



Adolescent trust and trustworthiness: Role of gender and social value orientation



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A B S T R A C T

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Trusting others is an essential feature of adolescent development. The aim of this study was to investigate gender differences in trusting behavior using an experimental game and relate these to the underlying social preferences. 206 adolescents (Mage = 15.1 years, 51% girls) performed a series of one-shot Trust Games to measure their levels of trust and trustworthiness. Social value orientation, or the preference to maximize one's own outcomes (proself) or both the outcomes of self and other (prosocial) was assessed using the Triple Dominance Measure. Boys were more trusting than girls, but no gender differences on trustworthiness were found. Prosocials were more trusting and trustworthy than proselfs. In addition, gender and social value orientation were independent predictors of trust (but not trustworthiness). These findings show that the higher levels of trust in boys are not the result of a gender difference in prosocial orientation.

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Introduction

Even from a very young age, boys and girls show gender differences in their social behavior (e.g. [Lutchmaya, Baron-Cohen, & Raggatt, 2002](#); [Weinberg, Tronick, Cohn, & Olson, 1999](#)). For example, young girls tend to engage in pretend play with peers, while boys are more likely to play physically with other children ([Lindsey & Mize, 2001](#)). When a child reaches adolescence, social behavior becomes more complex and meaningful, but gender differences remain (e.g. [Bussey & Bandura, 1999](#); [Card, Stucky, Sawalani, & Little, 2008](#); [Rose & Rudolph, 2006](#)). In this period the nature of social interaction changes radically due to a range of physical and environmental factors. Adolescent boys and girls have been found to differ in various social characteristics, such as levels of empathy ([Garaigordobil, 2009](#)), preference for support-seeking coping styles ([Piko, 2001](#)), and levels of conflict and power in friendships ([De Goede, Branje, & Meeus, 2009](#); [Jenkins, Goodness, & Buhmester, 2002](#)). Overall these studies point to a preference for empathy and support in relations among girls and more focus on competition and hierarchy in boys' interrelations. Trust plays an important role in these types of interactions ([Good, 1988](#)). Several studies have suggested crucial changes in trust behavior during adolescence (e.g. [van den Bos, Westenberg, Van Dijk, & Crone, 2010](#); [Fett, Gromann, Giampietro, Shergill, & Krabbendam, 2012](#); [Sutter & Kocher, 2007](#)), but little is known about gender differences in adolescent trust. This is the topic of the present study.

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Trust can be described as ‘a voluntary transfer of a good or favor to someone else, with future reciprocation expected but not guaranteed’ (Gunnthorsdottir, McCabe, & Smith, 2002, p. 50). Trust behavior not only consists of trusting others but also entails trustworthiness; that is whether a person will repay (instead of betray) the person who trusted her. Without trust social and economic interactions would be virtually impossible. Trust behavior can be measured in various ways. Survey measures can be used to study either specific forms of trust, such as social trust and parent-child trust, or to study the general view on the trustworthiness of others by using statements as “Most people can be trusted” (e.g. Flanagan & Stout, 2010; Kerr, Stattin, & Trost, 1999; Lewicki, Tomlinson, & Gillespie, 2006). Social dilemmas offer an alternative way to measure cooperation skills. Berg, Dickhaut, and McCabe (1995) introduced the Trust Game (also known as the Investment Game) to study trust and trustworthiness in an experimental setting. In the Trust Game one player, often referred to as the trustor, starts with a certain amount of money and can decide to invest (a part of) this amount in the second player, often referred to as the trustee. The amount of money given by the trustor is tripled: the trustee will receive three times the amount given by the trustor. In the next phase the trustee has the chance to return any amount of the money back to the trustor. This amount is not multiplied. Thus, in a situation of maximal cooperation the trustor invests the total amount of money and the trustee returns a fair share of the tripled amount (i.e. half) back to the trustor. This way both players take advantage of the multiplication of the money. However, the trustee can also decide not to give back any money and keep the tripled amount, leaving the trustor empty-handed. The trustor’s decision to invest the money is considered a measure of trust while the trustee’s decision to return money is considered a measure of trustworthiness (sometimes called reciprocity). Several studies have demonstrated the ecological validity of the Trust Game in real life situations (Baran, Sapienza, & Zingales, 2010; Darlan, 2005).

In the increasingly complex social world of adolescents, trust behavior is likely to be an essential feature of successful interactions with peers, parents and teachers. Studies using the Trust Game to examine the development of trust behavior from childhood to adolescence, report an increase of both trust and trustworthiness with age (van den Bos, van Dijk, & Crone, 2011; van den Bos et al., 2010; Sutter & Kocher, 2007). However, findings on the development of trust behavior from adolescence into adulthood are conflicting. Three studies find an increase in trust in this period (van den Bos, van Dijk, & Crone, 2011; Fett et al., 2012; Sutter & Kocher, 2007), while one study finds a decrease (van den Bos et al., 2010). One study reports an increase of trustworthiness from adolescence to adulthood (Belli, Rogers, & Lau, 2012) while other studies report no differences (van den Bos, van Dijk, Westenberg, Rombouts, 2011; van den Bos et al., 2010; Sutter & Kocher, 2007).

