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Reciprocity in Young Children

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Abstract

Reciprocal behavior, the rewarding of kind acts and the punishment of unkind acts, is relatively well established among adults. We test if reciprocal behavior exists already among children 3-8 years old. Three simple anonymous allocation games are conducted with 242 children. In a first stage, half of the children decide whether to give a bag of raisin to another anonymous child or not. The three games differ in terms of the cost of giving and the relative difference in payoffs. In a second stage the roles are reversed between the two children to test for reciprocal behavior. We find reciprocal behavior in all three games with highly significant effects for two of the three games. Furthermore, the degree of reciprocity tends to increase with age. The effect of reciprocity is not significant among 3-5 year old children, whereas the effect is highly significant in all three games for 6-8 year olds.

Key words: Reciprocity, Prosociality, Children, Experiments

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INTRODUCTION

Human cooperation is widespread despite individual incentives to free-ride (Nowak 2006). It has been suggested that strong reciprocity, the rewarding of kind acts and the punishment of unkind acts, is an important mechanism for enhancing and maintaining cooperation (Fehr et al. 2002; Fehr & Fischbacher 2003). As argued by Fehr and Gächter (2000) reciprocity has powerful implications for many economic domains. These include the provision of public goods and the enforcement of incomplete contracts, which are crucial for economic growth and general well-being (Zak and Knack 2001).

Reciprocity has for instance been studied in the ultimatum game (negative reciprocity) and the trust and gift-exchange games (positive reciprocity), and reciprocal behavior is now considered well established among adults (for overviews of experimental results see Fehr and Gächter (2000) and Camerer (2003)).^{1,2} However, little is known about the origins and development of reciprocity. In this study we provide new evidence about reciprocal behaviour among young children. There are only a few previous experimental studies on reciprocity in children, and these studies show somewhat conflicting results.

In an early experimental contribution, Fishbein & Kaminski (1985) tested for reciprocal behaviour among 6-, 8- and 11-year-old children. The participating children were paired up in same-age, same-sex pairs consisting of one confederate and one experiment participant. The pairs played a board game where the participants' encountered situations where they could either help or punish the other player. In half of the games the confederate child "voluntarily" helped the other child (voluntary help condition), while in the other half the game leader whispered compulsory instructions to the confederate to always help the other child

¹ However, substantial variation in behaviour has also been observed both across individuals within the same culture and across small scale societies isolated from Western Culture (Henrich et al. 2004).

² However, a recent field experiment by List (2006) fail to find significant positive reciprocity if all reputational concerns are removed.

(compulsory help condition). The whispering was designed to make the experimental participant think that the experimental leader instructed the help. It was found that children were more likely to help in the voluntary help condition than in the compulsory help condition, interpreted as evidence for reciprocity. However, the follow-up interviews revealed that many children were unable to differentiate between the two ways of helping, making it difficult to interpret the results. For instance, 80% of the 6-year-old actually thought that the help was voluntary, when it was compulsory. Hence, it is difficult to draw strong conclusions from this study. Another limitation is that salient payoffs were not used.

Harbaugh et al. (2002) carried out a trust game experiment among 8-, 11-, 14 -and 17-year-old children. The children were assigned the role of truster or trustee and both players received an endowment of 4 tokens. In the first stage the truster decided how many tokens to transfer to the trustee and any tokens transferred were tripled. In the second stage the trustee decided how much to return to the truster. The strategy method was used to elicit the backtransfer for any possible initial transfer. For the 8-year-old children the tokens earned during the experiment could be traded for toys in an experimental gift shop. The older children were paid one quarter for each token earned. The main purpose of the study was to test for age effects in trust (the initial transfer) and trustworthiness (the backtransfer), but no significant age pattern was found. Reciprocity in the trust game is measured as a positive association between the transfer and the backtransfer, and the backtransfer increased with the transfer at all ages. But the relationship was relatively weak and did not vary significantly with age.

Sutter and Kocher (2007) conducted the most recent study on the development of reciprocity with age. In the study, 662 subjects in six different age groups from 8-year-olds to retired persons participated in a trust game. The design was similar to the study of Harbaugh et al. (2002), although the strategy method was not used and the trustee did not receive an

initial endowment. The 8-year-old children were also paid in terms of cash rather than in terms of toys. The truster was given 10 money units as initial amount and decided how much of this to transfer to the trustee. The amount was tripled and given to the trustee, and the trustee decided how much to return to the truster. The earnings were converted to Euro with an exchange rate of 0.2 for 8-year-old children, and 0.5 for the other participants. They found that both trust (the transfer) and trustworthiness (the backtransfer) increased with age until adulthood. They furthermore found that there was a positive association between the amount invested and the amount returned already for 8-year old children and that this association increased with age.

