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The effect of social comparison on prosocial behavior in a group context

Author name: Jaimy Maassen

Student number: 506084

Supervisor: A. Pogliano

Second assessor: dr. D. Sisak

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Erasmus University Rotterdam

Abstract

The current research investigates the effect of social comparison on the prosocial behavior of individuals towards others in their reference group. It distinguishes itself from previous literature by making a clear distinction between the effects of upward and downward social comparison. Moreover, by investigating prosocial behavior in a group context, which is especially relevant as social comparisons are used commonly in groups in everyday life. The data collection was executed via an experiment. The respondents (N=208) were randomly exposed to no, upward or downward social comparison based on their score from a general knowledge quiz. Their prosocial behavior was thereafter measured utilizing a dictator game. The results of the analyses show that downward social comparisons significantly decrease the prosocial behavior of individuals. Moreover, females behave significantly more prosocial than males, when considering upward social comparison. No significant results were obtained when investigating different age groups and when investigating the feeling of competition as a potential mechanism. The implications of the results found in this study are to refrain from downward social comparison in groups or to give information on the possible negative consequences to avoid a decrease in prosocial behavior.

Keywords: social comparison, upward social comparison, downward social comparison, relative performance rankings, prosocial behavior.

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1. Introduction

In day-to-day life, people tend to often compare themselves to others. At work, in class, and in a lot more situations, individuals realize that they differ in many aspects, which leads them to compare themselves with others (Ye et al., 2021). This phenomenon is referred to as social comparison (Festinger, 1954), which can be formulated as "the process of thinking about information about one or more other people in relation to the self" (Wood, 1996, p. 520-521). This social comparison can manifest in many different forms and a lot of researchers have already written about this topic. It is for example found that people often compare themselves with others who are viewed as being better than the self (upward comparisons), as this leads to hopes of enhancing their self-assessments (Collins, 1996). They then want to affirm that they are almost as good as a person that they perceive to be better. However, a lot of research has also been done in the realm of downward comparisons. As people have the need to be or believe that they are better than others (Taylor & Brown, 1988), comparisons with worse-off others (downward comparisons) are also a common thing. Individuals namely tend to extract positive emotions from being better than others. However, research concludes that upward comparisons are more common and can be more valuable than downward comparison, as an individual can collect more useful information from this (Brickman & Bulman, 1977).

Next to the research on the impact of social comparison on factors like mood and self-evaluation, various research also investigates the effects of it on human behavior. Such as the impact of social comparison on prosocial behavior of individuals. As Klein (2003) concludes that downward comparisons, compared to upward comparisons, can increase an individuals' willingness to helping others. Furthermore, Yip and Kelly (2013) find that empathy is decreased by both upward and downward comparisons, which decreases prosocial behavior. In contrast, Zheng et al. (2015) find that downward comparisons increase empathy, compared to upward comparisons, leading to an increase in prosocial behavior. The literature thus shows contrasting results, which emphasizes that further investigation on this topic is interesting. In addition, it must be noted that most literature on the effects of social comparison are based on the individual level and their behavior towards random strangers. However, as Goethals and Darley (1987) describe, it can also be expected to have a number of implications for group processes. Therefore, it is interesting to see how this social comparison can impact the behavior of individuals in groups towards others in those groups. Specifically, this is interesting as many tasks nowadays are performed in groups, for example in education or at work.

Building on the effects of social comparison on prosocial behavior in groups, literature finds that providing group members with relative performance ranking information can improve an individual's productivity. However, it can also have negative effects if the ranking information lead to a rat race (Tran & Zeckhauser, 2012). Individuals namely care considerably about their rank, so this should be taken into account when researching the impact on prosocial behavior. Therefore, it seems valuable to conduct research on whether presenting group members with relative performance rankings can lead to the feeling of competition in groups so that it influences the prosocial behavior of the members of the group towards others in their group. Thus, investigating the feeling of competition that possibly arises from social comparisons as the mechanism for the extent to which individuals show prosocial behavior towards their group or not. Overall, this paper investigates whether social comparison in the form of relative performance rankings influences prosocial behavior towards the reference group. This leads to the following research question:

"What is the impact of presenting relative performance rankings to individuals on their prosocial behavior towards others in their reference group?"

This research is scientifically relevant as it addresses new insights into the impact of social comparisons on prosocial behavior. Specifically, a clear distinction is made between the effects of upward and downward social comparisons, rather than only investigating social comparison as a whole. Moreover, the research on the differences in upward and downward social comparison that does already exists, mainly focuses on the differences in effects for individual behavior rather than the behavior towards group members. Furthermore, this research finds opposing results regarding the effects of upward and downward comparisons (Yip & Kelly, 2013; Zheng et al. 2015) and mostly investigates empathy as the mechanism. In contrast, this research investigates the feeling of competition in the group as the mechanism.

Additionally, it focuses on prosocial behavior within a group in the context of the Netherlands. Even though there is already some research on prosocial behavior in groups in the previous literature, it focused on other countries than the Netherlands and on other target groups. These include Asian countries (Riyanto & Zhang, 2013), and target groups only consisting of students (Heursen, 2019). Firstly, as Asian countries have the culture where "losing face" in public is avoided and there is a strong emphasis on educational attainment, this could imply finding different results for the Netherlands. Secondly, as the present study is not only focused on students, but rather on the entire population of the Netherlands, the findings

can reveal interesting insights. Specifically, if the results differ among individuals with other demographics, such as different age groups.

This research is also socially relevant. Groupwork becomes increasingly important in everyday life and relative performance rankings are often used in these groups. Research shows that 25% of the Fortune 500 companies uses relative performance rankings to show to their employees (Weaver, 2021). In addition, this system is also used in schools and universities. As this paper investigates, this social comparison could potentially influence the prosocial behavior of the individuals towards others. It is therefore interesting to see what the effects of this relative performance rankings are. So that if it for example decreases prosocial behavior towards others, organizations should make a choice whether this is the intended effect they wanted to obtain. For example, when considering group projects at universities, a decrease in prosocial behavior may not be the intended effect of social comparisons, as schools and universities mostly aim for prosocial towards each other.

In order to answer the research question, firstly, hypotheses are formulated based on existing literature in the theoretical framework. These include the effects of upward and downward social comparison on prosocial behavior, the differences of this effect for age and gender and competitiveness as a potential mechanism. These hypotheses are tested via multiple analyses, based on the data collected via an experiment. In this experiment, respondents are shown relative performance rankings of their hypothetical group, whereafter the degree of prosocial behavior is determined based on a dictator game. After analyzing the data, the results show that downward social comparisons significantly decrease prosocial behavior. Moreover, the prosocial behavior of females is significantly higher than that of males. The relation of these findings to the previous literature, the limitations and the implications of the study are presented in the discussion section. Thereafter, the final conclusion is provided in the conclusion section.