None of the studies on trust behavior in adolescence have focused directly on the role of gender despite evidence that gender is an important factor in explaining behavior in social interactions (Balliet, Li, Macfarlan, & Van Vugt, 2011; Croson & Gneezy, 2009). Several studies have used the Trust Game to explore gender differences in trust behavior in adult populations (for a review, see Croson & Gneezy, 2009). The majority of studies suggest that men are more trusting than women (e.g. Ben-Ner & Halldorsson, 2010; Buchan, Croson, & Solnick, 2008; Chaudhuri & Gangadharan, 2007; Snijders, 1996), although several studies report no gender differences (e.g. Ashraf, Bohnet, & Piankov, 2006; Croson & Buchan, 1999). As for trustworthiness, some studies report no gender differences (e.g. Ashraf et al., 2006; Kanagaretnam, Mestelman, Nainar, & Shehata, 2009), but when differences are reported these are generally in the direction of women being more trustworthy (e.g. Ben-Ner & Halldorsson, 2010; Buchan et al., 2008; Chaudhuri & Gangadharan, 2007; Croson & Buchan, 1999). Thus, there is evidence that gender plays a role in trust behavior: that is men are on average more trusting and women more trustworthy.

Possible theoretical explanations for these gender patterns have been suggested from both sociocultural and evolutionary perspectives. From a sociocultural perspective, gender differences in trust behavior are the result of gender roles that determine the appropriate behavior for men and women (Buchan et al., 2008). According to social role theory, the female gender role promotes *communal* (interpersonal facilitative, friendly) behavior, while *agentic* (instrumental, outcome-based) behavior is more typical for the male gender role (Eagly, Wood, & Diekmann, 2000). Trusting can be viewed as agentic because it may enlarge the own outcomes, whereas trustworthiness can be seen as communal as it is purely altruistic. Within the evolutionary framework, gender differences are seen as the result of adaptive strategies that men and women have developed throughout evolutionary history. In most mammals, females spend more time nurturing and raising offspring than do males. Therefore, females benefit from being selective when choosing their mating partners. The evolutionary view assumes that women consequently have to be more careful in social interactions, especially with strangers. Female selectiveness in mating choice on the other hand has let men to evolve more competitive and risk-taking characteristics (Balliet et al., 2011; Simpson & Van Vugt, 2009). This could explain why men have found to be more trusting and women more trustworthy in the Trust Game. It should be noted that the sociocultural and evolutionary perspectives are not mutually exclusive.

One way to better understand gender differences in trust and trustworthiness, is to focus on the social preferences underlying social behavior. Social value orientation (SVO) is used to describe someone’s preferences when distributing resources between themselves and another. Some people, called *prosocials*, favor maximizing the outcomes for both the self and the other. Other people, known as *proselfs*, try to maximize their own outcomes; (Messick & McClintock, 1968; Van Lange, Otten, De Bruin, & Joireman, 1997). SVO has been shown to be a good predictor of real life prosocial behavior in various domains (e.g. Van Lange, Bekkers, Schuyt, & Vugt, 2007; Van Lange, Vugt, Meertens, & Ruiters, 1998). In the Trust Game, prosocials can be assumed to be both more trusting and trustworthy than proselfs. Since prosocials have a natural tendency for cooperation, they are expected to give more money in the role of trustor and to return more money in the role of trustee than proselfs. Indeed, the few studies examining the role of SVO in the Trust Game in adult populations have been able to confirm the hypothesis that prosocials are more trusting and trustworthy than proselfs (Kanagaretnam et al., 2009; Snijders, 1996).

Gender differences in trust behavior may possibly arise from gender differences in SVO. Studies examining SVO in adults suggest a small overrepresentation of women in the prosocial category (e.g. Van Lange, Otten, Bruin, & Joireman, 1997), although not all studies have been consistent (e.g. Van Lange, 1999). While SVO has not been used in adolescents, studies using other measures of prosociality suggest girls are more prosocially orientated than boys (Eisenberg, Cumberland, Guthrie, Murphy, & Shepard, 2005; Fabes, Carlo, Kupanoff, & Laible, 1999). Together, the literature on SVO, trust behavior, and gender differences, as reviewed above, suggests distinct hypotheses about the interrelationships between prosocial orientation and gender in explaining trust and trustworthiness in the trust game. That is, based on findings in adult populations, girls are expected to be more trustworthy than boys. These higher levels of trustworthiness could be explained by girls being more prosocially oriented. For trust, the prediction is different. Based on findings in adults, both boys and prosocials may show higher trust, whereas girls may be more likely to have a prosocial orientation. Thus, gender and SVO may have independent effects on trust in the trust game.