The results of Harbaugh et al. (2002) and Sutter and Kocher (2007) both find that the backtransfer increases with the transfer, consistent with reciprocal behavior. However, the results are contradictory when it comes to the age effect. To use the behaviour of the trustee in the trust game as a measure of reciprocity is also problematic as it does not distinguish between reciprocity and altruism. Reciprocity implies that a higher transfer should evoke a larger backtransfer, but as the choice-set also varies with the initial transfer it is difficult to draw inferences about reciprocity. The amount given to the trustee in the second stage may depend on the amount available to the trustee. The second stage in the trust game resembles a dictator game and in the dictator game it is commonly assumed that the fraction donated to the other player is independent of stakes, which would in itself create a positive association between the transfer and the backtransfer. To control for this effect it would be necessary to estimate how much the trustee would give to the truster for each possible endowment in a situation without a prior investment stage (i.e. in a pure dictator game).

To avoid the interpretational problems of the trust game we use the three simple anonymous allocation games used by Bernhard et al. (2007) in their recent study on prosocial behavior in children. To test for reciprocal behavior we add a second stage reversing the roles

of the players. In the first stage half of the children decide whether to give a bag of raisin to another child or not. The three games differ in terms of the cost of giving and the relative difference in payoffs. In the second stage the roles are reversed to test for reciprocal behavior. This provides a simple and straightforward test of reciprocity. Are children that receive a bag of raisin in the first stage more likely to give a bag of raisin in the second stage compared to children that do not receive a bag of raisin in the first stage? We find reciprocal behavior for all three games, with highly significant effects for two of the three games. Furthermore, the degree of reciprocity tends to increase with age. The effect of reciprocity is not significant among 3-5 year old children, whereas the effect is highly significant in all three games for 6-8 year olds.

EXPERIMENTAL DESIGN AND PROCEDURES

Subjects

Children in the ages of 3 to 8 years were recruited from day-care centers and schools in the city of Västerås, a typical middle sized town in Sweden. The principals of ten day-care centers and schools were contacted. They were located in both the central and the outer parts of town, creating a mixture of participants that reflected the children of the city. All of the day-care centers and schools agreed to participate in the study. Following school regulations the parents were asked for permission for their children to participate in the study. Of all the children approached 95 percent (264 children) were given consent by their parents to participate. Out of these 264 children, 22 children were excluded from the study. In order for the child to qualify for the study he/she had to like raisins and pass all the control questions. Out of the 22 children that did not qualify for the study, 7 children did not answer the control

questions correctly and 8 children did not like raisins. Furthermore, to be able to mix the children in the two stages at each study site, there had to be an even number of children in every class. This led to that some results did not count since the number of children was uneven in some classes. In uneven classes, all the children played the games, but one child was randomly excluded since they could not be matched up in even pairs. Seven children were excluded for this reason. The remaining 242 children participated in the study. Age was defined according to birth year.³ The age distribution of the children is shown in Table 1.

TABLE 1 IN HERE

Games

The allocation games used were based on the study by Bernhard et al. (2007). They used three simple allocation games to study prosociality among young children (3-8 years). In these games one child (the allocator) chose between two different allocations between herself and another child (the receiver). In all three games the allocator decided whether the receiver would receive one unit of the good (candy) or nothing. We used the same three games with the exception that one of the games was adapted slightly, and then added a second stage reversing the roles. The second stage provides a simple and clean test of reciprocity with the prediction that allocators in stage 2 will be more likely to give if they received something in the first stage. The allocator in the first stage did not know that there would be a second stage of the game, to rule out giving for strategic reasons.

The games were played in two stages, a Giving Stage and a Reciprocating Stage. The children were randomly allocated to player A or player B (121 children in each role). In the

³ Age 3 included children born in 2003, and so forth.

first stage player A decided how raisin-bags were to be divided between themselves and an anonymous child from the same group/class (player B). All player A children were randomly linked with three player B children, one for each game. First player A played the three games as the allocator, starting with Game 1 and finishing with Game 3. The games are described in Figure 1.

FIGURE 1 IN HERE

In each of the games player A made a choice between to give (choice 1) or not to give (choice 2) a bag of raisin to player B. In the first game $[(1,1) \text{ vs } (1,0)]$,⁴ player A always received a bag of raisins irrespective of the choice, meaning that giving a bag of raisins to player B led to an equal allocation between the players. Giving therefore increased both efficiency and equality. In the second game $[(0,1) \text{ vs } (0,0)]$, player A never received a bag of raisin irrespective of the choice, meaning that giving a bag of raisin to player B led to an unequal allocation.⁵ In this game, giving increased efficiency but decreased equality. In the third game $[(1,1) \text{ vs } (2,0)]$, player A choose between taking two bags of raisin herself or giving one of the bags of raisin to player B. In this game, efficiency was not affected by the choice but giving increased equality. This is also the only of the three games where giving carries a material cost to the giver, as player A has to give up one bag of raisin to give it to the other player.

In the reciprocating stage the roles were reversed and player B played the three games as an allocator in the same order, with the three previously matched A players as receivers. Player B was told what player A had chosen in the first stage, and if player A had given a bag of raisins, player B received the bag of raisins before she made her choice.

⁴ The pay-off of player A is denoted first.

⁵ This second game differed slightly from the game used by Bernhard et al (2007). In their study player A received one piece of candy irrespective of the choice, and the player chose between giving one or two pieces of candy to player B.