2. Theoretical framework

Research suggests that individuals want to change their initial rank to a more favorable one, showing that relative performance rankings can lead to costly unethical behavior in reference groups (Charness et al., 2014). This signals that prosocial behavior is decreased when relative performance rankings come into play. Supporting this finding, literature of Riyanto and Zhang (2013) concludes that prosocial behavior, in the form of transferring money to others, significantly decreased if participants were shown their relative performance rankings. This can

mainly be explained by status concerns that might be exhibited by the allocators. Specifically, high-scoring allocators can believe that they had to work harder for the money than the unknown recipients and are therefore more deserving of the money. The literature thus suggests that there is a decreasing effect on prosocial behavior coming from relative performance rankings, leading to the first hypothesis:

H1: "Presenting individuals with relative performance rankings decreases their prosocial behavior towards others in their reference group."

Diving deeper into the first hypothesis, research suggests that upward and downward comparisons can have different effects on the prosocial behavior of individuals. For example, Van de Ven et al. (2010) finds that prosocial behavior in the form of helping others increases with downward comparisons, due to the fear of being envied otherwise. Also, Isen (1970) suggests that due to the feeling of "warm glow of success", individuals that make downward comparisons are more willing to help others. Furthermore, research on empathy in this realm also has interesting findings. Yip and Kelly (2013) namely find that both upward and downward comparisons decrease empathy and therefore decrease prosocial behavior. On the other hand, Zheng et al. (2015) find that empathy is increased by downward comparisons, leading to an increase in prosocial behavior only for downward comparisons. It is thus not completely clear whether the effect sizes of upward and downward comparisons differ on prosocial behavior and to what extent. However, research for the most part suggest that prosocial behavior is likely to increase for downward comparisons and to have an opposite effect for upward comparisons. This could lead to finding no significant effect for the first hypothesis, because of pooling the upward and downward social comparison treatment together. This namely only presents a partial picture with the potential of the two effects cancelling each other out. Therefore, the first hypothesis is further investigated by splitting it up into two separate hypotheses, where upward and downward social comparison are investigated separately compared to no social comparison. This leads to hypothesis 2a and 2b:

H2a: "Presenting individuals with a downward social comparison increases their prosocial behavior towards others in their reference group."

H2b: "Presenting individuals with an upward social comparison decreases their prosocial behavior towards others in their reference group."

Next to this, research suggests that prosocial behavior of individuals in general depends on their age. Older adults (above 25 years old) are found to have more empathic concern than younger adults (between 18 and 25 years old). Therefore, research expects older adults to be more prosocial, compared to younger adults, and indeed finds this result (Rosi et al., 2019). Similarly, Rieger and Mata (2013) conclude from the findings of the dictator game that older adults tend to reveal more prosocial behavior than younger adults. These findings are further supported by the research of Roalf et al. (2011) as they find in their study concerning a social-giving game, that older adults were more likely to make equitable divisions of money than younger adults. Taken these results into account, literature suggest that older adults are more likely to engage in prosocial behavior, compared to younger adults. It is therefore also expected that the prosocial behavior of individuals in a group also changes with age, thus leading to the third hypothesis:

H3: "Presenting individuals with relative performance rankings has a stronger effect on prosocial behavior for older adults (older than 25 years old) than for younger adults (between 18 and 25 years old)."

Additionally, research suggest that prosocial behavior is also affected by the gender of individuals. For example, research states that most are convinced, women are more concerned with others than men. Moreover, that men are more competitive and assertive than women (Spence & Buckner, 2000). Furthermore, following the gender roles, men are more concerned with striving to a higher hierarchical status when there is a difference in status between them and others, than women (Gardner & Gabriel, 2004). Further research in this realm shows that men behave more prosocial when they can gain or imply a higher status, while it is more common for women behave prosocial when there is more emphasis on the relational aspect, such as supporting another individual (Eagly, 2009). In addition, psychological research suggests that women engage more in helping behavior than men, as they are more sensitive to social cues when determining their appropriate behavior (Gilligan, 1982). Supporting research of Andreoni and Vesterlund (2001), shows that females are more concerned with an equal payoff between all parties, while males are primarily focused on maximizing efficiency. For example, when looking at a team dictator game, it is found that female majority groups give significantly more money to the fourth recipient than male majority groups (Dufwenberg & Muren, 2006). Additionally, other research utilizing the dictator game also finds that women, on average, give almost twice as much money to their recipient than men (Eckel & Grossman, 1998). As can be read from the above, the extent to which gender differences in prosocial behavior are present

depends partly on the context of the experiment. As the context of this experiment is giving money to others without being able to gain a better rank from this act, it is expected that females behave more prosocial than males. This leads to the fourth hypothesis:

H4: "Presenting individuals with relative performance rankings has a stronger effect on prosocial behavior of females compared to males."

As earlier mentioned, large companies use relative performance rankings to show to their employees. Herein, the relative performance ranking system is used as a system that "compares the performance of workers against their peers and uses the effect of competition in the workplace to incite workers to increase performance" (Green & Rahmani, 2021, p. 26). Companies thus want to achieve the feeling of competition between individuals by showing them relative performance rankings and therewith increase their performance. This thus indicates that the feeling of competition can be named a mechanism in this realm of social comparison and prosocial behavior as proposed in the introduction of this research. Far less research is known on this topic than on the other mechanisms such as the earlier mentioned empathy and "warm glow of success". However, Heursen (2019) finds that the feeling of competition arises from social comparison in a study among Swiss students. They said they felt more competitive when they were shown the relative performance rankings compared to when they were not. In addition, this result was also found in a study among students and experienced managers, even stating that both were willing to give up financial gains to obtain a better rank (Woike & Hafenbrädl, 2020). This is in line with the finding of Frank (1985) that concludes that individuals care a lot about their own relative standing compared to their peers. However, the interesting part here is that these studies also emphasize that this feeling of competition, which arises from social comparison, can have negative side effects on the prosocial behavior that individuals show. For example, the competition can break down the group morale as individuals only want to achieve a better rank themselves (Weaver, 2021). Next to that, Heursen (2019) hypothesizes that ranking concerns due to relative performance rankings can lower the motivation to help others to increase their performance. While Heursen (2019) in the end does not find a negative effect on the willingness to help others, there is still a strong suggestion that the feeling of competition could be a possible mechanism explaining the extent of prosocial behavior when relative performance rankings are shown. In order to test this, first it has to be measured if indeed individuals get the feeling of competition in their group from being showed the relative performance rankings, which leads to hypothesis 5a. Thereafter, it is evaluated if the feeling of competition serves as a mechanism in this realm, which leads to hypothesis 5b.