In the present study, the role of gender and SVO in the Trust Game was investigated in a sample of adolescents. The following hypotheses were tested: boys are (1) more trusting and (2) less trustworthy than girls; prosocials are both (3) more trusting and (4) more trustworthy than prosocials and (5) girls are more prosocial than boys. Based on these hypotheses, (6) we expect gender and SVO to be independent predictors of trust. However, for trustworthiness, (7) we expect higher levels in girls to be mediated by their prosocial orientation.

Methods

Participants

A sample of 221 students enrolled in the third year of Dutch secondary education (9th grade) participated in this study. All eligible students participated in the study. Seven participants did not complete the session and eight participants did not provide valid test data. These 15 participants were excluded from the analysis, leaving 206 subjects in the study ($M_{\text{age}} = 15.1$ years, $SD = 0.46$ years, range = 14.1–16.5 years, 51% girls). Data was collected at five different secondary schools located in towns and cities throughout the Netherlands. Dutch secondary education is divided into three main levels: preparatory middle-level vocational education (VMBO), higher general continued education (HAVO) and pre-university education (VWO). The sample used for this study consisted of 95 VMBO students (46%), 69 HAVO students (33%) and 42 VWO students (20%).

Materials

Trust Game. The version of the Trust Game used in this study was based on the original game developed by Berg et al. (1995). Participants were instructed that they would be connected with several students from another secondary school through the internet. In reality the other players' behavior was based on a computer simulation. In the game, the participants had the opportunity to share money with the other players. However, beforehand they were told that neither they nor the other participants would actually be allowed to keep the money. At the beginning of the game, the subjects were asked to type the first letter of their first name in order to be able to identify them throughout the game. Our decision to use non-real opponents in the Trust Game was based on the testing conditions at the schools which made real-life interactions with students from other schools virtually impossible. The study was approved by the ethical committee of the Faculty of Psychology and Education of the VU University Amsterdam.

Each participant first played five rounds as the trustor and thereafter five rounds as the trustee. The participant was informed that he was connected with a different player every round, thus they played 10 one-shot games. Before every round the participant saw a screen indicating the computer was connecting to another participant through the internet. The participants only saw the first letter of the first name of the other player to keep the other's gender or background unknown. A different first letter was used each round. The words trustor and trustee were never used and the other player was always addressed by the first letter.

In each of the five trustor rounds, the participant was asked to send €0, €2, €4 or €6 to the trustee. If the participant chose €0, the trustee did not receive any money and could not make a decision. Therefore the round was finished and the computer would immediately show the final score (participant €6, trustee €0). If the participant chose to give money to the other player, the participant saw that the amount of money was tripled and was then told that the trustee was now making a decision. After this the amount returned by the trustee was shown and thereafter the final totals for that round (for example: participant €9, trustee €9). The amount sent back by the trustee was a percentage of the amount given by the participant, which was different for each round, but similar across participants (round 1 = 50%, round 2 = 33 $\frac{1}{3}$ %, round 3 = 0%, round 4 = 50%, round 5 = 33 $\frac{1}{3}$ %). After a round was finished, the participant again saw a screen connecting them to a new player for the next round. Cumulative scores over rounds were never shown.

The five trustee rounds started with a connection screen as well. After this the participant was told that the trustor was making a decision to give either €0, €2, €4 or €6 to the participant. The decisions by the trustor were preprogrammed and different for each round, but similar across participants (round 1 = €4, round 2 = €6, round 3 = €2, round 4 = €6, round 5 = €4). The amount was tripled and then the participant could choose an integer in between €0 and the total amount received to return to the trustor. The amount sent back to the trustor was then shown and then the final totals for that round were presented. Again, each new round started by connecting to a new participant.

The total amount sent to the trustee over five rounds was used as a measure of trust. The percentage of the investment by the trustor that was returned by the participant playing as a trustee averaged over the five rounds was used as a measure of trustworthiness.

Social Value Orientation. The Triple Dominance Measure was used to measure SVO (Messick & McClintock, 1968; Van Lange et al., 1997). The Triple Dominance Measure uses a decomposed game to measure SVO. Earlier studies have shown that this measure has a good internal consistency (e.g. Van Lange & Semin-Goossens, 1998) and test-retest reliability (e.g. Van Lange, 1999). In addition, there is evidence for ecological validity of this measure in various domains (e.g. Van Lange et al., 2007; Van Lange et al., 1998).

In the task, participants have to divide points between themselves and another hypothetical person. The task consists of nine forced choice dilemmas in which the subject can choose three possible distributions (displayed as A, B and C). One option allows the participant to distribute the points equally (the cooperative choice, for example 480 – 480), one option gives the participant the chance to maximize the own outcomes (the individualistic choice, for example 540–280) and the other option makes sure that the difference between the pay-off of the participant and the other is maximized (the competitive choice, for example 480–80).

The total number of cooperative, individualistic and competitive choice were used to classify the participants, according to the standard approach in SVO analyses (e.g. De Cremer & Van Lange, 2001; Van Lange et al., 1998). Only the participants that made six or more consistent choices were classified. Out of 221 students, 97 (47%) were classified as cooperators, 49 (24%) as individualists, 15 (7%) as competitors and another 45 participants (22%) could not be classified due to inconsistent choices. For the analysis, the individualists and competitors were combined into one single groups (the proselves). Of the 161 participants in the analyses, 60% were prosocials (the cooperators) and 40% were proselves.