Procedures

The procedures were based on the procedures used by Bernhard et al. (2007). When implementing the games, the main focus was to make the children understand them. Uncomplicated language and a clear game design were used. The two different allocation possibilities were presented on two large papers on which two circles with arrows were drawn. One arrow was pointing toward the playing child and another arrow was pointing in the opposite direction representing the receiving child. The different allocation possibilities were presented by placing small zip-lock plastic bags, filled with 15 raisins each, in the different circles.⁶ An example is presented in Figure 2.

FIGURE 2 IN HERE

The games were conducted in October 2006. All games were played between 9 and 11 am. Initially, introduction was made to the whole group and each child was given one card from a pair of memory-game cards. The order and the stage in which the children played the games were decided by randomly drawing a card. The first half of the children drawn played the giving stage and the second half the reciprocity stage. The children played the games individually in a separate room with a game leader. The children's understanding of the games was ensured by frequently asking control questions that had to be answered correctly in order for the results to be valid. After each game, the children were given the amount of raisin bags they had chosen in a larger plastic bag that they could bring home. After each game-session the children took their plastic bag and hid it on their personal shelf. The raisin

⁶ See Appendix 1 for a complete description of the entire game session.

bags given by Player B in the second stage were distributed on the Player A shelves when all children in the group had played.

Statistics

We use a Pearson chi-square test, to test the null hypothesis of no difference in the fraction of giving in the second stage between children that received a bag of raisin in the first stage and children that did not receive a bag of raisin in the second stage (D'Agostino et al 1988). Our main test is carried out for the entire age group. We also divide the sample into two age groups, 3-5 years and 6-8 years, and test the null hypothesis of no reciprocity within each of these age groups. This is a natural division as children in the age 3-5 years will be at a daycare center and children 6-8 years will be at pre-school or school.⁷ To test if there is a significant difference in reciprocity between the two age groups we use logistic regression analysis with the probability of giving in the second stage as the dependent variable. As independent variables we use a variable for if the child received a bag of raisin in the first stage, an age dummy variable and an interaction variable between these two. The interaction variable measures if the reciprocity differs significantly between the two age groups. We also control for gender in the logistic regression analysis. All reported p-values are two-sided, and a p-value below 5% is considered statistically significant.

RESULTS

The giving stage

⁷ In Sweden children typically start the first grade when they are seven years old. But in the year before the first grade they are in a pre-school class, which prepares them for the first grade and is located together with the school.

The results at stage 1 of the three games are shown in Figures 3-5. For the first game, the fraction of giving is 71% in the overall age group. The fraction of giving was similar among younger (69%) and older children (72%), with no significant difference ($p=0.736$). For game 2, the fraction of giving is 58% for 3-8 year old children. There was a tendency for the fraction of giving to decrease with age from 63% in the younger age group to 54% in the older age group, but this difference was not significant ($p=0.320$). In game three, the fraction of giving was 27% in the overall age group, with a similar rate among younger (29%) and older children (26%; p -value of difference= 0.791).⁸

FIGURE 3-5 IN HERE

The reciprocity stage

The results of stage 2 of the experiment are shown in Table 2 and Figures 6-8. For game 1, the degree of giving increases from 57% to 71% if the allocator received a bag of raisin in the first stage. However, this difference is not quite statistically significant ($p=0.144$). In game 2 the reciprocity effect is larger. The giving now almost doubles, from 35% to 64%, if the allocator received a bag of raisin in the first stage. This difference is also highly significant ($p=0.002$). In the last game, the effect of reciprocity is even larger and the degree of giving increases from 26% to 58% when the allocator received a bag of raisin in stage 1 ($p=0.001$).

When we divide the sample into two age groups, we find a highly significant effect of reciprocity in the older age group (6-8 years) for all three games. For the younger age group the effect of reciprocity is not significant for any of the three games. For two of the games

⁸ We also tested if there was a difference in giving in stage 1 between boys and girls. Gender was not significant for any of the three games.

there is a non-significant tendency towards reciprocity, but for one of the games the point estimate goes in the wrong direction. We also tested if there is a significant difference in reciprocity between the two age groups using logistic regression analysis. The effect of reciprocity is significantly larger in the older age group in game 1 ($p < 0.001$), but not in game 2 ($p = 0.781$) and game 3 ($p = 0.081$).⁹

TABLE 2 AND FIGURE 6-8 IN HERE

DISCUSSION

Our study provides new evidence that reciprocal behaviour exists already among young children; the evidence of reciprocity among 6-8 year old children in our data is strong. For the children in the age of 3-5 years, further work is needed to provide more firm evidence of the presence of reciprocal behavior. This type of data cannot be used to distinguish between whether reciprocity depends on genetic or environmental factors, as the genetic effects may develop with age. But it strengthens the evidence of reciprocity being an important aspect of human behaviour already at an early age.

A number of other studies on economic behavior of children have been carried out in recent years (Murnighan & Saxon 1998; Harbaugh & Kruse 2000; Harbaugh et al. 2001, 2002; Sutter & Kocher 2007; Benenson et al. 2007; Bernhard et al. 2007). Most studies on prosocial behaviour indicate that prosocial behaviour increases with age as in our study (Murnighan & Sutter 1998; Sutter & Kocher 2007; Benenson et al. 2007; Bernhard et al.