H5a: "Presenting individuals with relative performance rankings increases the competition they feel in their reference group, compared to when they are not shown relative performance rankings."

H5b: "The feeling of competition from the relative performance rankings serves as a mechanism for the extent to which individuals adhere to prosocial behavior towards others in their reference group."

3. Methodology

3.1 Experimental design and procedure

In order to investigate the effect of relative performance rankings on prosocial behavior in the reference group in the Netherlands, this research uses an experimental approach. The data for this research was collected via a survey, utilizing the online survey software Qualtrics. Approval for this research was received via the ethical thesis check before starting the data collection.

The experimental design consisted of six stages of which an overview is shown in Figure 1. More details on each stage are provided below, and the exact information given in the survey can be found in Appendix A.
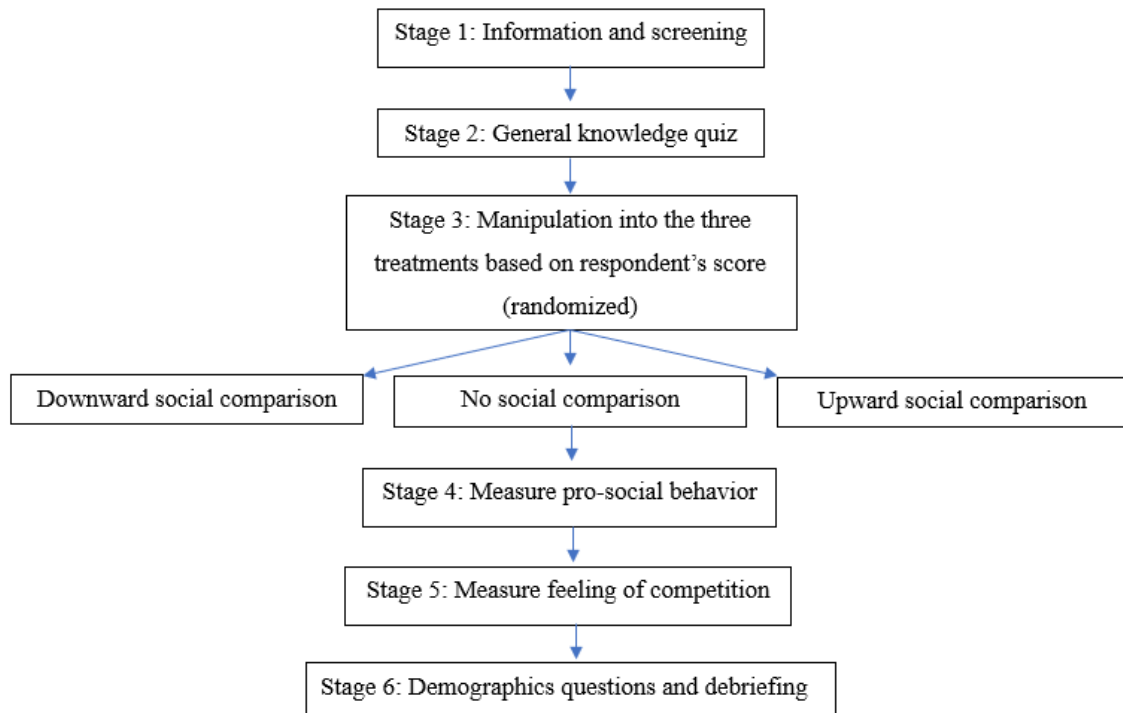
Figure 1. Overview of the six stages of the survey

Notes: Figure 1 shows an overview of the six stages that were executed in the survey. Each stage is indicated by the corresponding number and name.

The first stage operated as the screening and information stage. The respondents were informed that this survey was performed for a master's thesis, their answers would be handled with care and completely anonymous, they could quit the survey at any time if they did not want to continue and that it would take approximately six minutes to finish the survey. In addition, contact information was provided in case of questions and/or remarks. Furthermore, respondents were asked in this stage for their consent to participate in this research. In case no consent was given, the survey automatically stopped. In addition, the respondents were screened based on if they currently lived in the Netherlands, due to the nature of the research. Respondents were only redirected to the next stage if they answered "yes" and were otherwise automatically led to the end of the survey. This way, only the targeted sample continued answering the survey questions.

After this general information and screening, the respondents were provided with more detailed information on the experiment. This contained information that the study focused on behavior in groups and that they therefore had to imagine they were randomly allocated to a group with Person HYJ and KJH. These letter combinations were chosen rather than Person X

and Y or 1 and 2, as this was thought to sound less hypothetical to the respondents as ultimately it is important that respondents really empathize that they belong to a group with others. In addition, the respondents were informed they had to perform a general knowledge quiz in the next stage for which they would obtain a score, consisting of nine multiple-choice questions and one open question. It was also mentioned that each correct answer would add one point to their score and that they would have 20 seconds per question to answer. This time frame was chosen as this would overcome the potential risk of respondents looking on the internet for the correct answers to the questions.

After providing the respondents with all necessary information, they were redirected to the second stage where they had to perform the general knowledge quiz. This task was chosen as it results in a score for the respondent and therefore makes it possible to state relative performance rankings based on actual performance. However, it must be noticed that with a score of 0 (no correct answers), no downward comparison would be possible; and with a score of 10 (only correct answers), no upward comparison would be possible. Specifically, as a score of 0 cannot be compared to one that is worse off; and a score of 10 cannot be compared to one that is better off. Therefore, the questions for the general knowledge quiz were chosen in a way which made respondents obtaining the extreme scores very unlikely, based on the paper of Nelson and Narens (1980). This paper ranks 300 general knowledge questions based on their probability of recall for American undergraduates. Although, the sample differs from the targeted sample in this research, it is expected to give a better estimation of suitable questions than other resources. The nine multiple-choice questions were chosen based on a balanced set for probabilities of recall. Low and high probability of recall questions were chosen to avoid the extremes and the other questions had an average probability of recall. Table 1 in Appendix A presents the questions, the probabilities of recall and the corresponding correct answers. However, it must be noticed that these questions were assessed as open questions in the paper, while multiple-choice questions were used in the current research by adding wrong answer options. Therefore, there was a larger chance of respondents guessing the right answer by gambling in the current research, risking the extreme score of 10. Therefore, an additional question was added, which was an open question to make it extremely unlikely that any respondent obtained a maximum score of 10. The question stated: "How many bones does an adult human body contain?", with 206 being the correct answer. This question was chosen rather than an impossible question to make it more believable that the hypothetical group members potentially knew this for the relative performance rankings later in the survey.

