Reciprocity in Three- to Eight-Year-Old Children

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Abstract

Reciprocity means that in response to friendly actions, people are frequently much nicer and much more cooperative than predicted by the self-interest model; conversely, the response to hostile actions are frequently much more nasty and even brutal. In this thesis it is tested if reciprocity exists already in children 3- to 8-years-old, and if reciprocity changes between an younger (3- to 5-year-old) and an older (6- to 8-year-old) age group. Three different allocation games are conducted with 242 children from playschools and schools. The children divide raisins between themselves and an anonymous game-partner. In a first stage half of the children play the role of a dictator. In a second stage the roles are reversed to test for reciprocal behavior. For the entire age group tendencies of reciprocal behavior is found in all three games with significant results in two of the three games. Within the older age group, reciprocial behavior is significant in all three games. Within the younger age group, the reciprocial behavior is significant in one game. Reciprocity increases significantly with age, between the two age groups, in two of the three games. It is concluded that reciprocity exists already in children of 3 to 8 years of age, and that this behavior increases between the younger and the older age group.

Keywords: Reciprocity, children, development, allocation games

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1. Introduction

In standard economic theory humans are assumed to be solely self-interested, so called Homo economicus. Even though this can be true for some people and for some conditions, there are many situations where people deviate from self-interested behaviors. One example is where the tourist tips the waitress even though they have never met before and will probably never meet again. This is an example where complete contracts between two interacting individuals are not available, and the actions are explained by behavioral mechanisms, and can not be explained by the standard economic theory. A specific and important deviation from the self-interested behavior is reciprocity. According to Nielson and Stowe (2004) reciprocity suggests that individuals respond kindly to kind actions (positive reciprocity) and respond unkindly to unkind actions (negative reciprocity). For the waitress this means that smiling towards the tourist will generate a larger tip, which actually is supported by psychological studies (Tidd and Lochard 1978). Without the social norm of reciprocal behavior, most unenforceable contracts will not take place (Zak and Knack 2001).

Reciprocity is a widely developed phenomenon in many cultures. Alvin Gouldned (1960), together with other sociologists, claims that all human cultures are surrendered this rule. Further, the archeologist Richard Leakey says that in the reciprocial behavior, the very essence of what makes us humans is found. He argues that it was the reciprocity that enabled us to engage in networks of commitment (Cialdini 2005).

Reciprocity is used in a wide variety of economic situations. One situation is where a supermarket offers its customers to taste samples of meals, to make them buy more of the products. Another example is where a businessman pays the lunch of his prospective client, to enforce a potential deal. A third specific situation that occurred in 1985 was when Ethiopia financed a 5000 dollar aide to Mexico after the earthquake in Mexico City, even though Ethiopia at that time was the worlds most poor and suffering country. The reason for this funding traces back to Mexico helping Ethiopia before, in 1935 after the Italian invasion (Cialdini 2005).

Economists have in recent years become interested in reciprocity. Fehr and Gächter (2000) show that reciprocial behavior found in adults have powerful implications for many economic domains. Further they find that reciprocity is an important determinant in the enforcement of contracts and social norms and enhances the possibilities of collective action greatly. Reciprocial behavior seems to be formed prior to adulthood, and changes little thereafter (Sutter and Kocher 2005). There is however little knowledge of the development of reciprocity before adulthood (Harbaugh 2002a, Sutter and Kocher 2005).

Economists have started to find interest in children as economic agents, with preferences that may differ systematically from those of adults (Levison 2000). Children, just as adults, live in complex economic environments where they make choices, exchange goods, make decisions under uncertainty and share and bargain (Harbaugh et al. 1999). According to Harbaugh et al (2002b) children learn behavioral patterns early, and already at the age of 7 children can engage in complex situations and seem to correctly be able to consider the probability of rejection in bargaining. Studies have shown that behavior learnt in early childhood also seems to affect the behavior later in life (Goleman 1995). This would suggest that studies of the development of reciprocity in early childhood could increase the understanding of this crucial social behavior later in life.

2. Background

There are only a few studies published on the development of reciprocity in children, and these studies show somewhat conflicting results. One explanation can be that the method for testing reciprocity differs among all these studies. One of the first studies to investigate children's reciprocity in an experimental setting was performed by Fishbein and Kaminski (1985). They used a sample of 120 children divided into 3 age groups with an approximate average age of 6.5, 8.5 and 11.5 years. The experimental game they used was Taylor's (1975) social interaction game. This game tested whether the motive behind a helpful act affected the reciprocial behavior. 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, alone in a room, with the exception of an experimental leader. In the game the participants encountered situations where they could either help or punish the other player. The confederate was pre-instructed to always help the other child. The game tested if the experimental participants would value help differently if it was made on a *voluntary* decision or if the help was a *compulsory* choice. In half of the games the confederate "voluntarily" helped, while in the other half, the game leader whispered compulsory instructions to the confederate about how to play (always in a helping manner). The whispering was designed to make the experimental participant think that the experimental leader instructed the help. Reciprocity was measured by dividing the number of times the experimental participant helped the confederate by the total number of opportunities to help. The experimental participants were interviewed after the game to ensure that they had understood how the help was given, if it was voluntary or compulsory. The results from this study were ambiguous. On the one hand the results showed that the context in which help was received significantly affected the extent of children's reciprocity in all age groups. The children returned help more often when it looked like the confederate voluntarily had helped. No age effect was discovered. However, on the other hand, the follow up interviews revealed that the children were unable to differentiate between the two ways of helping. As many as 80 percent of the 6.5 year olds actually thought that the help was voluntary, when it was compulsory. Hence, it is difficult to draw any conclusions from this study.

This critique implies that intention-based models may not be suitable examining reciprocial behavior in children. Another fact that might affect the result of the study is that the game did not use salient payoffs. The authors did not highlight these issues but suggested further research of reciprocity in both children younger than 6, and older than 12 years, to investigate if an age effect could be discovered.

A study that dealt with some of these issues was conducted by Harbaugh et al (2002a). They used another method, a broader age span and had salient rewards. This study investigated whether reciprocity developed with age. It was conducted with 153 pupils in four different age groups; 8-, 11-, 14 -and 17-year-olds respectively. The children played a modified version of Berg et al.'s (1995) one-shot trust game, which measures trust and reciprocity. In the game it was measured if a trusting behavior, giving, affected reciprocial behavior, giving back. The children were paired with 4 different anonymous players, one from each age group. The players were assigned the role of truster or trustee. The games were played in two stages. In the first stage the truster received 4 tokens (X=4), and decided how much to give to the trustee (x=0, 1, 2, 3 or 4). In the second stage the trustee received triple the amount of tokens given by the truster (3x), and then the trustee decided how much to return (y). In this stage a so-called strategy method was used, to elicit the trustee's actual strategy. That is, rather than asking the trustee to respond to the amount actually passed by the truster, the amount passed was not revealed. Instead the trustee was asked to decide how much she would pass if the initial transfer was respectively 0, 1, 2, 3, and 4. The trustee was later paid in accordance with the actual amount transferred by the truster from the same age group in stage one. The earned tokens could be traded for toys in an experimental gift shop the day after the games were played. Reciprocity was measured by comparing the average return, y, in the different ages, given the amount sent, x. The results from this study showed little variation in reciprocity in 8 to 17 years old.