⁹ We also tested in a logistic regression analysis if the degree of giving in stage 2 and the effect of reciprocity differed between men and women (controlling for age group). But there was no significant gender difference for any of the three games.

2007), although Harbaugh et al. (2002) and Harbaugh & Krause (2000) are exceptions to this pattern.

The most closely related study to ours is the recent study by Bernhard et al. (2007), on which we based the design of our study. They studied prosocial behavior in children in the ages 3-8 years using stage one of the games used in our study. All children were assigned a role as an allocator, and were paired with an anonymous passive recipient child in the same age from either the same group (in-group treatment) or from a different school (out-group treatment). The allocator decided how to allocate candy between themselves and the anonymous child. Each child played all three games with the same anonymous recipient. As we carried out an in-group treatment using the same three games it is interesting to compare the in-group results across the studies. For game 1 the results are similar across the two studies, with a similar rate of giving and a relatively stable age pattern. For game 3, which was the second game in Bernhard et al, the overall rate of giving is similar across the two studies. However, in the Bernhard et al. study the rate of giving increased with age, whereas the rate of giving was similar in the two age groups in our study. For game 2 the level of giving was higher in our study, but in both studies the level of giving tended to decrease with age (although this decrease was more pronounced in the Bernhard et al. study). This last game had the same structure in both studies, but differed somewhat. We used a choice between 0,0 vs 0,1 and Bernhard et al. used a choice between 1,1 vs 1,2. The studies also differed with respect to the material incentives used. We used raisins whereas Bernhard et al. used candy. Another difference is that in our study the children were matched with a different counterpart in the three games, whereas in Bernhard et al. the recipient was the same for the three games. Further work is needed to test if these methodological differences are important or not.

Our results can be driven by both negative and positive reciprocity. Negative reciprocity in our setting implies that a child that received no bag of raisins in the first stage become less

likely to give a bag of raisin in the second stage. Positive reciprocity implies that a child that received a bag of raisins in the first stage become more likely to give a bag of raisin in the second stage. By comparing the rate of giving between the first and the second stage, we get some tentative information about whether the results are due to negative or positive reciprocity. For game 1, the results suggest that the reciprocity effect is largely driven by negative reciprocity. For game 2, both negative and positive reciprocity appear to be important and for game 3 the results appear to be largely driven by positive reciprocity. These results are intuitively appealing as they correspond to the overall rate of giving in the three games. In game 1 the unconditional giving is 71%, and most recipient children can expect to receive a bag of raisin. Giving is here costless to the giver and equalizes the payoffs between the two players. Failing to give therefore evokes a strong negative reaction. For game 3 the reverse is true. Here the unconditional rate of giving is only 27%, and most recipient children cannot expect to receive a bag of raisins. Giving is here costly and unexpected and therefore evokes a strong positive reaction. Game 2 is in between these situations with an unconditional rate of giving of 58%, and therefore seem to evoke both modest positive and modest negative reciprocity.

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Appendix 1. Description of an entire game session

Before each game session a small presentation to the whole group was performed. Following is an outline of this presentation;

Hi everyone! My name is Pontus/Sandra. I study at a school in Stockholm. I am here today to play a little game with you. This is a game that I will play individually with each and every one of you. The game is a little special because it is a secret. After you have played the game you have to be mute, and not tell any of your friends, what the game was about. You have to keep this secret until everyone has played, otherwise it will not be a surprise to all children what the game is about. Do you know how to keep a secret? Will everyone promise that they will keep this secret until all children have played? Good. Now I am going to give you a card with a picture on it. (Bringing out memory game cards with pictures on them. Handing out a card to each child and keeping the paired picture). Has everyone got a picture? Now keep this card until I draw your picture, then it is your turn to come with me and play the game. (Mix the stack of cards and draw a picture). For example, has anyone got an elephant? Then it is your turn to play, you can come with me.

Then we walked with the child to a quiet room where we had prepared for the game. We asked the child for their name and age. In the game room we asked the child to sit down. In front of the child were two identical large papers. Following is an outline of how the game was played;

Welcome to the game. The secret of this game is that you are going to play a game with three different friends from your group, but you don't know which of your friends you will play

with, and they will not know that they play with you. Your job in this game is to choose which one of these papers you like the best. (Pointing at one paper). This paper has a circle with an arrow pointing at you. This means that if you choose this paper you will get what I put in this circle. Your friend will get what I put in the other circle, the one with an arrow pointing away toward the three empty plastic bags. They represent the three friends that you will play with. Are you ready to play with your first friend? (We distributed the bags of raisins according to the first game explaining who will receive what, and how many bags. Then we asked control questions to make sure the child understood). So, how many bags of raisins do you get if you choose this paper? And how many bags does your friend get? (If the child played in the Reciprocating stage we would explain what the child they played with had chosen before them, from the same allocation possibilities. We then continued by explaining, this means that your friend has given/has not given you a bag of raisins. Then we gave a bag of raisins, if their friend had chosen so. Then we gave the child a plastic bag explaining that what we put in this bag after each game, they will keep and can take home). Now you can choose the paper you like the most. (The child points at a paper). Good, you will get ... bags of raisins and your friend will get ... bags of raisins. So, why did you choose this paper? Ok, we now put your raisins in your bag, that you can bring home, and your friend will also get one bag of raisins/will not get anything in his or her bag. (We put a bag of raisins in the first plastic bag if a bag was given to the recipient child). Now, if you are ready, it is time to play with a new friend. (The new game starts).