After completing the general knowledge quiz, the respondents arrived at stage three, where the manipulation into the treatments took place by means of randomization. In total there were three treatments: no social comparison, upward social comparison and downward social comparison. The difference in treatment came from the different information the respondents received (Figure 2). The respondents that were randomly assigned to no social comparison were shown a message telling them their absolute score. Specifically, if they for example obtained a score of 7, the message stated: "Your score on the general knowledge quiz is: **7 out of 10**.", thus not comparing them to the others in their hypothetical group. The respondents that were randomly assigned to either upward or downward social comparison treatment were shown their relative performance rankings in their groups by means of a ranking. If for example looking at a score of 7, the message for the upward comparison was: "Your score on the general knowledge quiz is: **7 out of 10**. Below you see the ranking of your group: 1. Person HYJ with score: **10 out of 10**; 2. Person KJH with score: **9 out of 10**; **3. You with score: 7 out of 10.**". The message for the downward comparison was: "Your score on the general knowledge quiz is: **7 out of 10**. Below you see the ranking of your group: **1. You with score: 7 out of 10**; 2. Person HYJ with score: **2 out of 10**; 3. Person KJH with score: **1 out of 10**.". Thereafter, the respondents were asked to answer their rank in their group, choosing from the answer options "1", "2" and "3", to make sure they all read the information properly. In order to make sure that it was clear to the respondent in which direction their comparison went, extreme scores for the hypothetical others in the group were chosen to be shown. Specifically, as can for example be seen above when scoring a 7, the others hypothetically scored a 9 and 10 out of 10 in the upward comparison, rather than for example two times a score of 8. As the distances between the scores of the members of the group were larger this way, it was more likely that the respondents really made the upward and downward comparisons that they were supposed to make in order for the treatment to work. In the extreme case a respondent obtained a score of 10 and was assigned to the upward social comparison treatment or a score of 0 and was assigned to the downward social comparison treatment, the respondent was assigned to the absolute treatment as the original assigned treatment was impossible. However, as the questions were selected with care, this did not cause any major differences in group sizes as these cases rarely occurred.
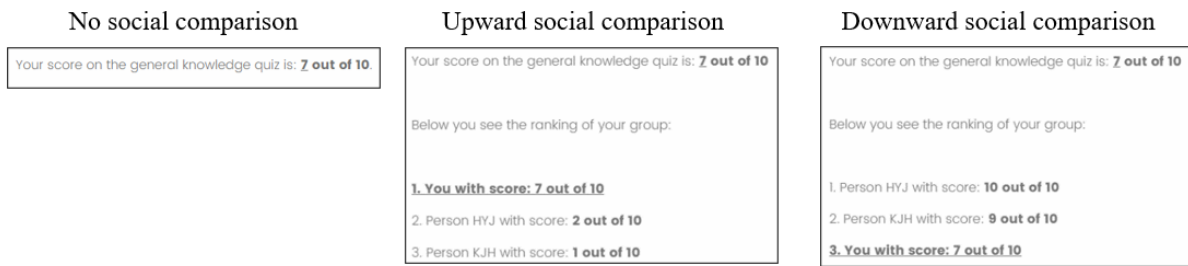
No social comparison	Upward social comparison	Downward social comparison
Your score on the general knowledge quiz is: **7 out of 10**.	Your score on the general knowledge quiz is: **7 out of 10** Below you see the ranking of your group: **1. You with score: 7 out of 10** 2. Person HYJ with score: **2 out of 10** 3. Person KJH with score: **1 out of 10**	Your score on the general knowledge quiz is: **7 out of 10** Below you see the ranking of your group: 1. Person HYJ with score: **10 out of 10** 2. Person KJH with score: **9 out of 10** **3. You with score: 7 out of 10**

Figure 2. Respondent information for the three treatment conditions

Notes: Figure 2 shows the respondent information for the three treatment conditions in the case a respondent obtained a score of 7 on the general knowledge quiz. The information was extracted from the survey software Qualtrics.

After the manipulation into the three treatments, the respondents arrived at stage four. In this stage the dependent variable for prosocial behavior was measured. In order to do so, the dictator game was played. Each respondent was informed that at the end of the research, three people were randomly chosen to receive 10 euros and that the winners could decide to what extent they wanted to split the money with their group members. This acts as an incentivized lottery making the choice of the respondents less hypothetical, as they could actually win the money, they had to make a decision about. The respondents were also informed that this money would actually be split like they indicated amongst them and respondents of the survey that resembled Person HYJ and Person KJH. Then it was asked how the respondent would divide the money if he/she was a lucky winner. This led to the outcome variable for prosocial behavior, namely the added amount given away to the two group members.

In order to act upon the promise in the survey, three winners were actually chosen to receive the amount they kept to themselves. The amount they decided to give away to others was given to respondents in the survey that decided to keep this amount. For example, imagine that Person X wanted to keep 5 euros and give 2.5 euros to both Person HYJ and KJH. Person Y and Person Z both wanted to keep 2.5 euros and give 7.5 euros to Person HYJ and Person KJH. In this case, Person X was randomly chosen to be the lucky winner, so he/she received 5 euros and Person Y and Z both received 2.5 euros.

The dictator game was chosen in this research as previous literature, such as the work of Rieger and Mata (2013) validated this game to measure prosocial behavior. However, as already mentioned in the introduction, one remark of this paper was that the high-scoring individuals kept more money to themselves than low-scoring individuals, as they were

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convinced that they had to "work harder for the money". In order to overcome this potential problem in this research, it was made very clear to the respondents that the choice of becoming "the dictator" or in case of the research "the lucky winner" was completely random and not correlated with their score on the quiz.

Then moving on to the fifth stage in which the dependent variable for the feeling of competition was measured. Utilizing insights from the research of Heursen (2019), the respondents were asked to indicate to what extent they agreed/disagreed with the following statement: "I felt in competition with the other two members of my group.". For this purpose, a 5-point Likert scale was used (Likert, 1932), ranging from strongly disagree to strongly agree.

Lastly, in the final stage, the respondents were asked to answer some questions on demographics to serve as control variables. Specifically, their age, gender and educational attainment. These control variables were chosen as they were expected to influence the outcome variables. In addition, participants could leave their e-mail addresses in this stage to potentially become one of the three lucky winners of the lottery. However, it was clearly stated that this was not a necessary step. After this last question of the survey, the respondents were shown a debriefing message to thank them. This message also included more information on the purpose of the research. In addition, the contact details were shown once again to give the respondents the opportunity to ask questions or state remarks.