These results are in line with the study by Fishbein and Kamainsky (1985). Although Harbough (2002a) used a game that is well established in testing reciprocity (Song 2004), the study design can be criticized. The strategic method could have been confusing for the trustees since they had to answer many different questions. Further, even though the payoffs were salient and paid according to the answers, they were paid the day after the tests, which

may also have influenced the answers. The authors recognized some of these issues and suggested that if reciprocial behavior is developed with age, it is likely to occur when the children are younger than the subjects in this study.

Sutter and Kocher (2005) conducted the most recent study on the development of reciprocity with age. It improved some of the issues from Harbaugh et al, (2002a); removing the strategic method, making the game clearer and giving payoffs directly. In the study 662 subjects participated in six different age groups 8-, 12- and 16-year-olds, subjects in their early 20s, mid 30s and late 60s. In their study the participants played the trust game, inspired by the study by Harbaugh et al. (2002a). However, some modifications were made. The children were paired up with only one other anonymous child, from a different class, but from the same age group. The truster was given 10 units of money as initial amount (X=10). The truster decided how much money to give to the trustee (x=0 to 10). The amount was tripled and given to the trustee (3x). The trustee then only responded to the actual amount given by the truster, and decided how much to give back (y). Reciprocity was defined as the return y, in relation to the received amount 3x. The higher y for any given x, the higher the degree of reciprocity. The experiment was run as a paper and pencil experiment, where the participant had to write down their decisions on a decision form. The children were paid right after the game. The results from this study indicated that reciprocity exists already at the age of 8. The degree of reciprocity also increased with age, from 8- until early 20-year-olds.

One unique feature with this study was that it examined an interactive decision-making task with real, monetary incentives rather than asking strategic questions. Another unique feature was that the experiments were made with participants ranging from childhood to retirement. There is however still a gap in the research of the development of reciprocity in younger children, than the experimental participants in the studies mentioned above.

Regarding Berg et al's (1995) one-shot trust game, it has received some critique for not distinguishing between reciprocity and altruism. Altruism is defined by Fehr and Gächter (2000) as "a form of *unconditional* kindness; that is, altruism given does not emerge as a response to altruism received". Cox (2001) criticizes the trust game by writing that "the problem with these single-game experimental designs used to generate the data in these

experiments do *not* discriminate between actions motivated by reciprocity and actions motivated by altruism". The trustee may give a part of the profit to the truster because of altruism rather than reciprocity. This critique shows that both the study made by Harbaugh et al. (2002a) and Sutter and Kocher (2005) might have some difficulties distinguishing the actual reciprocity in the data.

No experimental study with salient payoffs testing reciprocity in children under the age of 8 exists. However, there has been a study conducted using salient payoffs testing the development of prosocial behavior in children in the ages 3 to 8 (Bernhard 2006). In this study prosocial behavior is defined as sharing, helping and trusting. A set of 3 different allocation games was used testing 229 children. The constructions of the games were very simple. All children were assigned a role as a dictator, and were paired with an anonymous passive child in the same age from either the same group or from a different school. The dictator's task was to allocate candy between themselves and the anonymous child. Two choices were presented in each game. In the first game the dictator could choose between receiving 1 and giving 1 bag of candy (1,1) or receiving 1 and giving 0 bags of candy (1,0). In game two the choices were (1,2) against (1,0). In the last game the dictator decided between (1,2) and (1,1). The candy was presented in front of the dictator before the decision was made, and the dictator was paid according to the choice made, right after each game. The results from this study show that prosocial behavior increases with age within this age group. There were also tendencies towards stronger prosocial behavior favoring children from an in-group environment compared to out-group children from another school. The Bernhard study showed that behavioral development can be examined with children under the age of 8 using salient payoffs, if the design of the experimental games is simple enough for the children to understand. Salient payoffs are to be preferred, since people behave differently in hypothetical situations (Fehr and Tyran 2001).

The purpose of the present study is to fill the gap in the research of reciprocial behavior in children. More specifically two questions are examined;
- Does reciprocity prevail in small children aged 3 to 8 years old, and if so
- How does reciprocial behavior change between younger (3- to 5-year-old) and older (6- to 8-year-old) children?

3. Method

The method applied in this theses, was inspired by the Bernhard (2006) study. Experimental allocation games were used to present real situations that were simple enough for the children to understand. However, the games in the Bernhard study were designed as one-stage allocation games. To test reciprocity, the games needed to be modified to two-stage games, with the possibility of reciprocating in the second stage.

3.1 Study Participants

Young children in the ages of 3- to 8-years-old were recruited from playschools and schools, to participate in scientific games. All the enrolled children lived in Västerås, a middle sized town in Sweden (SCB 2006). Västerås also reflected Sweden well in an ethnical composition (Forslund 2007). Ten institutions were contacted. They were located in both the central- and the outer parts of town. Both privately and publicly financed institutions were chosen. This created a mixture of participants that reflected the children of the city.

The principals of these institutions were contacted, and all of them agreed to let the children participate in the study. The regulations at the playschools and schools were followed when contacting the children's guardians for permission to participate in the study. Of all the children approached 5 percent were not given consent by their parents to participate. Thus, a 95 percent participation ratio was attained, and 264 children participated. However, out of the 264 children, 22 (8.3 percent) did not pass all the criteria for participating (see further below). The remaining 242 children constitute the sample of the study.

3.2 Design of the Games

A set of three allocation games that tested different reprocial situations were used. The games were played in two stages, a Giving Stage and a Reciprocating Stage. Half of the children in each group were randomly assigned a role as a Giver and participated only in the Giving Stage. The other half of the children were assigned the role as a Reciprocator and participated only in the Reciprocating Stage. **Table 1** shows the number of participating children divided into different age groups and game roles. Age was defined according to birth year [3].