After we had played all three games we asked the child if they liked raisins. Then we followed him or her back to the group, and showed a new picture to the group. When all children had played the games we put the raisins distributed by allocators on receivers' shelves. Then we gathered the group and thanked them for participating.

TABLES**Table 1. Number of children in the two stages, divided into different age groups.**

	3 years	4 years	5 years	6 years	7 years	8 years	Total
Player A (Allocator in stage 1)	9	18	22	24	27	21	121
Player B (Allocator in stage 2)	17	21	14	25	30	14	121
Total	26	39	36	49	57	35	242

Table 2. Number (%) of givers in stage 2 (the reciprocity stage).

	Player B received in stage 1	Player B did not receive in stage 1	
	Number (%) of givers in stage 2	Number (%) of givers in stage 2	p-value of difference*
Game 1:			
Age 3-8	61/86 (71)	20/35 (57)	0.144
Age 3-5	18/33 (55)	15/19 (79)	0.078
Age 6-8	43/53 (81)	5/16 (31)	<0.001
Game 2:			
Age 3-8	45/70 (64)	18/51 (35)	0.002
Age 3-5	22/37 (59)	5/15 (33)	0.088
Age 6-8	23/33 (70)	13/36 (36)	0.005
Game 3:			
Age 3-8	19/33 (58)	23/88 (26)	0.001
Age 3-5	6/15 (40)	11/37 (30)	0.474
Age 6-8	13/18 (72)	12/51 (24)	<0.001

*The p-value is estimated with a contingency table Pearson chi-square test.

FIGURES

Game 1:	Stage 1 (the giving stage)			Stage 2 (the reciprocity stage)	
	Choice 1	Choice 2		Choice 1	Choice 2
Player A (allocator)	1	1	Player B (allocator)	1	1
Player B (receiver)	1	0	Player A (receiver)	1	0

Game 2:	Stage 1 (the giving stage)			Stage 2 (the reciprocity stage)	
	Choice 1	Choice 2		Choice 1	Choice 2
Player A (allocator)	0	0	Player B (allocator)	0	0
Player B (receiver)	1	0	Player A (receiver)	1	0

Game 3:	Stage 1 (the giving stage)			Stage 2 (the reciprocity stage)	
	Choice 1	Choice 2		Choice 1	Choice 2
Player A (allocator)	1	2	Player B (allocator)	1	2
Player B (receiver)	1	0	Player A (receiver)	1	0

Figure 1. The games in the experiment.



Figure 2. Illustration of Choice 2 in Game 3 (two bags of raisins to the allocator and zero bags of raisins to the receiver).