3.2 Data collection and sample

The survey was distributed via multiple social media channels to obtain a decently balanced sample in terms of characteristics. Specifically, WhatsApp, LinkedIn and Facebook were utilized. It was chosen to distribute the survey online, as this was the most efficient way to gain a large enough sample for obtaining meaningful results. As previous literature did not state clear effect sizes, the optimal sample size could not be calculated via G-power. However, as previous related studies aimed at approximately 200 respondents, this number was also chosen as the objective for this study. The survey was available both in English and Dutch. This gave the respondents the opportunity to complete the survey in their preferred language. The full survey and the survey link can be consulted in Appendix A.

As stated in the research question, the target group contains of individuals that currently live in the Netherlands and are above the age of 18 years old due to legal constraints. As furthermore no specific target group was addressed within the Dutch population, diverse groups

can be compared. As a result, the findings can ideally be generalized to the whole Dutch population due to the variety of respondents.

In total, there were 222 responses to the survey. However, three respondents did not give their consent to continue in the research. Furthermore, five respondents did not currently live in the Netherlands and another six respondents did not completely finish the survey. These respondents were omitted and resulted in a final data set consisting of 208 responses. The discarded responses were, on average, similar across the three treatments, resulting in a sample size of 73 respondents for no social comparison, 66 respondents for upward social comparison and 69 respondents for downward social comparison. The average age of the respondents was 32.41 years old, with a minimum age of 18 and a maximum age of 73 years old. In addition, 38.94% of the sample was male and thus 61.06% of the sample was female. Furthermore, the majority of the respondents (46.15%) had WO (university) as their highest/current educational level. In addition, 33.65% had an applied university degree, 15.38% had a secondary vocational degree and only 4.81% of the respondents had a high school degree as their highest/current educational level.

3.3 Variables

The outcome variables of this research are *prosocial behavior* and *competitiveness*, which indicate the level of prosocial behavior and feeling of competition from the showing respondents the relative performance rankings. The variable *treatment* shows if a respondent was exposed to social comparison (*treatment=1*) or was not exposed to social comparison (*treatment=0*). Furthermore, the variable *all treatment*, indicates if a respondent was either in the no treatment group (*all treatment=0*), in the upward social comparison treatment (*all treatment=1*) or in the downward social comparison treatment (*all treatment=2*). This treatment variable allows for a more nuanced analysis considering all three possible groups and is therefore used in the vast majority of analyses. Additionally, the control variables in this research are *age, gender, education* and *score*. These control variables are added to the analyses to increase the explanatory power. The outcome and control variables are explained in more detail below.

3.3.1 Outcome variables

The variable *prosocial behavior* indicates to what extent people adhere to prosocial behavior by means of giving money to others. This variable was created by having the respondents participate in a dictator game with 10 euros, wherein they were asked how much money they wanted to give away to their two group members. The amounts given by the respondent were then added up to form this variable. A higher amount of money given away to group members indicates a higher level of prosocial behavior for that individual. In addition, the variable *competitiveness* indicates to what extent the respondent felt competition towards their group members. The answer options ranged from "strongly disagree" to "strongly agree". These answer options were allocated the following values to make them useful outcomes for the analysis: "strongly disagree": 0, "somewhat disagree": 1, "neither agree nor disagree": 2, "somewhat agree": 3, "strongly agree": 4.

3.3.2 Control variables

The variable *age* is continuous and shows the age of the respondents in years. Furthermore, the variable *female* indicates the gender of the respondents, by taking the value 0 if the respondent is male (*female=0*) and taking the value of 1 if the respondent is female (*female=1*). The survey also included the option "prefer not to say", however this option was not chosen by any of the respondents, thus no taken into account. In addition, the variable *education* shows the highest obtained/current educational level of the respondents. The respondents could choose from the following four options: "high school", "middle vocational education", "higher vocational education" and "university". These options were assigned values from 0 to 3 to make them easier to use in the data analysis, ranging from 0 for the lowest educational level ("high school") and 3 for the highest educational level ("university"). Lastly, the variable *score* indicates the respondent's score on the general knowledge quiz. This variable is continuous and can take any value from 0 (minimum score) to 10 (maximum score). The descriptive statistics for the outcome and control variables can be consulted in Table 1.

Table 1. Descriptive statistics of the main variables

Variable	No. Observations	Mean	Std. deviation	Minimum	Maximum
Outcome variables					
Prosocial behavior	208	4.916	3.298	0	10
Competitiveness	208	1.202	1.303	0	4
Control variables					
Age	208	32.409	14.898	18	73
Female	208	0.611	0.489	0	1
Education	208	2.212	0.876	0	3
Score	208	5.808	1.669	2	10

Notes: Table 1 shows the descriptive statistics of the main variables for the data analysis. The columns represent the variable, number of observations, mean, minimum and maximum, respectively. The variables *female* and *education* are represented as proportions. All other variables are continuous.

3.4 Analysis strategy

As a first step in the data analysis, it is checked if the randomization of the sample into the three treatments worked properly. This randomization check is executed by running multiple Kruskal Wallis tests for different variables to check if there were statistically significant differences between the three groups before the treatment. If the Kruskal Wallis tests all show a p-value greater than 0.05, it can be concluded that the randomization worked properly as all groups did not statistically significantly differ in characteristics before the treatment. Specifically, the null hypothesis of the difference in medians being zero, cannot be rejected. If this is the case, the groups can be compared to assess the treatment effect.

This Kruskal Wallis test is also used to test the hypothesis together with the Mann Whitney U test. More specifically, these tests are used in order to assess if there is a statistically significant difference between the groups that are analyzed in the hypotheses. The Mann Whitney U test is used when the differences between two groups are being investigated, while the Kruskal Wallis test is used when the differences between three groups are investigated like mentioned above for the randomization check. The assumptions for these nonparametric tests are all satisfied. Specifically, the assumption of independent observations as the occurrence of one observation does not influence another observation. Additionally, the data is drawn from an underlying continuous distribution. However, the downside of using these tests is that these nonparametric tests have less power than parametric tests. Therefore, in order to identify the sign and magnitude of the difference, if there is a statistically significant difference, a multiple

linear regression is executed. The assumptions related to this parametric test that need to be satisfied are no selection bias, linearity in parameters, no perfect collinearity, homoscedasticity, normality and the zero conditional mean assumption. There is no selection bias as the respondents were randomly assigned to one of the three treatments, so this assumption is satisfied. Furthermore, the models for all hypotheses testing are linear in parameters and there is no perfect collinearity as none of the independent variables are constant and there are no exact relationships amongst them. In addition, the assumption of homoscedasticity and normality for inference are also satisfied. Specifically, as heteroscedasticity-robust standard errors are used in all regressions and a large enough sample was obtained for the distribution to be approximately normal. Lastly, the zero conditional mean assumption, which implies that the error term must be zero for all values of X, is expected to hold. However, it could be that omitted variable bias arises, but this is not expected due to the relevant variables that were added as controls to the models and due to the experimental nature of the data.