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

Stage / Age	3 years	4 years	5 years	6 years	7 years	8 years	Total
Givers	9	18	22	24	27	21	121
Reciprocators	17	21	14	25	30	14	121
Total	26	39	36	49	57	35	242

The children's role in each game was to decide how raisin-bags were to be divided between themselves and an anonymous child from the same group. All children were randomly linked with three other children from the opposite stage, one for each game. First the Giver played the three games, starting with Game 1 and finishing with Game 3. The Giver decided to give or not to give, and hence played a so-called dictator role. Then the Reciprocator played the three games in the same order, with the three previously randomly linked Givers. Initially the Reciprocator was told what the Giver had chosen, and if the Giver had given any raisin bags, the Reciprocator received them before he or she made the choice. Finally the Reciprocator decided to give or not to give. The different allocation combinations are presented in **Table 2, Table 3** and **Table 4.**

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

Table 2. Allocation combinations in Game 1

Giving Stage

Giver	receives / gives
Choice 1	1, 1
Choice 2	1, 0

Reciprocating Stage

Reciprocator	receives / gives (back)
Choice 1	1, 1
Choice 2	1, 0

Table 3. Allocation combinations in Game 2

Giving Stage

Giver	receives / gives
Choice 1	0, 1
Choice 2	0, 0

Reciprocating Stage

Reciprocator	receives / gives (back)
Choice 1	0, 1
Choice 2	0, 0

Table 4. Allocation combinations in Game 3

Giving Stage

Giver	receives / gives
Choice 1	1, 1
Choice 2	2, 0

Reciprocating Stage

Reciprocator	receives / gives (back)
Choice 1	1, 1
Choice 2	2, 0

All the games had a similar design, as show in **Tables 2 - 4**. The Giver could always decide to give or not to give *one* bag of raisins to the Reciprocator. The Reciprocator had the same distributional choice, to give or not to give, *one* bag of raisins to the Giver. When a player made a choice in Game 1, he or she always received one bag of raisins from that choice (1,1 or 1,0)[4]. In Game 2, when a player made a choice, he or she could not receive any raisins (0,1 or 0,0)[5] from that choice. In Game 3 the player could choose between receiving one or two bags pf raisin (1,1 or 2,0)[6]. In this last game the player needed to give up one bag of raisins in order to share. An important feature of the three games was that the Reciprocators were given a raisin bag (or none, if the Giver did not give any bag) from the anonymous Giver via the game leader *before* they were presented with the same choice.

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[4] (1,1 or 1,0) means that the child making the decision can choose between either; receiving one bag of raisin and giving one bag to the other child, or receiving one bag of raisin and giving zero bags to the other child.

[5] (0,1 or 0,0) means that the child making the decision can choose between either; receiving zero bags of raisin and giving one bag to the other child, or receiving zero bags of raisin and giving zero bags to the other child.

[6] (1,1 or 2,0) means that the child making the decision can choose between either; receiving one bag of raisin and giving one bag to the other child, or receiving two bags of raisin and giving zero bags to the other child.

3.3 Procedure[7]

When creating 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 towards 3 plastic bags, representing the 3 opposing children, see **Picture 1**. The different allocation possibilities were presented by placing small zip-lock plastic bags, filled with 15 raisins each, in the different circles.

Picture 1. Game 2 (choice 2,0)
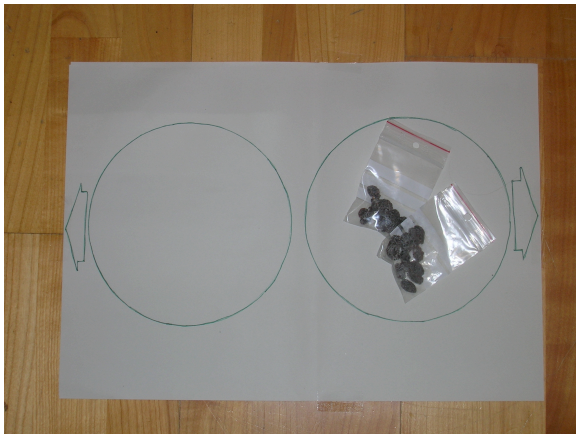
The games were conducted in October 2006. All games were played between 9 and 11 am. Initially, introduction was made to the whole group and each child was given one card from a pair of memory-game cards. The order and the stage in which the children played the games were decided by randomly drawing a card. The first half of the children drawn played the Giving Stage and the second half the Reciprocating 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. Furthermore, after each game played, the children were also asked the reason for choosing the allocation. In order for the player to qualify into the experimental sample the child had to pass all the control

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[7] See Appendix 1 for a complete description of the entire game session.

questions and he or she also had to like raisins. 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 equal amount of Givers and Receivers in every group/class. This lead to that some results did not count since the number of children was uneven in the class. In uneven classes, all the children played the games, but 7 children, who played the first stage, were randomly excluded since they could not be matched up in even pairs. After each game-session the children took their plastic bag and hid it on their personal shelf. The raisin bags from the Reciprocators were distributed on the Givers shelves when all children in the group had played.

3.4 Statistical Methods

Before looking at reciprocity, and hence the second stage of the games, the Giving Stage needs to be analyzed. The Givers degree of giving, between the younger and the older group, was tested using the Pearson Chi-square test (D'Agostino et al 1988).

The first research question was to test if reciprocity prevails in children in the ages 3 to 8. To test this, only the Reciprocators choices, were analyzed. The Reciprocators were divided into two groups: those who were given raisins from the Givers and those who were not. Then the difference in proportion of giving from the Reciprocators to the Givers was tested between these two groups. The intuition behind this is that the Reciprocators that gave even though they had received 0 from the Giver, acted in an altruistic manner. If the Reciprocators that received 1 gave to a larger extent than those who received 0, this higher rate of giving represented reciprocity. To test for differences in the degree of giving, the Pearson Chi-square test (D'Agostino et al 1988) was used.

The second research question was to test how reciprocial behavior changed between younger (3- to 5-years-old) and older (6- to 8-years-old) children. To test this, the sample from the Reciprocating Stage was first divided into two different groups, one with the younger children and one with the older children. Then the age groups were each divided into two separate groups: those who were given raisins from the Givers and those who were not. To test for differences in the degree of giving *within* the younger and older age group, the Pearson Chi-square test (D'Agostino et al 1988) was used.

To fully understand if there was a difference in reciprocity *between* the two age groups, a logistic regression analysis was fitted, with the decision of the reciprocator to give (1) or not to give (0) as the dependent variable, see **Equation 1**.

