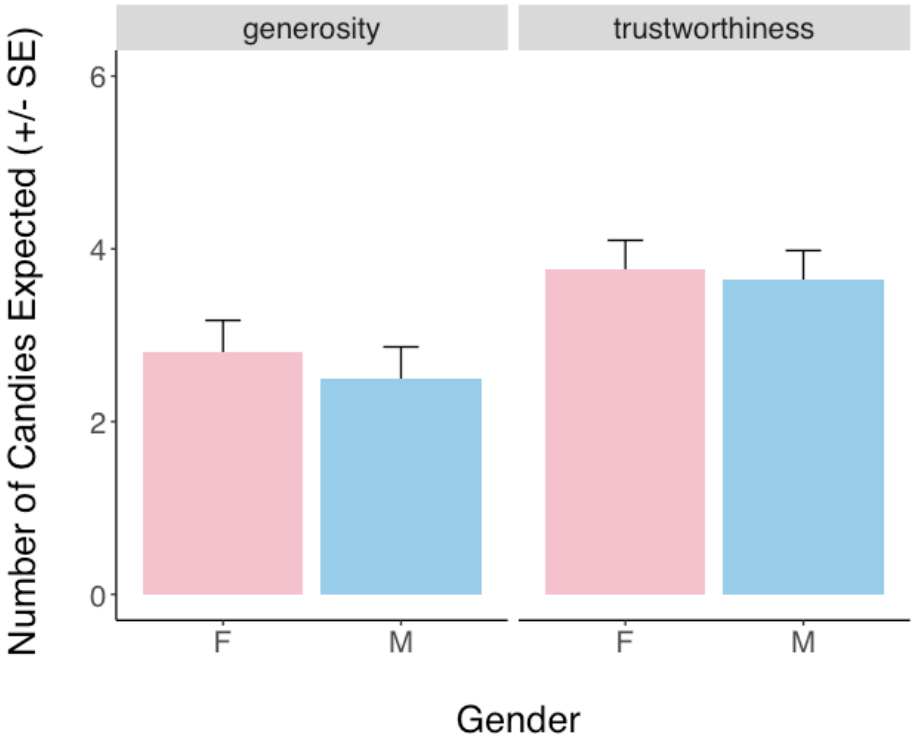

Figure S5: Mean predictions for number of candies participants thought the other player expected by gender and condition. Error bars are standard errors.