In order to test the first hypothesis, if presenting individuals with relative performance rankings decreases their prosocial behavior towards others in their reference group, first a Mann Whitney U test is executed. This test shows whether there is a statistically significant difference in prosocial behavior between the group with and without relative performance rankings. If a statistically significant difference is found, a multiple linear regression is executed to determine the sign and magnitude of the difference. The outcome variable in this regression is *prosocial behavior*. The independent variables are *treatment* and all control variables. This results in the following formula:

$$Prosocial\ behavior_i = \beta_0 + \beta_1 Treatment_i + \sum_{j=1}^{4} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where $Control\ variable_j$ for $j = 1, \ldots, 4$ represents the four control variables: *age*, *female*, *education* and *score*. In order to increase the explanatory power, these control variables are used in all subsequent regressions, if not stated otherwise.

If the Mann Whitney U test shows a p-value smaller than 0.05, the null hypothesis of the groups being equal can be rejected, showing there is evidence of a statistically significant difference between the two groups. Then, if a negative statistically significant coefficient for *treatment* is found, it can be concluded that, on average, if individuals are exposed to social comparison (either upward or downward), their prosocial behavior towards others in their reference group decreases compared to not being exposed to social comparison, ceteris paribus.

For testing hypothesis 2a and 2b, if the prosocial behavior of individuals increases with downward social comparisons and decreases with upward social comparisons, compared to no social comparison, a Kruskal Wallis test is firstly executed. This test reveals whether the level of prosocial behavior significantly differs between the three groups. If evidence of a statistically significant difference is found, a multiple linear regression is executed to assess the sign and magnitude of the difference. The dependent variable in this regression is *prosocial behavior*, the independent variables are *all treatment,* which has no treatment as the baseline category, and all control variables. This results in the following formula:

$$Prosocial\ behavior_i$$
$$= \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$
$$+ \sum_{j=1}^{4} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where $Control\ variable_j$ for j = 1, …, 4 represents the four control variables: *age*, *female*, *education* and *score*.

If the Kruskal Wallis test shows a p-value smaller than 0.05, this indicates that there is a statistically significant difference in prosocial behavior between the three groups. Then, if a positive statistically significant coefficient is found for *upward comparison*, this indicates that, on average, if individuals are exposed to upward social comparison, they show more prosocial behavior towards others in their reference group compared to individuals that were not exposed to treatment, ceteris paribus. The same reasoning holds if a positive statistically significant coefficient is found for *downward comparison*.

Furthermore, as this effect is now only studied at the intensive margin, with the amount of money given to others as the indicator of prosocial social behavior, it is also interesting to see the effects at the extensive margin. Specifically, as this allows to obtain a more nuanced examination of the effects. Specifically, by investigating the differences of giving money to others or not in the three groups. For this purpose, a new variable: *donated* was created taking the value 0 if a respondent did not donate any of the money to one another in their group (*donated=0*) and taking the value 1 if the respondent did donate any amount to one another in their group (*donated=1*). In order to investigate the differences, a bar graph based on means is created, showing the mean of the variable *donated* for each group. Thereafter, a probit regression model is executed to assess the statistical significance. This regression resembles the following:

$$Donated_i = \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$

$$+ \sum_{j=1}^{4} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where *Control variable$_j$* for j = 1, ..., 4 represents the four control variables: *age*, *female*, *education* and *score*.

In order to test the third hypothesis, if exposing older adults (above 25 years old) to social comparison has a stronger effect on their prosocial behavior than younger adults (between 18 and 25 years old), a new variable: *older adults* was created. This variable indicates if the respondent was between the age of 18 and 25 (*older adults=0*) or above 25 years old (*older adults=1*). For this analysis it is again chosen, as in the second hypothesis, to represent the full picture, thus comparing the three groups: no treatment, upward and downward social comparison. Therefore, a multiple linear regression is executed including an interaction term of *all treatment* and *older adults*. This allows to see the different effect on prosocial behavior for the different treatment exposures by the different age groups. All control variables excluding *age* are added to the regression. This results in the following formula:

$$Prosocial\ behavior_i$$
$$= \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$
$$+ \beta_3 Older\ adults_i + \beta_4 Upward\ comparison \cdot Older\ adults_i$$
$$+ \beta_5 Downward\ comparison \cdot Older\ adults_i$$
$$+ \sum_{j=1}^{3} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where *Control variable$_j$* for j = 1, ..., 3 represents the three remaining control variables: *female*, *education* and *score*.

If β_4 is found to be a positive statistically significant coefficient, this indicates that, on average, older adults show more prosocial behavior towards others in their reference group then younger adults, when being exposed to the upward social comparison treatment, ceteris paribus. In addition, following the same reasoning, if β_5 is found to be a positive statistically significant coefficient, this indicates that, on average, older adults show more prosocial behavior towards others in their reference group than younger adults, when being exposed to the downward social comparison treatment, ceteris paribus.

For testing the fourth hypothesis, a similar approach is used as for hypothesis three. However, the interaction term with *all treatment* is now replaced by the variable *female* rather than *older adults*. All control variables excluding *female* are added to the regression. This leads to the following formula:

$$Prosocial\ behavior_i$$
$$= \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$
$$+ \beta_3 Female_i + \beta_4 Upward\ comparison \cdot Female_i$$
$$+ \beta_5 Downward\ comparison \cdot Female_i + \sum_{j=1}^{3} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where *Control variable$_j$* for j = 1, …, 3 represents the three remaining control variables: *age*, *education* and *score*.

If β_4 is found to be a positive statistically significant coefficient, this indicates that, on average, females show more prosocial behavior towards others in their reference group then males, when being exposed to the upward social comparison treatment, ceteris paribus. In addition, if β_5 is found to be a positive statistically significant coefficient, this indicates that, on average, females show more prosocial behavior towards others in their reference group than males, when being exposed to the downward social comparison treatment, ceteris paribus.