Equation 1. Logistic regression equation.

$$P = \frac{1}{1 + e^{-x}} \qquad \text{where}$$

$$X = \alpha + \beta_1 \operatorname{Re}ciprocity + \beta_2 Age\_6 - 8 + \beta_3 \operatorname{Re}ciprocity * Age\_6 - 8 + \beta_4 Gender + \varepsilon$$

In the regression equation above P is the probability to give and the constant (α) and β_1-β_4 are coefficients to be estimated (and ε is an error term). Four different explanatory variables are included. The first variable, reciprocity, takes into account the choice made by the Giver, i.e. if the Reciprocator received 1 or 0. The second variable is a dummy variable on the older age group. This variable tests if there is a difference in the degree of giving, between the younger and the older age group. The third variable is an interaction coefficient that is created between the reciprocity variable and the age variable. This is the central variable in the regression analysis. The interaction variable measures if the level of reciprocity is different between the two age groups. A positive interaction variable would indicate that reciprocity is larger in the older age group compared to the younger and thus changes with age. In the regression analysis the gender of the child is controlled and this is the forth variable (coded as 0 for girls and 1 for boys). All reported p-values are two sided. As the logistic regression equation is non-linear, it was estimated with the maximum likelihood method (Green 1997). The Chi-square results were also included in the results. These showed the significance of the regression.

4. Results

## 4.1 Giving Stage

Game 1 (1,1 or 1,0)

In the first stage of Game 1, the Givers degree of giving (1,1) in the entire age group was 74 percent. When the outcome was divided into 2 age groups, the result was 71 percent for the younger age group and 75 percent for the older age group, see **Figure 1**. The difference in the degree of giving between the age groups was not significant (p=0.235), see **Table 5**.
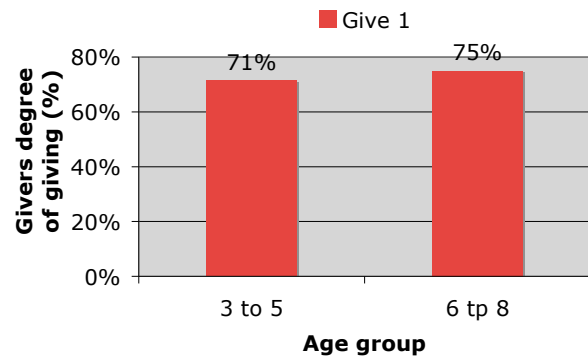
Figure 1. *Givers degree of giving in Game 1*

Game 2 (0,1 or 0,0)

In the first stage of Game 2, the Givers gave at a ratio of 55 percent (0,1), in the entire age group. When this result was divided into two age groups, the degree of giving was 61 percent for the younger age group, and 50 percent for the older age group, see **Figure 2**. The difference in the degree of giving was not significant (p=0.224), see **Table 5**.
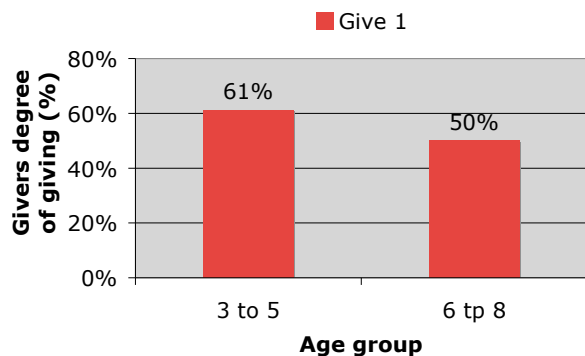
Figure 2. *Givers degree of giving in Game 2*

Game 3 (1,1 or 2,0)

In the first stage of Game 3, the degree of giving (1,1) was 26 percent in the whole group. Dividing the result into two age groups show a degree of giving of 27 percent in the younger group and of 26 percent of the older group, see **Figure 3**. The difference in the degree of giving was not significant (p=0.986), see **Table 5**.
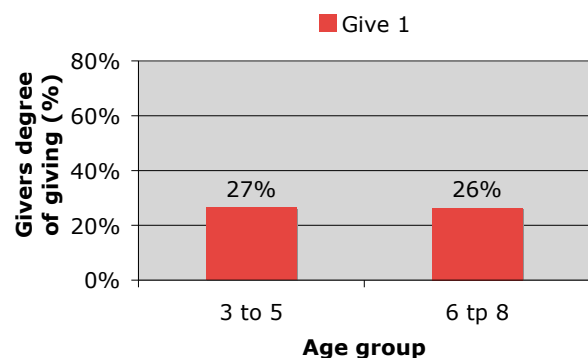
Figure 3. *Givers degree of giving in Game 3*

Table 5. Significance of Giving Stage

Age group 3-8 year old	Pearson Chi-square	p-value
Game 1	1.408	0.235
Game 2	1.481	0.224
Game 3	0.000	0.986

4.2 Reciprocity Stage – Entire Age Group

Game 1 (1,1 or 1,0)

In the second stage of Game 1, the Reciprocators gave a bag of raisins (1,1) to their Giver in 71 percent of the cases when they had received 1 bag of raisin from a Giver. The Reciprocators that received 0 raisin bags from their Giver, gave in 57 percent of the cases, see **Figure 4**. The reciprocity was not significant (p=0.144), see **Table 6**.
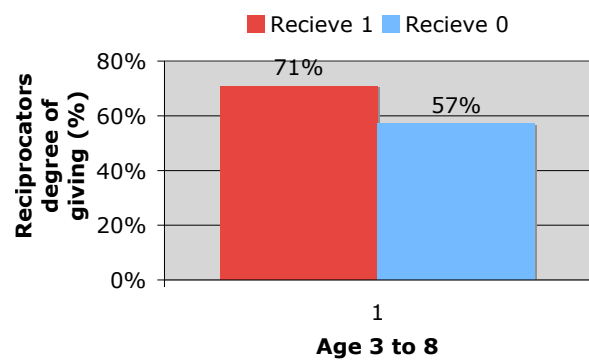
Figure 4. Reciprocators degree of giving in Game 1.

Game 2 (0,1 or 0,0)

In the Reciprocating stage of Game 2, the results from the entire age group showed that the Reciprocators gave a bag of raisins (0,1) to their Giver in 64 percent of the cases, when the Giver had previously given 1 bag of raisin. In the other case, when the Givers had not given raisin, the Reciprocators gave in 35 percent of the cases, see **Figure 5**. The reciprocity was significant (p=0.002), see **Table 6**.
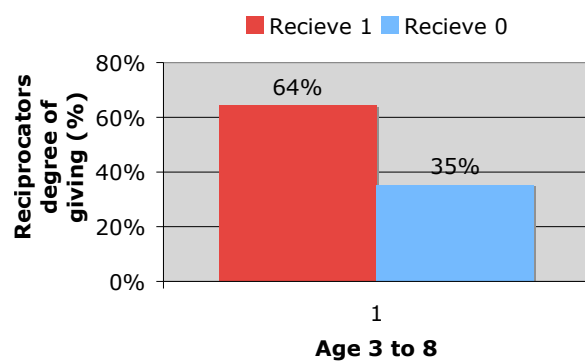
Figure 5. Reciprocators degree of giving in Game 2.