Procedure

Participants were recruited via their schools. Five schools across the Netherlands agreed to participate in this study. All eligible students and their parents received a letter one week before the testing to inform them about the research and to ask for passive consent, in accordance with procedures approved by the ethical committee of the VU University. A small minority did not agree to participate and were thus not included. Participants also were informed that they could withdraw from participation at any time during the testing. The study was performed by six students at the same time in a quiet room. After receiving verbal explanation on the Trust Game, two of the six participants were asked to play out a single round for illustration and each student answered a few questions individually to make sure the procedure was clear. If the wrong answers were given, participants were instructed to ask for further explanation from the experimenters. Thereafter all six participants performed the game separately on a laptop followed by paper questionnaires including the Triple Dominance Measure (for SVO) and a number of general questions (such as age, gender and level of education). In line with standard procedures for testing at schools, subjects were not paid for their participation and could not earn any real money by playing the Trust Game.

Statistical analysis

In order to test the first four hypotheses, *t*-tests were performed to compare boys and girls, and prosocials and proselves on trust and trustworthiness. In order to test if boys and girls differed in their SVO (fifth hypothesis), a cross table analysis with chi-square testing was used. For the last two hypotheses regression analyses were performed. In these analyses, trust and trustworthiness were the dependent variables and gender and SVO were the independent variables. Although not hypothesized, possible interactions between gender and SVO on the dependent variables were also examined.

Results

Descriptive statistics

The descriptive statistics for age and educational level separated for boys and girls as well as prosocial and proselves are depicted in Table 1. No significant differences in age were found between boys and girls ($t(153) = 1.26, p > .05$) or prosocials

Table 1

Descriptive statistics for age and education separated for boys and girls as well as prosocials and proselves.

	Gender				Social value orientation			
	Boys		Girls		Prosocials		Proselfs	
	M	SD	M	SD	M	SD	M	SD
Age	15.2	0.5	15.1	0.4	15.1	0.5	15.2	0.4
Educational level	N	(%)	N	(%)	N	(%)	N	(%)
VVO level	17	22	20	24	21	22	16	25
HAVO-level	26	33	26	31	33	34	19	30
VMBO-level	35	45	37	45	43	44	29	45

and proselves ($t(153) = -1.64, p > .05$) and no significant differences were found in educational level between boys and girls ($\chi^2(2) = 0.14, p > .05$) or between prosocials and proselves ($\chi^2(1) = 0.42, p > .05$). Although not hypothesized, age was negatively correlated with both trust ($r(154) = -0.19, p < .05$) and trustworthiness ($r(154) = -.21, p < .01$). An ANOVA analysis revealed no effect of educational level on trust ($F(2, 158) = 1.51, p > .05$) or trustworthiness ($F(2, 158) = 0.03, p > .05$).

Group comparisons (hypotheses 1–5)

Table 2 shows the descriptive statistics for trust and trustworthiness separated for boys and girls. The *t*-test revealed a significant difference in trust between boys and girls ($t(159) = 2.10, p < .05$), confirming hypothesis 1. However, no significant gender effect was found for trustworthiness ($t(159) = -0.75, p > .05$). Thus, hypothesis 2 could not be confirmed.

The descriptive statistics for trust and trustworthiness separated for prosocials and proselves are depicted in Table 3. *T*-tests revealed that the differences between prosocials and proselves were significant for trust ($t(159) = 3.54, p < .01$) and trustworthiness ($t(159) = 4.25, p < .001$). Therefore, hypotheses 3 and 4 were confirmed.

Table 4 depicts a contingency table displaying the frequency distributions of subject on gender and SVO. In boys, 51% of the participants were classified as prosocials; in girls prosocials made up 69% of the sample. A chi-square test revealed that this difference was significant ($\chi^2(1) = 5.08, p < .05$), confirming hypothesis 5.

Regression analyses (hypotheses 6 and 7)

To test hypotheses 6 and 7 regression analyses were performed. In these analyses both gender (boy = 0, girl = 1) and SVO (prosocial = 0, proselves = 1) were used as independent variables on the dependent variables trust and trustworthiness. The first regression test revealed that gender ($\beta = -0.22, p < .01$) and SVO ($\beta = -0.31, p < .001$) were significant independent predictors of trust ($R^2 = 0.12, F = 10.80, p < .001$). No significant interaction effect between gender and SVO was found ($\beta = -0.05, p > .05$). Adding age as an independent variable in the regression did not alter the outcome of the analysis. The results of this analysis confirm hypothesis 6.