In order to test hypothesis 5a, if exposing individuals to social comparison increases their feeling of competitiveness in their reference group, a Kruskal Wallis test is executed to see if there is a statistically significant difference in the feeling of competitiveness in the three groups: no treatment, upward and downward social comparison. If a statistically significant difference is found, a multiple linear regression is executed to assess the sign and magnitude of the difference. The dependent variable in this regression is *competitiveness* and the independent variables are *all treatment* and all control variables. This results in the following formula:

$$Competitiveness_i$$
$$= \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$
$$+ \sum_{j=1}^{4} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where *Control variable$_j$* for j = 1, …, 4 represents the four control variables: *age*, *female*, *education* and *score*.

If the Kruskal Wallis test shows a p-value smaller than 0.05, this indicates that there is a statistically significant difference in competitiveness between the three groups. Then, if a positive statistically significant coefficient is found for *upward comparison*, this indicates that, on average, individuals that were exposed to upward social comparison have a higher feeling of competitiveness in their reference group compared to individuals that were not exposed to treatment, ceteris paribus. The same reasoning holds if a positive statistically significant coefficient is found for *downward comparison*.

Then finally for testing the last hypothesis 5b, if the feeling of competitiveness serves as a mechanism for the extent to which individuals adhere to prosocial behavior towards others in their reference group, a mediation analysis is executed (Baron & Kenny, 1986). This mediation analysis consists of three sets of regressions. The first regression is to investigate whether the treatment (*all treatment*) affects the outcome variable (*prosocial behavior*). This regression is already executed in the second hypothesis, so these results are utilized. The second regression is to investigate if the treatment (*all treatment*) has an effect on the mediator (*competitiveness*). This regression is already executed for hypothesis 5a, so these results are utilized. Then the final regression is to investigate whether the effect of the treatment (*all treatment*) is smaller than before or not statistically significant if the mediator (*competitiveness*) is added to the first regression. This leads to the following formula:

$$Prosocial\ behavior_i$$
$$= \beta_0 + \beta_1 Upward\ comparison_i + \beta_2 Downward\ comparison_i$$
$$+ \beta_3 Competitiveness_i + \sum_{j=1}^{4} \gamma_i Control\ variable_{ji} + \varepsilon_i$$

Where $Control\ variable_j$ for $j = 1, \ldots, 4$ represents the four control variables: *age*, *female*, *education* and *score*.

If the effect of the treatment is smaller than before or statistically insignificant in this regression, it can be concluded that competitiveness serves as a mechanism for prosocial behavior. However, if the regression from the second hypothesis yields no statistically significant result, the mediator (*competitiveness*) is concluded to just be a third variable that may or may not be associated with prosocial behavior.

4. Results

4.1 Randomization check

The first main step in the data analysis was to check if the randomization into the three treatment groups worked properly. Specifically, it was checked if the groups only differed with respect to the treatment, on average, to make sure that possible treatment effects could be correctly assigned to the treatments instead of to differences a priori. In order to verify if this randomization worked properly, a Kruskal Wallis test was run for all control variables: age ($\chi^2(2)$= 2.709, p= 0.258), female ($\chi^2(2)$= 1.788, p= 0.409), education ($\chi^2(2)$= 0.488, p= 0.784) and score ($\chi^2(2)$= 0.125, p= 0.939). The results all showed p-values greater than 0.05, indicating that the null hypothesis of the difference in medians being zero, could not be rejected. It could therefore be concluded that the three groups were not statistically significantly different from each other before the treatment and thus the randomization worked. As a consequence, the three groups could be compared in order to assess the treatment effects.

4.2 The effect of social comparison on prosocial behavior

This section presents the results regarding the effect of social comparison on prosocial behavior of individuals towards others in their reference group. Firstly, this effect was addressed combining upward and downward social comparison into one group, called treatment group, and comparing this group to the no treatment group. A Mann Whitney U test was performed to evaluate whether prosocial behavior differed by the treatment. The results of this test indicated that there was no statistically significant difference between the prosocial behavior of the treatment group and the no treatment group (z= 1.184, p=0.237). This result is visually presented by a boxplot (Appendix B Figure 1), showing that the medians of both groups were at the same level. More intuitively, the bar graphs in Figure 3 show that the mean of the social comparison treatment group is lower than the no treatment group, however, the standard deviation error bars overlap almost completely. This gave an indication that the difference was not statistically different, which was supported by the results of the Mann Whitney U test. As no statistically significant difference between the two groups was found, no further analysis was performed. It can be concluded that the first hypothesis, whether showing individuals relative performance rankings decreases their prosocial behavior compared to when individuals are not shown relative performance rankings, can be rejected as no statistically significant results were obtained.
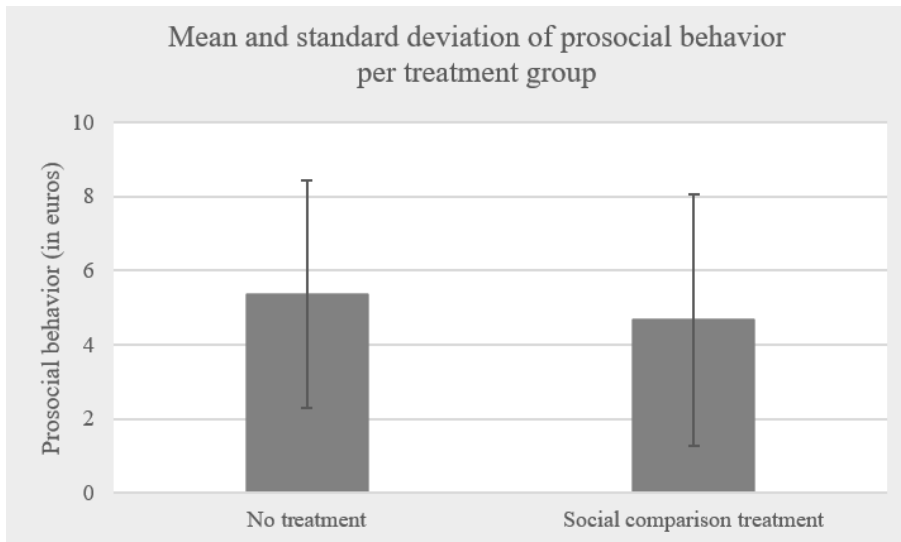
Figure 3. Mean and standard deviation of prosocial behavior per treatment group

Notes: Figure 3 shows the bar graph for *prosocial behavior* for the no treatment group (=0) and the treatment group (=1), respectively. The bar graphs show the mean of each group together with the standard deviation indicated by the standard deviation error bar.