Game 3 (1,1 or 2,0)

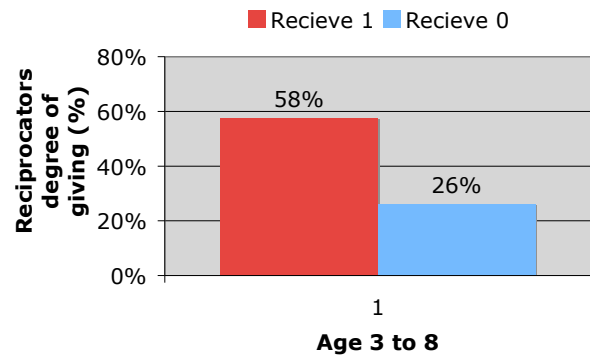In the Reciprocating stage for the entire age group of Game 3, the Reciprocators gave (1,1) in 58 percent of the cases when they had received 1 bag of raisins. In the other case, when the Reciprocators had received 0 raisin bags, they gave in 26 percent of the cases. See **Figure 6**. This result was significant (p=0.001), see **Table 6**.

Figure 6, *Reciprocators degree of giving in Game 3*

Table 6, Significance, Reciprocating Stage

Age group 3-8 year old	Pearson Chi-square	p-value
Game 1	2.137	0.144
Game 2	9.936	0.002***
Game 3	10.468	0.001***

*** significant at the 1 percent level

4.3 Reciprocity Stage – Two Age Groups

Game 1 (1,1 or 1,0)

The results from the Reciprocating Stage, when divided into two age groups, were as follows; in the younger age group the Reciprocators gave (1,1) at a 55 percent rate when they had received 1, and gave at a 79 percent rate when they had received 0, see **Figure 7**. This result was significant (p=0.078), see **Table 7**. In the older age group the Reciprocators gave at an 81 percent rate when they had received 1, and
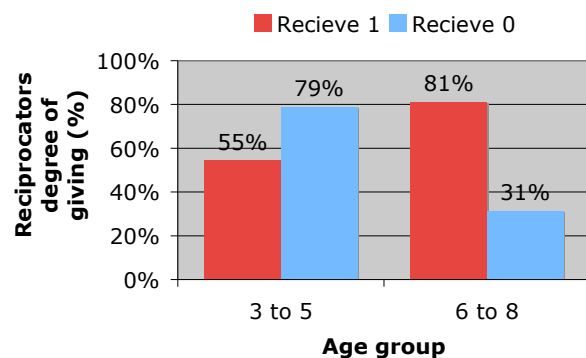
Figure 7, *Reciprocators degree of giving divided into two age groups in Game 1*

at a 31 percent rate when they had received 0. This result was significant (p<0.001).

Game 2 (0,1 or 0,0)

In Game 2, the division into two age groups showed that, in the younger age group the Reciprocators gave (0,1) at a 60 percent rate when they had received 1, and at a 33 percent rate then they had received 0, see **Figure 8**. This result was significant (p=0.088), see **Table 7**. In the older age group the Reciprocators gave at a 70 percent level when they had received 1 and at a 36 percent level when they had received 0. This result was significant (p=0.005).
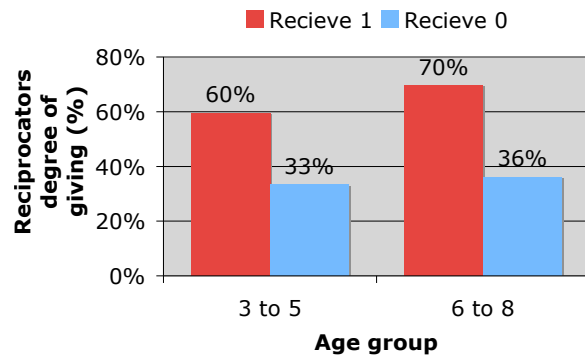
***Figure 8**, Reciprocators degree of giving divided into two age groups in Game 2*

Game 3 (1,1 or 2,0)

In Game 3, the division of the Reciprocators into two age groups gave the results that; in the younger age group the Reciprocators gave (1,1) at a 40 percent rate when they had received 1, and at a 30 percent rate when they had received 0, see **Figure 9**. This difference in giving was not significant (p=0.474), see **Table 7**. In the older age group the Reciprocators gave at a 72 percent level when they had received 1, and at a 23 percent level when they had received 0. The difference in giving, measuring reciprocity, was significant (p<0.001).
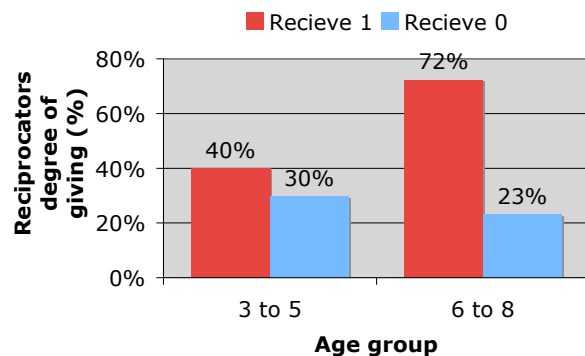
***Figure 9**, Reciprocators degree of giving divided into two age groups in Game 3*

Table 7. Significance, Stage 2 of Games 1, 2 and 3, divided by two age groups

	Age group	Pearson Chi-square	p-value
Game 1	3 to 5	3.096	0.078*
	6 to 8	14.444	<0.001***
Game 2	3 to 5	2.918	0.088*
	6 to 8	7.783	0.005***
Game 3	3 to 5	0.512	0.474
	6 to 8	13.653	<0.001***

* significant at the 10 percent level, *** significant at the 1 percent level

4.4 Logistic Regression of Reciprocal Change

Game 1 (1,1 or 1,0)

The logistic regression of Game 1 showed that the interaction variable between age and reciprocity was positive and significant ($p<0.001$), hence the older children reciprocate to a larger extent. See **Table 8**.

Table 8. Logistic regression Game 1

	Regression Coefficient (β)	Standard Error (SE)	t-value (β/SE)	p-value
Constant	1.637	0.611	2.679	0.007***
Reciprocity	-1.123	0.670	-1.676	0.093*
Age 6-8	-2.235	0.795	-2.811	0.005***
Reciprocity * Age 6-8	3.545	0.946	3.747	<0.001***
Gender	-0.674	0.433	-1.557	0.120
Number of observations	121			
Chi-square	19.801			0.001***
Log-likelihood	-66.885			

* significant at the 10 percent level, *** significant at the 1 percent level

Game 2 (0,1 or 0,0)

The results from Game 2 showed that the interaction variable was positive, but the effect was not significant between the two age groups ($p=0.781$). See **Table 9**.