In the second regression analysis trustworthiness was the dependent variable. The analysis showed that SVO ($\beta = -0.32, p < .001$) but not gender ($\beta = -0.03, p > .05$) was a significant predictor of trustworthiness ($R^2 = 0.10, F = 9.99, p < .001$). Again no interaction effect between gender and SVO was found ($\beta = -0.04, p > .05$). The outcome of the analysis was not changed by adding age as an independent factor. Since no main effect for gender was found (hypothesis 2), the independent effects of gender and SVO (hypothesis 7) could not be studied.

Discussion

The primary objective of this study was to examine how gender and SVO are related to adolescent trust behavior as measured in a Trust Game. As expected, boys were more trusting than girls but, in contrast to our hypothesis, no gender differences were found in trustworthiness. For SVO, girls were more likely to have a prosocial value orientation than boys confirming our hypothesis. Furthermore, prosocials were both more trusting and more trustworthy than proselves, in line with the hypotheses. The results of this study point to gender differences in trust behavior in adolescence and to a clear preference for trust behavior in prosocials. Finally, gender and SVO were independent predictors of trust.

Three of the four hypotheses regarding main effects of gender and SVO could be confirmed. However, in contrast to our hypothesis, we found no gender differences in adolescent trustworthiness. Several studies in adult populations have found women to be more trustworthy (e.g. Ben-Ner & Halldorsson, 2010; Buchan et al., 2008; Chaudhuri & Gangadharan, 2007; Croson & Buchan, 1999). It is possible that gender differences in trustworthiness vary with age. Garbarino and Slonim (2009) examined the robustness of gender differences in the Trust Game across age (18–84 year). They found men to be more trusting than women across all age groups. However, in their study trustworthiness depended on gender, age and the amount received. Younger women returned more than men when they received a large amount from the trustor, but less when they received a small amount. In the older subjects no such interaction between gender and amount was found. The findings by Garbarino and Slonim (2009) are in line with the idea that cooperation in women is more sensitive to context (see Croson & Gneezy, 2009).

In this study, we not only examined how gender and SVO are related to trust behavior, but also how these factors are interrelated. As expected, boys were more trusting than girls and prosocials were more trusting than proselves. Since girls were more likely to have a prosocial value orientation than boys, this leads to gender and SVO being independent predictors of

Table 2
Descriptive statistics for trust and trustworthiness separated for boys and girls.

Variable	Gender	N	M	SD	Range
Trust	Boys	78	15.4	6.0	0–30
	Girls	83	13.6	4.7	0–28
Trustworthiness	Boys	78	29.5%	14.3%	0–63%
	Girls	83	31.2%	13.6%	0–59%

Table 3

Descriptive statistics for trust and trustworthiness separated for prosocials and proselfs.

Variable	Social value orientation	N	M	SD	Range
Trust	Prosocials	97	15.7	5.2	0–30
	Proselfs	64	12.6	5.3	0–30
Trustworthiness	Prosocials	97	34.0%	13.4%	0–59%
	Proselfs	64	24.9%	12.9%	0–63%

Table 4

Contingency table displaying the distribution of participants according to gender and social value orientation.

	Prosocials	Proselfs	Total
Boys	40	38	78
Girls	57	26	83
Total	97	64	161

trust. To our knowledge, only two other studies so far have investigated the role of gender and SVO in the Trust Game; both in a sample of adults. [Snijders \(1996\)](#) found that prosocials and men are more trusting and that prosocials and women are more trustworthy, but does not report any relation between gender and SVO. [Kanagaretnam et al. \(2009\)](#) found prosocials to be more trusting and trustworthy. For gender, they only found men to be more trusting, but no differences for trustworthiness. In addition, gender did not capture any differences in trusting behavior that were not already captured by SVO. Remarkably, in this study, men were found to be more prosocial than women. The authors speculate that the women in their sample of undergraduates in business might overcompensate to fit in the competitive business world.

It is likely that gender and SVO are related to trust in a different way. SVO may directly influence trust decisions, while gender presumably is related to trust through another factor. The present study suggests that prosocial orientation is not the underlying variable that can explain gender differences in trust. Although girls are found to be more prosocially orientated, boys show a higher level of trust in specific cooperation situations. Which factors can explain this difference remains to be elucidated. Some authors have proposed that trust in men can be explained by factors such as risk taking, sensation seeking and optimism (e.g. [Ben-Ner & Halldorsson, 2010](#)). It has been suggested that gender differences in social dilemmas are moderated by the context of the interaction ([Balliet et al., 2011](#); [Croson & Gneezy, 2009](#)). Manipulating motives for cooperation within dilemmas may therefore be a fruitful way to further unravel gender differences in social behavior. Furthermore, it is not clear whether the independent effects of gender and SVO are typical for adolescence. Further research could examine how these factors influence trust behavior throughout development.