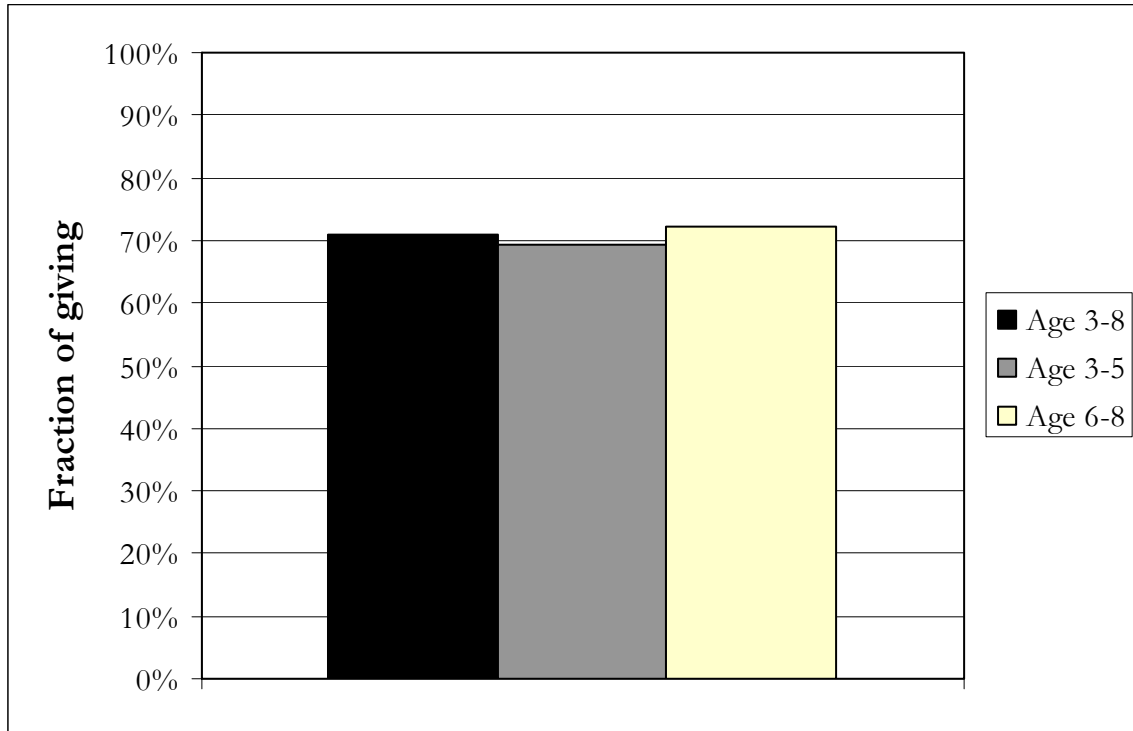


Figure 3. Fraction of giving in game 1 in stage 1.

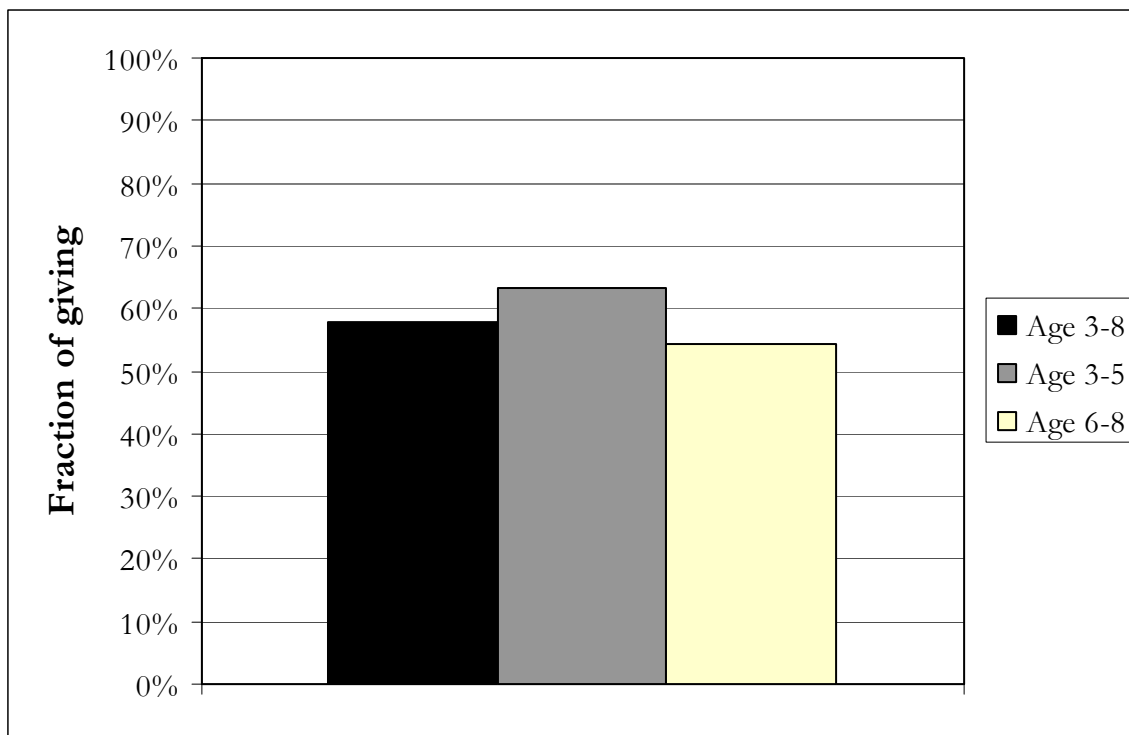


Figure 4. Fraction of giving in game 2 in stage 1.