Table 9. Logistic regression Game 2

	Regression Coefficient (β)	Standard Error (SE)	t-value (β/SE)	p-value
Constant	-0.876	0.611	-1.434	0.152
Reciprocity	1.158	0.655	1.768	0.077*
Age 6-8	0.190	0.657	0.289	0.772
Reciprocity * Age 6-8	0.233	0.835	0.279	0.781
Gender	0.270	0.391	0.691	0.490
Number of observations	121			
Chi-square	11.380			0.023**
Log-likelihood	-78.078			

* significant at the 10 percent level, ** significant at the 5 percent level

Game 3 (1,1 or 2,0)

The results from Game 3 showed that the interaction variable had a positive and significant effect (p=0.081), see **Table 10.** Hence, as in Game 1, the older children reciprocated to a larger extent.

Table 10. Logistic regression Game 3

	Regression Coefficient (β)	Standard Error (SE)	t-value (β/SE)	p-value
Constant	-0.679	0.391	-0.737	0.083*
Reciprocity	0.554	0.649	0.854	0.394
Age 6-8	-0.291	0.491	-0.593	0.553
Reciprocity * Age 6-8	1.568	0.899	1.744	0.081*
Gender	-0.476	0.419	-1.136	0.256
Number of observations	121			
Chi-square	15.408			0.004***
Log-likelihood	-70.419			

* significant at the 10 percent level, *** significant at the 1 percent level

The Chi-square tests were significant in all three games. Gender had no significant effect in any of the games.

5. Discussion

The first question in this study was to investigate whether reciprocity prevailed in the ages 3 to 8. For the entire age group, the Chi-square tests showed that, reciprocal behavior was found in all three games, and the results were significant in two of the three games. The second question was to examine if reciprocial behavior changed between the younger and older age group. The Chi-square tests showed that within the older age group, the reciprocial behavior was significant in all three games, while within the younger age group, the reciprocial behavior was significant in one of the games. The logistic regression analysis showed an increase in reciprocial behavior from the younger to the older age groups in all three games. These results were significant in two of the three games.

The main strengths in the present study derive from using a new type of allocation games to detect reciprocity in the young age groups of children tested. In previous economic studies (Harbaugh et al. 2002a and Sutter and Kocher 2005), the games that have been used to study reciprocity in children derive from Berg et al. (1995). In these games, the players have to be able to both count money and calculate returns. These games were not suitable for the purpose of this study since the children were as young as 3 years old, and not able to perform these tasks. Therefore a new and simpler set of experimental games was constructed to measure reciprocity in these young children. The design of the experiments was based on the three simple allocation games that were performed in Bernhard's study (2006), since they were feasible on children in the ages studied. However one of the games was changed. Instead of using the game (1,1 or 1,2), it was decided to use (0,0 or 0,1). The difference is that instead of receiving one, as in the Bernhard study, the child cannot receive anything. The major reason for doing this was because Bernhard in her study pointed out that the youngest children only focused on their own payoff, and had problems focusing on the other child's payoff. By letting the own payoff be 0 instead of 1, it was possible to get the youngest children to look beyond their own bags of raisins.

The data from the Giving Stage of Game 1 and Game 3 can be compared to two of the allocation games played in the Bernhard (2006) study, since they are alike. The results in the present study were similar to the results reported by Bernhard, see **Table 11**. Game 1 had

similar results in both studies with a rather high rate of giving. In Game 3 the present study had more constant results, while an increasing trend of giving with age, was found in Bernard's study. One explanation of the difference in these results can be that the currency used is different. Bernhard used candy as payoff. Perhaps the candy did not have the same salience in all age groups, since it is possible to see that the youngest children gave very seldom, whilst the oldest children gave almost half of the times. Another possible explanation could be cultural differences between Sweden and Switzerland (where the Bernhard study was conducted). It is worth noticing that the studies have a similar rate of giving when sharing is relatively cheap in Game 1, but differs when sharing becomes more expensive in Game 3. However the rate of giving was lower in Game 3 in both studies compared to in Game 1.

Table 11. Rate of giving in Giving Stage. Comparison with the Bernhard study.

	Present study		Bernhard study		
Game / Age	3 − 5	6 − 8	3 − 4	5 − 6	7 − 8
Game 1	71%	75%	65.2%	61.1%	76.8%
Game 3	26%	27%	8.7%	22.2%	44.6%

There were specific reasons for creating three games. At first it was desired to attain an even distribution between giving and not giving in the first stage to maximize the statistical power. By using 3 different games the chances of finding sufficient giving to allow measurements of reciprocity increased. It was not certain before the experiments were conducted, which game that would generate the most even distribution, even thought the results from Bernhard's (2006) study could give some indications. From this point of view, Game 2 was the best game since it had the most even distribution. However, when analyzing the data, it became clear that all the games showed significant results. This implied that all three gamed gave valid and useful information. Furthermore using three games also increased the total amount of data and information from the study.

The new games were designed for children and emphasized the understanding of the games. Almost all children understood the games, and answered the control questions correctly. There were only 7 children (2.6 percent) that did not pass all the control questions, and these

children were excluded from the study. All of these excluded children were turning 3, or had recently turned 3. We did however play all three games with them, so they would not feel left out. Two age exceptions were made for children under three years old to participate, since they fulfilled the other prerequisites. With such a low exclusion ratio as 2.6 percent, it can be concluded that the games fitted the studied age group very well. Since all the excluded children were 3 years old or about to turn 3 three, one can argue that the games would not have been suitable for children under the age of 3. The age exceptions that were made were all children that were considered very well developed by their playschool teachers.

A unique feature of the allocation games was that they differentiated between altruism and reciprocity. In the trust game by Berg et al. (1995) it is not possible to do that. The trust game measures reciprocity as the difference between the amount giving back and the amount received. There is no way of knowing how much of the giving is determined by reciprocity and how much that comes from pure altruism. In the present study, reciprocity is measured as the difference between how much given when having received nothing compared to how much given when having received one. This way the altruistic effect is eliminated.

In economic experimental games, monetary payoffs are often used as incentive. When studying small children, money is not a suitable currency since small children do not fully understand the value of money, and they also find it difficult to count (Bernhard 2006). Therefore a currency that both the younger and the older children in the age group would appreciate was selected. Candy could have been the choice, but with the ongoing health debate in Sweden, raisins were chosen instead. One of the first principals contacted, explained that many schools and playschools have a policy, not to allow candy at all. To make the study as accurate as possible, all the children that did not like raisins, a total of 8 of the participating children (3.3 percent) were excluded. Hence, the majority of the children liked raisins. This implies that the raisin bags were a rather successful currency. A question that arises with this currency is weather raisins is something that the younger children appreciates more than the older ones. This, however, did not seem to be the case, since the giving in stage one did not significantly differ between the age groups. The importance of an appropriate currency became clear when some of the teachers played the games out of curiosity. When they played with raisins, they were all very generous and could not understand why the

children did not give in every situation. Later, when they were asked how they would have acted if there was money at stake, they changed their choices and said that they would not have given in all situations.