In the analysis, a weak, but significant, negative correlation between age and both trust and trustworthiness was found indicating that the older participants were less trusting and trustworthy than the younger. No hypotheses regarding age were formulated since the age range was expected to be too narrow. The decrease of trust and trustworthiness with age is surprising as most studies report either an increase or no effect from childhood to adolescence to adulthood ([Belli et al., 2012](#); [van den Bos, van Dijk, & Crone, 2011](#); [van den Bos, van Dijk, Westenbergh, et al., 2011](#); [van den Bos et al., 2010](#); [Fett et al., 2012](#); [Sutter & Kocher, 2007](#)). Two studies found an increase in trust and trustworthiness in the age range of the present study (14–16 year) by comparing 12 year old participants to 16 year old participants ([Sutter & Kocher, 2007](#); [van den Bos et al., 2010](#)). However, thus far no studies have looked at the development of behavior in the Trust Game by using age as a continuous variable. Several studies on prosocial behavior have shown that cooperative behavior does not necessarily develop linearly (e.g. [Eisenberg, Carlo, Murphy, & van Court, 1995](#); [Eisenberg et al., 2005](#); [House et al., 2013](#)) and therefore comparing different age groups (e.g. early and late adolescents) may not be sufficient. The result of the present study suggests that it may also be useful to study the development throughout adolescence of trust and trustworthiness either using age as a continuous variable or by measuring a larger number of age groups.

Several methodological concerns should be considered. First, the participants were told they were playing with real players from another school, but some students may have doubted whether the other players were real, possibly influencing their decisions. However, by using screens showing that the participant was connecting to another player and screens showing that the other players were making a decision we have tried to ensure that the task was realistic. Furthermore, the use of computer players did allow us to standardize the trust game, facilitating comparisons between subjects. Another point of discussion is the use of discrete rather than continuous values. Trustors could only send €0, €2, €4 or €6 and nothing in between, while trustees could only send integers. It is possible that the use of discrete or continuous values influences the results in social dilemmas (see [Zhong, Kokubo, & Tanimoto, 2012](#)), although this effect has not been found in a Trust Game. In addition, our use of hypothetical rather than real rewards may have influenced the adolescents' decisions. Some researchers argue that using hypothetical instead of real rewards influences economic decision making (e.g. [Hertwig & Ortmann, 2001](#); [Vlaev, 2012](#)), while others state that hypothetical rewards are just as valid (e.g. [Locey, Jones, & Rachlin, 2011](#); [Madden, Begotka, Raiff, & Kastern, 2003](#)).

To summarize, the present study shows that adolescent boys are more trusting than girls but that there is no gender effect on trustworthiness. Adolescents with a prosocial value orientation are both more trusting and trustworthy than those with a

proself value orientation. Further analysis showed that gender and SVO are independently associated with trust. The results indicate that gender differences in adolescent cooperation are complex and cannot simply be explained by differences in prosocial orientation.