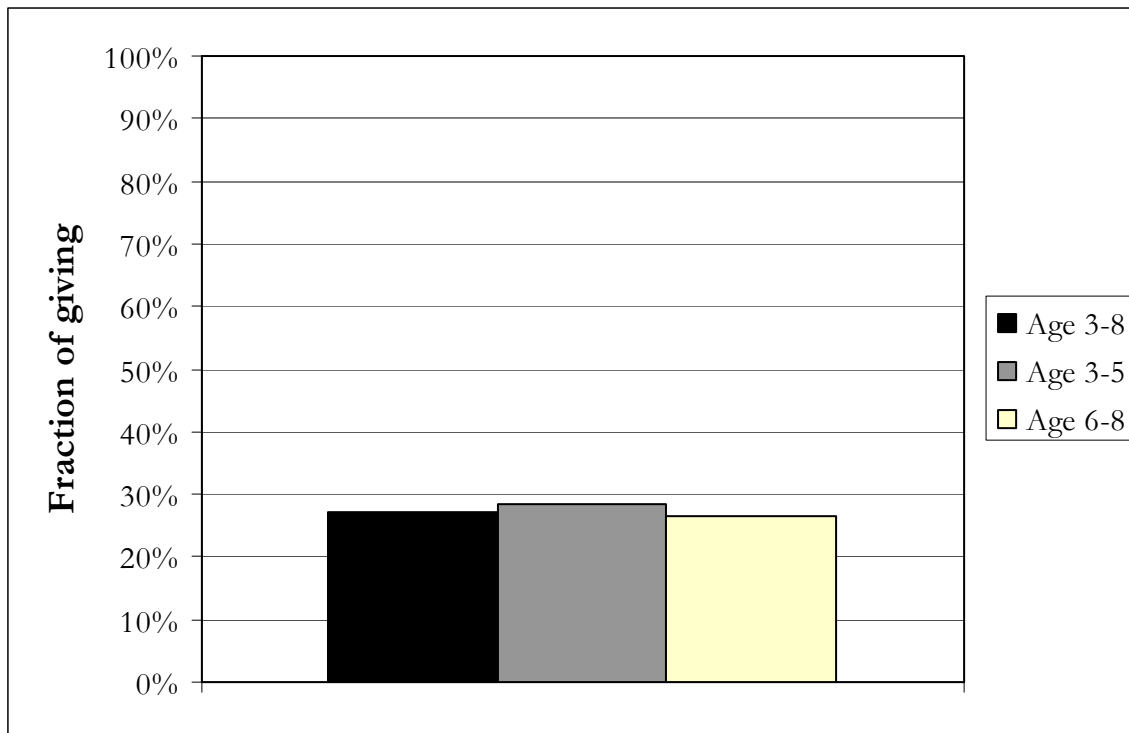


Figure 5. Fraction of giving in game 3 in stage 1.

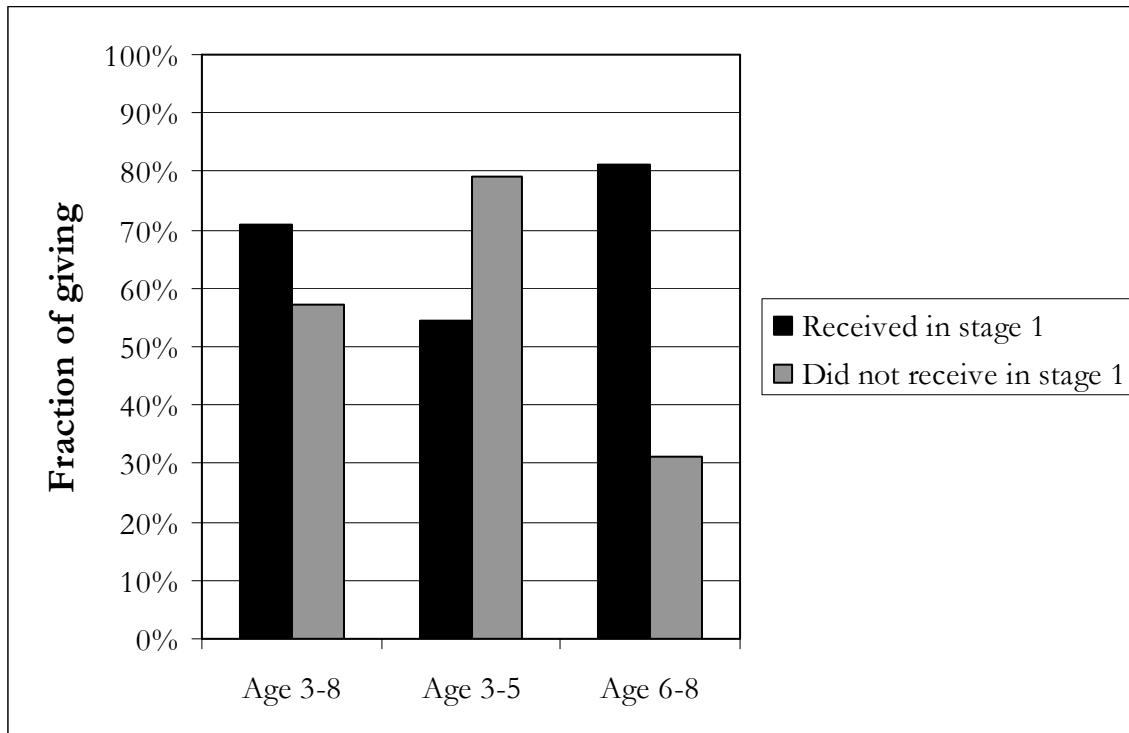


Figure 6. Fraction of giving in game 1 as a function of receiving in stage 1.