Reciprocial patterns were found in all three games, but they were displayed in different ways. The fact that all three games showed significant findings implies that all of them were suitable for researching reciprocity. To understand the results better it is important to view the games as complementary, and to understand how the different allocations change the way reciprocity is functioning.

Game 1 (1,1 or 1,0) was the game where the Reciprocators had the highest degree of giving. This indicates that giving in this game can be viewed to be the least expensive of all three games, when the Reciprocator received one bag of raisins when making either choice. Within the older age group reciprocity was found, and the results were highly significant. Within the younger age group reciprocity was not found. Instead it showed a negative sign at a significant level. This is a very surprising result. This is the only game where the Reciprocators gave at a higher ratio when they had received none from the Giver compared to when they had received one. An explanation of this behavior is difficult. One reason can perhaps be found in the study by Bernhard (2006), where the younger children seemed to be very focused on their own payoff and not so focused on their game partner payoffs. In the present study this tendency can also be found. In the short interviews that were made with the younger Reciprocators in Game 1, only 4 out of 12 (33 percent) Reciprocators mentioned the Giver as a reason for giving or not giving (see **Appendix 2** for the interview answers). If the younger Reciprocators, when playing this game, did not pay much attention to their Giver, they might more randomly chose between the two allocations.[8] In the older age group the same figures were 27 out of 39 (69 percent). The older children seemed take the Giver into account to a higher degree. Because of the different behaviors in the two groups, reciprocity was not detected at a significant level in the whole age group. The logistic regression supported these findings and showed a significant increase of reciprocial behavior between

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[8] Some younger children were more interested in figuring out in what bag there were more raisins (which of course were the same number in each bag– 15), than focusing on the game partners payoff.

the younger and the older age group. Overall, the results from Game 1 need to be viewed together with the other games to get a fuller understanding of reciprocial behavior.

Game 2 (0,1 or 0,0) was designed to deal with the issue of the younger children being very focused on their own payoff. Therefore this game had no own payoff in either choice, trying to make the player to look at the giving decision. In this game the Reciprocators gave to a lower extent compared to Game 1. It is viewed to be more expensive to give, since the Reciprocator did not receive raisins in any of its giving choices. Reciprocity was found and the result was highly significant in the entire age group. Analyzing the younger and older age group separately, reciprocity was found and the results were significant in both groups. The difference in the ratio of giving did not change much between the age groups, which was confirmed in the regression analysis that found no significant increase of reciprocity with age. This was the only game where reciprocity was significantly detected in both age groups and where this behavior did not seem to change with age. It was also the only game that completely focused on the other players' payoff. The result indicates that when removing the own payoff, a reciprocial mechanism seems to be guiding the decision, even for the younger children. The effect of removing the own payoff was also shown in the interviews. In the younger age group 8 out of 19 (42 percent) of the Reciprocators mentioned the Giver as a reason for giving or not giving. In the older age group the figures were 38 out of 52 (73 percent). In both age groups, a larger amount of children, answering the interviews, recognized the Giver when making the choice, compared to Game 1.

Game 3 (1,1 or 2,0) was designed to detect the presence of strong reciprocity. A person is a strong reciprocator if she is willing to sacrifice resources to be kind to those who are being kind (Fehr et al. 2002). This is called strong positive reciprocity. In this game the Reciprocators had the lowest rate of giving of all games. Giving was relatively expensive since the Reciprocator had to give up a bag of raisins in order to give. Game 3 was the only game where the Reciprocator could receive two bags of raisins from its own choice, by not giving anything to the other child. In the whole age group reciprocity was found positive and highly significant. When viewing the younger and older children in separate groups, reciprocity was highly significant in the older age group. The children in the younger age group showed a positive tendency for reciprocity, but not at a significant level. The logistic

regression was in line with these findings and detected an increase in reciprocity between younger and the older age group at a significant level. The younger Reciprocators' egoistic behavior displayed in the interviews from Game 1 was also found in Game 3. Out of 21 respondents, 14 (67 percent) had egoistic reasons for choosing the way they did. Only 5 children (24 percent) said that the Giver affected their decision. This game is also the one that found the highest degree of egoistic answers among the older children, 17 out of 45 (38 percent)[9]. However, as in Game 1, the older children in Game 3 seemed less self-focused than the younger ones, and 20 (44 percent) explained their decision in a response to the Giver. Although there was a large tendency for egoism in both age groups, a strong form of reciprocity was activated. In the older age group this is displayed by the largest difference in the degree of giving compared to the other games. Out of the older Reciprocators that received none, 23 percent still gave a bag of raisins in an altruistic manner. However, the Reciprocators that received one, gave one in 72 percent of the cases, which created a difference in the degree of giving of almost 50 percent. This result is consistent with other studies; for example Pruitt (1968) found greater reciprocation for more self-sacrificing favors than for less self-sacrificing ones.

Overall, reciprocity seems to be an important part of the decisions for the entire age group. These results might be due to the fact that the older children seem to have a more developed sense of reciprocity, with significant findings in all games. In the younger age group egoism might have a stronger effect than reciprocity, which would explain why reciprocity was only significant in Game 2. When testing for strong reciprocity in Game 3, the younger children showed a tendency for reciprocity, which indicates that reciprocity is an important and operating factor in the decision process, even for younger children.

Reciprocity can be expressed in two ways, in a positive way where receiving is rewarded by giving back, and in a negative way where not receiving is punished by not giving back. Theses two different kinds of reciprocity worked differently in the three games. One can analyze which kind of reciprocity that is most active in the different games. **Table 12**

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[9] As an example: There was one girl who, when playeing Game 1 and Game 2, spoke about fairness. When she saw the allocations of Game 3 she started to look very uncomfortable. One could see that she wanted the two raisin bags for herself but that this went against everything she had earlier said. Finally she chose the two bags with the explanation that she was right handed.

compares the Givers degree of giving in the Giving stage with Reciprocators degree of giving in the Reciprocating stage. The notion behind this comparison is that the Givers initial degree of giving creates a reference point for positive and negative reciprocity in the Reciprocating stage. For example in Game 3 the Givers gave at a 26 percent ratio. The Reciprocators that received 0 also gave at a 26 percent ratio, which implies that the altruistic rate of giving is about 26 percent. However, the Reciprocators that received 1 gave at a higher ratio, 58 percent, indicating that something triggered them to repay this kind act, with another kind act. This is positive reciprocity. Negative reciprocity, to repay an unkind act, by another unkind act, is seen in Game 1. Here the Givers give at a 74 percent ratio. If positive reciprocity was detected in this game, the Reciprocators that received 1 would have given at a higher ratio than the Givers, but they do not. Instead the Reciprocators that received 0 gave at a lower ratio, 57 percent, which implies that negative reciprocity is activated. Game 2 shows both positive and negative effects of reciprocity, but with a slightly higher negative effect.