References

- Ashraf, N., Bohnet, I., & Piankov, N. (2006). Decomposing trust and trustworthiness. *Experimental Economics*, 9(3), 193–208. <http://dx.doi.org/10.1007/s10683-006-9122-4>.
- Balliet, D., Li, N. P., Macfarlan, S. J., & Van Vugt, M. (2011). Sex differences in cooperation: a meta-analytic review of social dilemmas. *Psychological Bulletin*, 137(6), 881–909. <http://dx.doi.org/10.1037/a0025354>.
- Baran, N. M., Sapienza, P., & Zingales, L. (2010). *Can we infer social preferences from the lab? evidence from the trust game*. NBER Working Papers.
- Belli, S. R., Rogers, R. D., & Lau, J. Y. F. (2012). Adult and adolescent social reciprocity: experimental data from the Trust Game. *Journal of Adolescence*, 35(5), 1341–1349. <http://dx.doi.org/10.1016/j.adolescence.2012.05.004>.
- Ben-Ner, A., & Halldorsson, F. (2010). Trusting and trustworthiness: what are they, how to measure them, and what affects them. *Journal of Economic Psychology*, 31(1), 64–79. <http://dx.doi.org/10.1016/j.joep.2009.10.001>.
- Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, reciprocity, and social history. *Games and Economic Behavior*, 10(1), 122–142. <http://dx.doi.org/10.1006/game.1995.1027>.
- van den Bos, W., van Dijk, E., & Crone, E. A. (2011). Learning whom to trust in repeated social interactions: a developmental perspective. *Group Processes & Interpersonal Relations*. <http://dx.doi.org/10.1177/1368430211418698>.
- van den Bos, W., van Dijk, E., Westenberg, M., Rombouts, S. A. R. B., & Crone, E. A. (2011). Changing brains, changing perspectives: the neurocognitive development of reciprocity. *Psychological Science*, 22(1), 60–70. <http://dx.doi.org/10.1177/0956797610391102>.
- van den Bos, W., Westenberg, M., van Dijk, E., & Crone, E. A. (2010). Development of trust and reciprocity in adolescence. *Cognitive Development*, 25(1), 90–102. <http://dx.doi.org/10.1016/j.cogdev.2009.07.004>.
- Buchan, N. R., Croson, R. T. A., & Solnick, S. (2008). Trust and gender: an examination of behavior and beliefs in the Investment Game. *Journal of Economic Behavior & Organization*, 68(3–4), 466–476. <http://dx.doi.org/10.1016/j.jebo.2007.10.006>.
- Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological Review*, 106(4), 676–713. <http://dx.doi.org/10.1037/0033-295X.106.4.676>.
- Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: a meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development*, 79(5), 1185–1229. <http://dx.doi.org/10.1111/j.1467-8624.2008.01184.x>.
- Chaudhuri, A., & Gangadharan, L. (2007). An experimental analysis of trust and trustworthiness. *Southern Economic Journal*, 73(4), 959–985.
- Croson, R., & Buchan, N. (1999). Gender and Culture: international experimental evidence from trust games. *American Economic Review*, 89(2), 386–391. <http://dx.doi.org/10.1257/aer.89.2.386>.
- Croson, R., & Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic Literature*, 47(2), 448–474. <http://dx.doi.org/10.1257/jel.47.2.448>.
- Darlan, D. S. (2005). Using experimental economics to measure social capital and predict financial decisions. *The American Economic Review*, 95(5), 1688–1699.
- De Cremer, D., & Van Lange, P. A. M. (2001). Why prosocials exhibit greater cooperation than proselfs: the roles of social responsibility and reciprocity. *European Journal of Personality*, 15(S1), S5–S18. <http://dx.doi.org/10.1002/per.418>.
- De Goede, I. H. A., Branje, S. J. T., & Meeus, W. H. J. (2009). Developmental changes and gender differences in adolescents' perceptions of friendships. *Journal of Adolescence*, 32(5), 1105–1123. <http://dx.doi.org/10.1016/j.adolescence.2009.03.002>.
- Eagly, A. H., Wood, W., & Diekmann, A. H. (2000). Social role theory of sex differences and similarities: a current reappraisal. In T. Eckes, & H. M. Trautner (Eds.), *The developmental social psychology of gender* (pp. 123–174). Mahwah, NJ: Erlbaum.
- Eisenberg, N., Carlo, G., Murphy, B., & van Court, P. (1995). Prosocial development in late adolescence: a longitudinal study. *Child Development*, 66(4), 1179–1197. <http://dx.doi.org/10.1111/j.1467-8624.1995.tb00930.x>.
- Eisenberg, N., Cumberland, A., Guthrie, I. K., Murphy, B. C., & Shepard, S. A. (2005). Age changes in prosocial responding and moral reasoning in adolescence and early adulthood. *Journal of Research on Adolescence*, 15(3), 235–260. <http://dx.doi.org/10.1111/j.1532-7795.2005.00095.x>.
- Fabes, R. A., Carlo, G., Kupanoff, K., & Laible, D. (1999). Early adolescence and prosocial/moral behavior I: the role of individual processes. *The Journal of Early Adolescence*, 19(1), 5–16. <http://dx.doi.org/10.1177/0272431699019001001>.
- Fett, A.-K. J., Gromann, P. M., Giampietro, V., Shergill, S. S., & Krabbendam, L. (2012). Default distrust? an fMRI investigation of the neural development of trust and cooperation. *Social Cognitive and Affective Neuroscience*. <http://dx.doi.org/10.1093/scan/nss144>.
- Flanagan, C. A., & Stout, M. (2010). Developmental patterns of social trust between early and late adolescence: age and school climate effects. *Journal of Research on Adolescence*, 20(3), 748–773. <http://dx.doi.org/10.1111/j.1532-7795.2010.00658.x>.
- Garaigordobil, M. (2009). A comparative analysis of empathy in childhood and adolescence: gender differences and associated socio-emotional variables. *International Journal of Psychology and Psychological Therapy*, 9(2), 217–235.
- Garbarino, E., & Slonim, R. (2009). The robustness of trust and reciprocity across a heterogeneous U.S. population. *Journal of Economic Behavior & Organization*, 69(3), 226–240. <http://dx.doi.org/10.1016/j.jebo.2007.06.010>.
- Good, D. (1988). Individuals, interpersonal relations, and trust. In D. Gambetta (Ed.), *Trust: Making and Breaking cooperative relations* (pp. 31–48). Oxford: Basil Blackwell.
- Gunthorsdottir, A., McCabe, K., & Smith, V. (2002). Using the Machiavellianism instrument to predict trustworthiness in a bargaining game. *Journal of Economic Psychology*, 23(1), 49–66. [http://dx.doi.org/10.1016/S0167-4870\(01\)00067-8](http://dx.doi.org/10.1016/S0167-4870(01)00067-8).
- Hertwig, R., & Ortmann, A. (2001). Experimental practices in economics: a methodological challenge for psychologists? *Behavioral and Brain Sciences*, 24(03), 383–403.
- House, B. R., Silk, J. B., Henrich, J., Barrett, H. C., Scelza, B. A., & Boyette, A. H. (2013). Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences*, 110(36), 14586–14591. <http://dx.doi.org/10.1073/pnas.1221217110>.
- Jenkins, S. R., Goodness, K., & Buhrmester, D. (2002). Gender differences in early adolescents' relationship qualities, self-efficacy, and depression symptoms. *The Journal of Early Adolescence*, 22(3), 277–309. <http://dx.doi.org/10.1177/02731602022003003>.
- Kanagaretnam, K., Mestelman, S., Nainar, K., & Shehata, M. (2009). The impact of social value orientation and risk attitudes on trust and reciprocity. *Journal of Economic Psychology*, 30(3), 368–380. <http://dx.doi.org/10.1016/j.joep.2008.12.003>.
- Kerr, M., Stattin, H., & Trost, K. (1999). To know you is to trust you: parents' trust is rooted in child disclosure of information. *Journal of Adolescence*, 22(6), 737–752. <http://dx.doi.org/10.1006/jado.1999.0266>.
- Lewicki, R. J., Tomlinson, E. C., & Gillespie, N. (2006). Models of interpersonal trust development: theoretical approaches, empirical evidence, and future directions. *Journal of Management*, 32(6), 991–1022. <http://dx.doi.org/10.1177/0149206306294405>.
- Lindsey, E., & Mize, J. (2001). Contextual differences in Parent–Child Play: Implications for Children's gender role development. *Sex Roles*, 44(3–4), 155–176. <http://dx.doi.org/10.1023/a:1010950919451>.
- Lucey, M. L., Jones, B. A., & Rachlin, H. (2011). Real and hypothetical rewards in self-control and social discounting. *Judgment and Decision Making*, 6(6), 552–564.
- Lutchmaya, S., Baron-Cohen, S., & Raggatt, P. (2002). Foetal testosterone and eye contact in 12-month-old human infants. *Infant Behavior and Development*, 25(3), 327–335. [http://dx.doi.org/10.1016/S0163-6383\(02\)00094-2](http://dx.doi.org/10.1016/S0163-6383(02)00094-2).