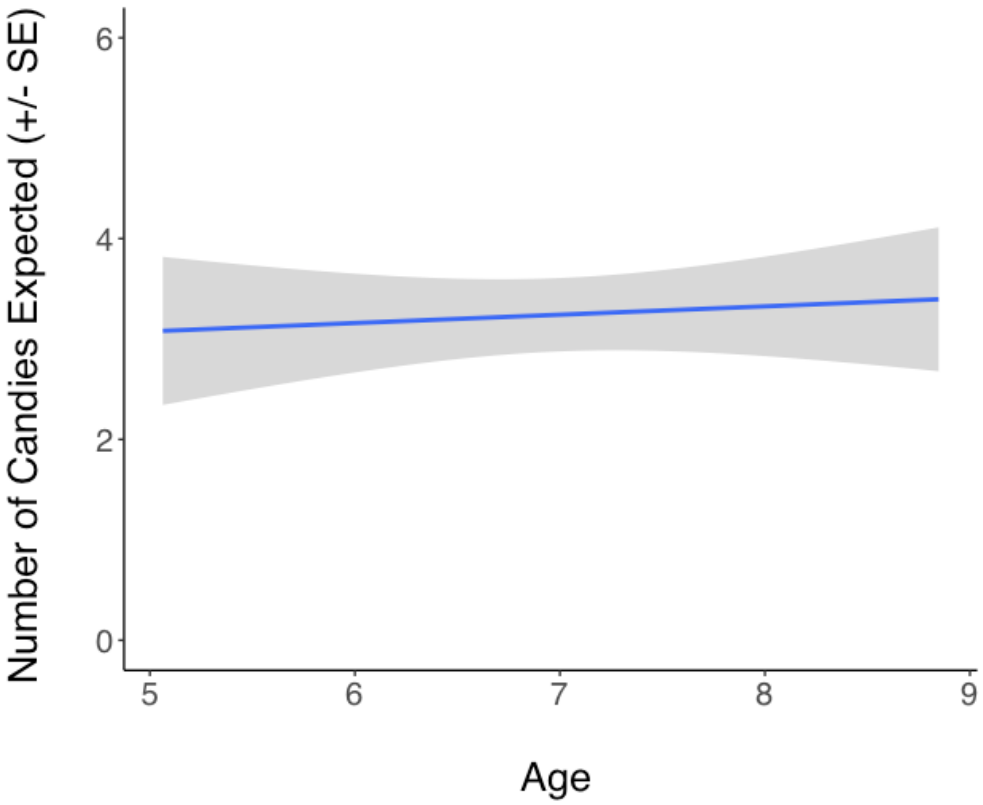

Figure S6: Mean predictions for number of candies participants thought the other player expected by exact age. The shaded region represents the 95% confidence interval.

3. Full Protocol & Script

3.1. Generosity Condition

I have some activities for you today. In this first part, you'll have a chance to get some Starburst. Here is a paper bag [*grab paper bag*]. I'll write your name on it [*Write name on* bag] and whatever candy you get will go in this bag. I will give it to you at the very end.

We'll be playing a game with a tray that looks like this. Inside the tray are two dishes. This dish is closer to us and has two Starbursts. This dish is farther away and has six Starbursts.

In this game we can't reach in from the top (*Touch top of tray*), so the only way to get the Starbursts is to use this tool (*Hold up one tool).*

Your tool has a hook on the end that can hook onto the dishes and pull them out. Once you pull out a dish, you can keep the Starbursts inside. In this game, you can only pull out one dish.

With your tool, you can reach the dish with two Starbursts *(Demonstrate that tool reaches dish),* but it's not long enough to reach the dish with six Starbursts *(Demonstrate that tool doesn't reach dish).*

So, **C1**: which dish can you reach with your tool*? (Hold up tool)*
That's right, you'll be able to reach the closer dish.

And **C2**: how many Starbursts do you get from that dish?
That's right, you get two Starbursts.

In order to reach the dish with six Starbursts, we need to make your tool longer. Using this special part (*Point to red connector*), we can join your tool to another tool and make one *long* tool. With this *long* tool, we can reach the dish with six Starbursts. (*Demonstrate, then disassemble and give kid their tool)*

C3: When you attach the two tools together, can you reach the farther dish?
That's right, you can reach the farther dish.

C4: How many Starbursts do you get from that dish?
That's right, you get 6 Starbursts.

Ok, now you have everything you need to make the long tool. Go ahead and make it. (*Watch or help them assemble the long tool*)

Remember, in this game you can only get one dish. Go ahead and use the long tool to get the dish with six Starbursts. (*Watch/help them get the dish with six Starbursts*)

Ok, great! You got six Starbursts. (*Disassemble long tool.)*

Now, you have a choice to make. You have to decide what to do with these six Starbursts.

There was a kid who couldn't be here today who likes Starbursts. You can decide if you want to give some of these Starbursts to them.

However many Starbursts you want to keep for yourself, you can put into your paper bag. (*Point to paper bag with child's name on it*). However many Starbursts you want to give to the kid who couldn't be here today you can put into this paper bag. (*Pull out and point to new bag*)

> **C5**: Where would you put the Starbursts you want to keep for yourself?
> That's right, you would put them into your paper bag.
>
> **C6**: And where would you put the Starbursts you want to give to the kid who couldn't be here today?
> That's right, you would put them into this bag.

Ok, great, go ahead and make your choice. I'm going to finish writing something down. Let me know when you are done. (*Turn 90 degrees away to give them some privacy. Wait for them to finish allocating before moving on).*

[Record the number of starbursts kept and given]

[RESET APPARATUS- add six more starbursts to the farther dish, remove second tool]

Great! I just have a few questions for you [ASK DISCUSSION QUESTIONS]

1. How many Starbursts do you think the kid who couldn't be here today expected to get from you?
2. Can you tell me why you gave the kid who couldn't be here today [X] Starbursts?
3. What do you think the word "trust" means?