Table 12. Comparison of the degree of giving between the two stages, entire age group.

Stage Game	Giving Stage	Reciprocating Stage	
		Received 1	Received 0
Game 1	74 %	71 %	57 %
Game 2	55 %	64 %	35 %
Game 3	26 %	58 %	26 %

A limitation of the study is the sample size. The sample size was 242 children, but in the context of the games, half the children, 121, could be studied to search for reciprocity, since the children were matched up in pairs. The Reciprocators in the younger age group consisted of 49 children, while the older group consisted of 72. The reason why there are slightly fewer children in the youngest group is because the playschools had much smaller groups than the schools and a much higher absence rate. The results from the older group were clear; reciprocity existed. The younger age group however, did not give as clear results. One consideration could have been the sample size. Consider Game 2 as an example. In this game the level of reciprocity was almost the same in both age groups. In the older age group this result was highly significant, but in the younger age group it was not. A possible reason could be that the sample size in the younger age group being smaller.

An effect of the sample size is the difficulty to draw conclusions based on any single age. The reason for dividing the sample into two groups was to make the groups larger, and hence the data more accurate, than if it would have been 6 different age groups (one for each age). Also, the older age group spend their days at school, while the younger group spend their days at playschool. At most of the playschools, the children aged 3 to 5 were in the same group, and in also in some schools participating the children aged 6 to 8 were in the same school class, a so-called mixed class. This made the division of the children into these two groups even more natural.

The present data shows that it is quite possible to identify and study reciprocity in children down to the age of 3. This study thus opens up the possibility for future investigation. Besides looking at reciprocity and age, it would also be very interesting to see how much other variables affect reciprocity, for example the number of siblings, the parents' degree of reciprocial behavior and if the children is involved in any activity like sports. It would also be interesting to use the new allocation games developed in this thesis to test reciprocial behavior in older children and adults. Other questions that are interesting to address are; when is reciprocity derived? Is it a congenital human behavior from the evolution or is it passed on through cultural codes? Reciprocity and its development is an important field that still has a large number of questions that needs to be explored before a full understanding of the subject can be reached.

Concluding, the present study shows that reciprocial behavior was found in children aged 3 to 8. Furthermore, the degree of reciprocity was higher in the older children (6- to 8-years-old), compared to the younger children (3- to 5-years-old).

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6.1 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 were we had prepared for the game. We asked the child for their name and age.[10] In the game room we asked the child to sit down. In front of the child was two identical large papers, see **Picture 1** (page 14). 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

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[10] We also asked if they could guess how old we are. Some four-year-olds guessed we are five or six years old, while some seven-year-olds could guess fifteen or twenty.

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/ will not get anything in his or her bag. (We put a bag of raisins in the first plastic bag). 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 Reciprocators on Givers' shelf. Then we gathered the group and thanked them for participating.

6.2 Appendix 2. Interview Comments

Game 1 (1,1 or 1,0) Comments from the children

Positive comments about Giver when giving

Comment / Age	3	4	5	6	7	8
Wanted to give to Giver			1		2	1
Giver gave me, I want to give back				3	7	1
I am also kind						1
Then both gets						1
I am kind				1	2	1
Otherwise unfair					1	
Then it's fair		1				
I like to give	1			1		
Sum	**1**	**1**	**1**	**5**	**12**	**5**

Negative comments about Giver when not giving

Comment / Age	3	4	5	6	7	8
Then I get, but not the Giver					1	
Giver didn't give me				1	1	
Then I have revenge						1
I don't like to give back			1			
Don't want to give					1	
Sum	0	0	1	1	3	1

Egoistic comments

Comment / Age	3	4	5	6	7	8
I want to			1	2		
I want that					1	
I like raisin						
I get raisin			1			
Good choice					1	
Because		2				
Best choice		1				
Sum	0	3	2	2	2	0

Other comments

Comment / Age	3	4	5	6	7	8
I choose which ever			1			
I don't know			2	1	4	3
Sum	**0**	**0**	**3**	**1**	**4**	**3**

Game 2 (0,1 or 0,0) Comments from the children.

Positive comments about Giver when giving

Comment / Age	3	4	5	6	7	8
Wanted to give to Giver					2	
Giver gave me, I wan to give back		1		3	4	
I am also kind						1
Then both gets						1
I am kind					2	1
Otherwise unfair					1	
Then it's fair				1	4	
I like to give				1		1
Giving is fun			1	1	1	
Sum	**0**	**1**	**1**	**6**	**14**	**4**

Negative comments about Giver when not giving

Comment / Age	3	4	5	6	7	8
Otherwise unfair					1	1
Giver didn't give me			3		4	
Then I have revenge						5
I don't like giving back	1			1		
No one gets					2	
Don't want to give back		1				
Giver didn't want one	1					
Sum	**2**	**1**	**3**	**1**	**7**	**6**

Egoistic comments

Comment / Age	3	4	5	6	7	8
I want to	1	2		2		
I want that		1				
I like this		1				
Best choice	1			1	1	
One has to		1				
I can show my mother				1		
It's the right choice		1				
Sum	**2**	**6**	**0**	**4**	**1**	**0**

Other comments

Comment / Age	3	4	5	6	7	8
I choose which ever				1	1	
I don't know			3	3		4
Sum	**0**	**0**	**3**	**4**	**1**	**4**

Game 3 (1,1 or 2,0) Comments from the children.

Positive comments about Giver when giving

Comment / Age	3	4	5	6	7	8
Giver gave me, I want to give back					1	
I am kind					2	2
Then we get the same					1	
Then it's fair				1		
I like to give				1		
Want to give to Giver				1	1	
Sum	**0**	**0**	**0**	**3**	**5**	**2**

Negative comments about Giver when not giving

Comment / Age	3	4	5	6	7	8
Giver didn't dive me	1	1		2	5	1
Don't like to give	1	1	1			
Otherwise unfair					1	
Giver didn't want one						1
Sum	**2**	**2**	**1**	**2**	**6**	**2**

Egoistic comments

Comment / Age	3	4	5	6	7	8
I see 2	1			1		1
I want two / many			1	2	6	
I want two, what will mom say?		1				
Will take home		1				
Think it's good					2	
Most fun			1			
I like this choice	1	1				
I want to		2	1	2		
I want some more		2				
I like raisin				1		
Good choice		1				
Because					1	
Best choice			1	1		
Sum	**2**	**8**	**4**	**7**	**9**	**1**

Other comments

Comment / Age	3	4	5	6	7	8
I choose which ever				1	2	
I don't know			2	1	1	3
Sum	**0**	**0**	**2**	**2**	**3**	**3**