- Madden, G. J., Begotka, A. M., Raiff, B. R., & Kastern, L. L. (2003). Delay discounting of real and hypothetical rewards. *Experimental and clinical psychopharmacology*, 11(2), 139.
- Messick, D. M., & McClintock, C. G. (1968). Motivational bases of choice in experimental games. *Journal of Experimental Social Psychology*, 4(1), 1–25. [http://dx.doi.org/10.1016/0022-1031\(68\)90046-2](http://dx.doi.org/10.1016/0022-1031(68)90046-2).
- Piko, B. (2001). Gender differences and similarities in adolescents' ways of coping. *The Psychological Record*, 51(2), 4.
- Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in peer relationship processes: potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin*, 132(1), 98–131.
- Simpson, B., & Van Vugt, M. (2009). Sex differences in cooperation: integrating the evolutionary and social psychological perspectives. *Advances in Group Processes*, 26, 81–103.
- Snijders, C. (1996). *Trust and Commitments*. Amsterdam: Thesis Publishers.
- Sutter, M., & Kocher, M. G. (2007). Trust and trustworthiness across different age groups. *Games and Economic Behavior*, 59(2), 364–382. <http://dx.doi.org/10.1016/j.geb.2006.07.006>.
- Van Lange, P. A. M. (1999). The pursuit of joint outcomes and equality in outcomes: an integrative model of social value orientation. *Journal Of Personality and Social Psychology*, 77, 337–349.
- Van Lange, P. A. M., Bekkers, R., Schuyt, T. N. M., & Vugt, M. V. (2007). From games to giving: social value orientation predicts donations to noble causes. *Basic and Applied Social Psychology*, 29(4), 375–384. <http://dx.doi.org/10.1080/01973530701665223>.
- Van Lange, P. A. M., Otten, W., De Bruin, E. M., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: theory and preliminary evidence. *Journal of Personality and Social Psychology*, 73(4), 733–746.
- Van Lange, P. A. M., & Semin-Goossens, A. (1998). The boundaries of reciprocal cooperation. *European Journal of Social Psychology*, 28(5), 847–854. doi: 10.1002/(sici)1099-0992(199809/10)28:5<847::aid-ejsp886>3.0.co;2-l.
- Van Lange, P. A. M., Vugt, M. V., Meertens, R. M., & Ruiters, R. A. C. (1998). A social dilemma analysis of commuting preferences: the roles of social value orientation and Trust1. *Journal of Applied Social Psychology*, 28(9), 796–820. <http://dx.doi.org/10.1111/j.1559-1816.1998.tb01732.x>.
- Vlaev, I. (2012). How different are real and hypothetical decisions? Overestimation, contrast and assimilation in social interaction. *Journal of Economic Psychology*, 33(5), 963–972. <http://dx.doi.org/10.1016/j.joep.2012.05.005>.
- Weinberg, M. K., Tronick, E. Z., Cohn, J. F., & Olson, K. L. (1999). Gender differences in emotional expressivity and self-regulation during early infancy. *Dev Psychol*, 35(1), 175–188.
- Zhong, W., Kokubo, S., & Tanimoto, J. (2012). How is the equilibrium of continuous strategy game different from that of discrete strategy game? *Biosystems*, 107(2), 88–94. <http://dx.doi.org/10.1016/j.biosystems.2011.10.001>.