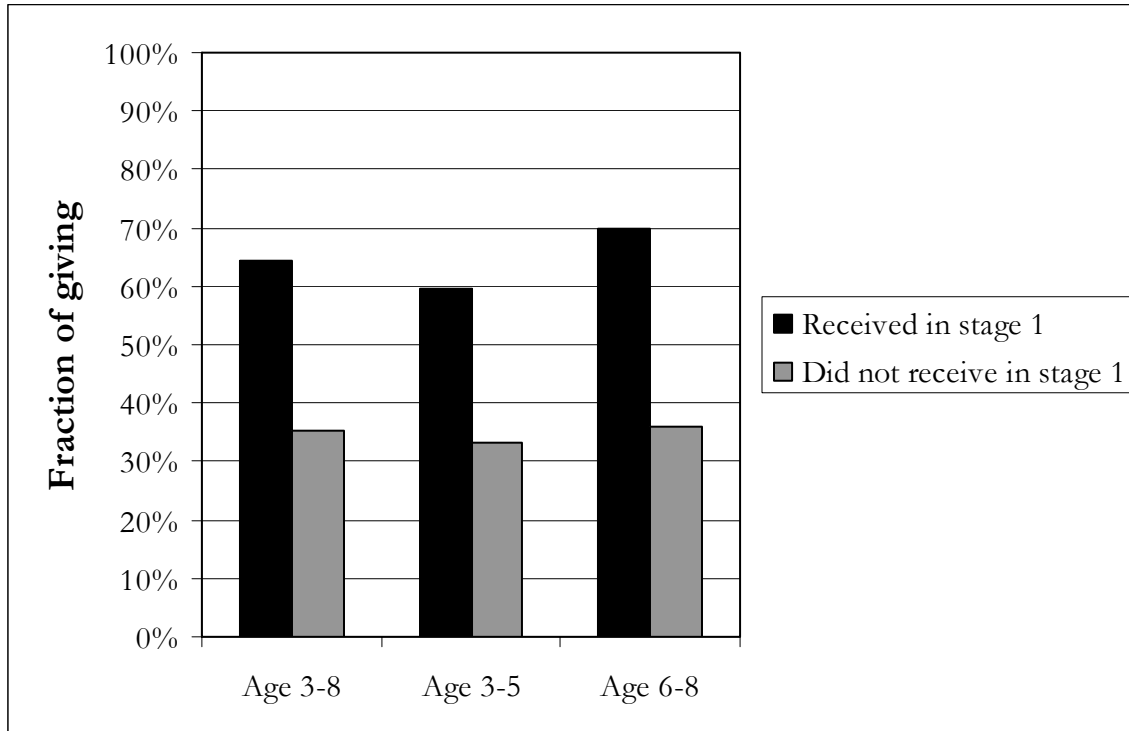


Figure 7. Fraction of giving in game 2 as a function of receiving in stage 1.

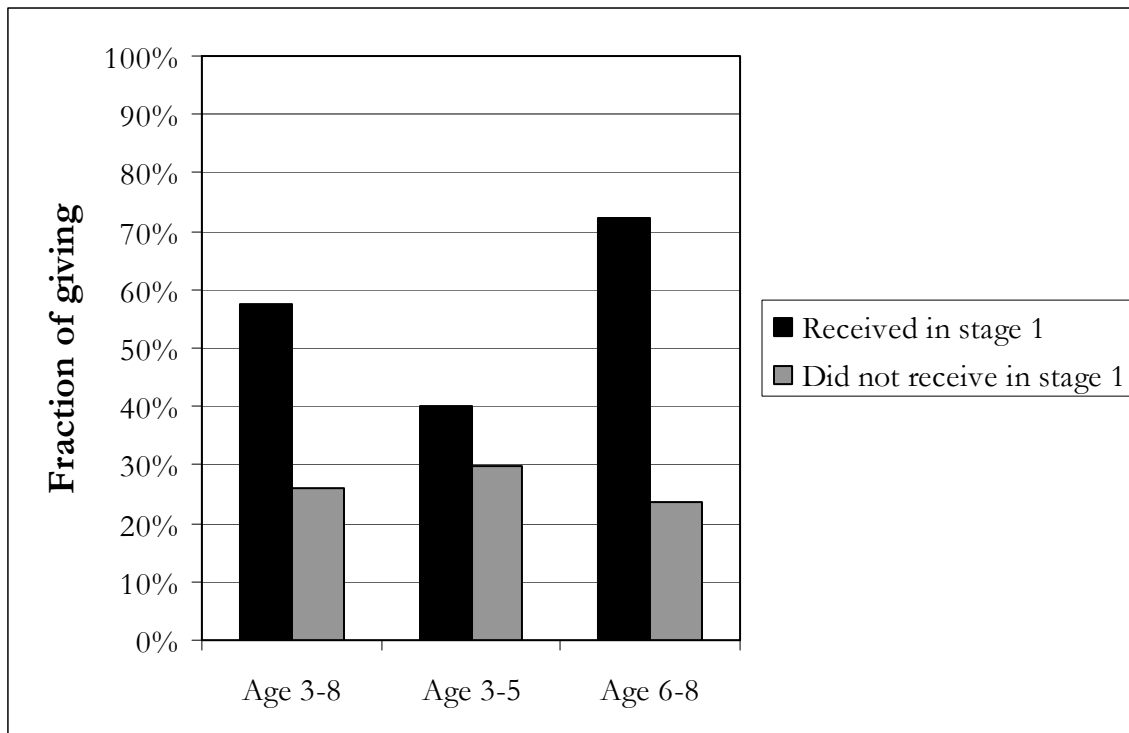


Figure 8. Fraction of giving in game 3 as a function of receiving in stage 1.