Okay, thanks for playing!

3.2. Trustworthiness Condition

I have some activities for you today. In this first part, you'll have a chance to get some Starburst. Here is a paper bag [*grab paper bag*]. I'll write your name on it [*Write name on* bag] and whatever candy you get will go in this bag. I will give it to you at the very end.

We'll be playing a game with a tray that looks like this. Inside the tray are two dishes. This dish is closer to us and has two Starbursts. This dish is farther away and has six Starbursts.

In this game we can't reach in from the top (*touch top of tray*), so the only way to get the Starbursts is to use this tool. (*Hold up one tool)*

Your tool has a hook on the end that can hook onto the dishes and pull them out. Once you pull out a dish, you can keep the Starbursts inside. In this game, you can only pull out one dish.

With your tool, you can reach the dish with two Starbursts *(Demonstrate that tool reaches dish),* but it's not long enough to reach the dish with six Starbursts *(Demonstrate that tool doesn't reach dish).*

So, **C1**: which dish can you reach with your tool*? (Hold up tool)*
That's right, you'll be able to reach the closer dish.

And **C2**: how many Starbursts do you get from that dish?
That's right, you get two Starbursts.

In order to reach the dish with six Starbursts, we need to make your tool longer. Using this special part (*Point to red connector*), we can join your tool to another tool and make one *long* tool. With this *long* tool, we can reach the dish with six Starbursts. (*Demonstrate, then disassemble and give kid their tool)*

C3: When you attach the two tools together, can you reach the farther dish?
That's right, you can reach the farther dish.

C4: How many Starbursts do you get from that dish?
That's right, you get 6 Starbursts.

Yesterday, a kid who really likes Starbursts played this game. I gave them a choice. They could either use their tool to get the dish with two Starbursts, OR they could give their tool to you so that you could make a *long* tool and reach the dish with six Starbursts. They knew you could give them some of the six Starbursts.

The kid from yesterday chose to give their tool to you *(Give tool)*. That means they didn't get any Starbursts yesterday, but they knew you could share with them today.

So let's double-check something before we move on.

C5: Did the kid from yesterday use their tool to get two Starbursts, OR did they give their tool to you?

That's right, they gave their tool to you.

C6: So, did the kid from yesterday get any Starbursts in this game?

That's right, they did not get any Starbursts.

Ok, now you have everything you need to make the long tool. Go ahead and make it. (*Watch or help them assemble the long tool*)

Remember, in this game you can only get one dish. Go ahead and use the long tool to get the dish with six Starbursts. (*Watch/help them get the dish with six Starbursts*)

Ok, great! You got six Starbursts. (*Disassemble long tool.)*

Now, you have a choice to make. You have to decide what to do with these six Starbursts.

However many Starbursts you want to keep for yourself, you can put into your paper bag. (*Point to paper bag with child's name on it*) However many Starbursts you want to give to the kid from yesterday who gave you their tool, you can put into this paper bag. (*Pull out and point to a new bag*).

C7: Where would you put the Starbursts you want to keep for yourself?

That's right, you would put them into your paper bag.

C8: And where would you put the Starbursts you want to give to the kid from yesterday?

That's right, you would put them into this bag.

Ok, great, go ahead and make your choices. I'm going to finish writing something down, let me know when you are done. (*Turn 90 degrees away to give them some privacy. Wait for them to finish allocating before moving on).*

[Record the number of starbursts kept and given]
[RESET APPARATUS- add six more starbursts to the farther dish, remove second tool]

Great! I just have a few questions for you [ASK DISCUSSION QUESTIONS]

4. How many Starbursts do you think the kid who couldn't be here today expected to get from you?
5. Can you tell me why you gave the kid who couldn't be here today [X] Starbursts?
6. What do you think the word "trust" means?

Okay, thanks for playing!