As discussed in the theoretical framework, it could be the case that a statistically insignificant effect for the first hypothesis could be due to the possible opposite effect of upward and downward social comparisons. The analysis was therefore expanded by splitting the pooled treatment group into an upward and downward treatment group. Specifically, as this analysis presents the full picture, where is it not possible to find a statistically insignificant effect because of two effects cancelling each other out. In order to see if the three groups: no treatment, upward and downward social comparison differed with respect to prosocial behavior, a Kruskal Wallis test was executed. The results of this test showed a statistically significant difference in prosocial behavior between the three groups ($\chi^2(2)$= 14.113, p= 0.001). This result is visually presented by a boxplot (Appendix B Figure 2), showing that the no treatment group and the upward social comparison group resemble in terms of medians, while the downward social comparison group shows a different median. More intuitively, the bar graphs of the three groups are presented in Figure 4.
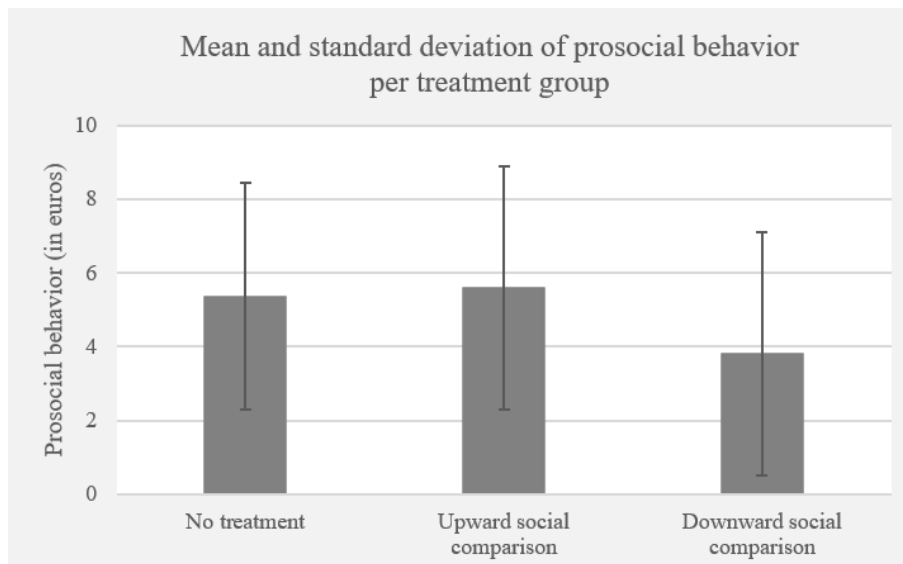
Figure 4. Mean and standard deviation of prosocial behavior per treatment group

Notes: Figure 4 shows the bar graph for *prosocial behavior* for the no treatment group (=0), the upward social comparison group (=1) and the downward social comparison group (=2), respectively. The bar graphs show the mean of each group together with the standard deviation indicated by the standard deviation error bar.

As can be noticed from Figure 4, the bar graphs of the no treatment group and the upward social comparison group resemble in terms of means and the standard deviation error bars overlap almost completely. The downward social comparison group, on the other hand, shows a different result. A smaller mean is presented, along with a standard deviation error bar that shows less overlap with the other two groups. To further investigate this difference, two Mann Whitney U tests were performed. One where the no treatment group was compared to the upward social comparison group ($z = -0.971$, $p = 0.332$), showing that there is no statistically significant difference between these groups. On the other hand, the other Mann Whitney U test, where the no treatment group was compared to the downward comparison group ($z = 2.950$, $p = 0.003$), shows that there is a statistically significant difference between these groups. As statistically significant results were found from both nonparametric tests, a multiple linear regression was executed to dive deeper into this result. To check the robustness of the results to including covariates, the regression model was both run with and without control variables. The estimated impact between both models was relatively similar, however, the inclusion of the control variables in the latter regression caused the standard errors to diminish. Therefore, it was chosen to only present the results of the full model including the control variable, these results can be consulted in Table 2. From the results in Table 2 it becomes clear that, on average,

being in the downward social comparison group decreases the respondent's prosocial behavior by 1.53 euros, compared to when being in the no treatment group, ceteris paribus. This effect is statistically significant at the 5% significance level. This effect is economically relevant, as 1.53 euros is a noteworthy difference in prosocial behavior given that the total amount to be divided was only 10 euros.

Consequently, hypothesis 2a, that the prosocial behavior of individuals increases when being exposed to downward social comparison, can be rejected as the results show that in fact the prosocial behavior decreases significantly. As no statistically significant effect was found for being in the upward social comparison group compared to the no treatment group, there is not enough evidence to not reject hypothesis 2b. Therefore, hypothesis 2b is thus also rejected.

Table 2. Regression results for prosocial behavior

	(1) Prosocial behavior
Upward comparison	0.293
	(0.541)
Downward comparison	-1.530***
	(0.535)
Age	0.00724
	(0.0178)
Female	0.793*
	(0.459)
Education	-0.310
	(0.281)
Score	0.145
	(0.145)
Constant	4.457***
	(1.386)
Observations	208
R-squared	0.084

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The variable *all treatment* is presented in the table by "upward comparison" and "downward comparison" and has "no treatment" as the baseline category.

The fact that only a statistically significant result was found for the downward social comparison group is not surprising if Figure 4 would be consulted again. More specifically, the means for the upward social comparison group and the no treatment group are remarkably close

with almost completely overlapping standard deviation error bars, while the mean for the downward social comparison group is further away and has a less overlapping standard deviation error bar. Given that this analysis shows a difference between upward and downward social comparison treatment, all subsequent analyses make use of this more nuanced analysis of not pooling the treatment too.

Diving deeper into this effect of the treatment (split in upward and downward social comparison) on prosocial behavior, it was also studied based on the extensive margin to see if this resulted in different conclusions. This was executed by looking at if the respondent donated (*donated*=1) or not (*donated*=0). The means per treatment group of the variable *donated* are visually presented in Figure 5. This figure shows that the means of the no treatment group (0.808) and upward social comparison groups (0.803) are remarkably close, while the mean of the downward social comparison treatment (0.667) is lower, together with a standard deviation error bar that is less overlapping then the other two standard deviation error bars. This aligns with the above-mentioned conclusions. Specifically, there is only an effect for the downward social comparison treatment compared to no treatment and this effect is negative. However, the probit regression (Appendix B Table 1) yielded no statistically significant results at the 5% significance level, consequently no further conclusions were drawn from this analysis.
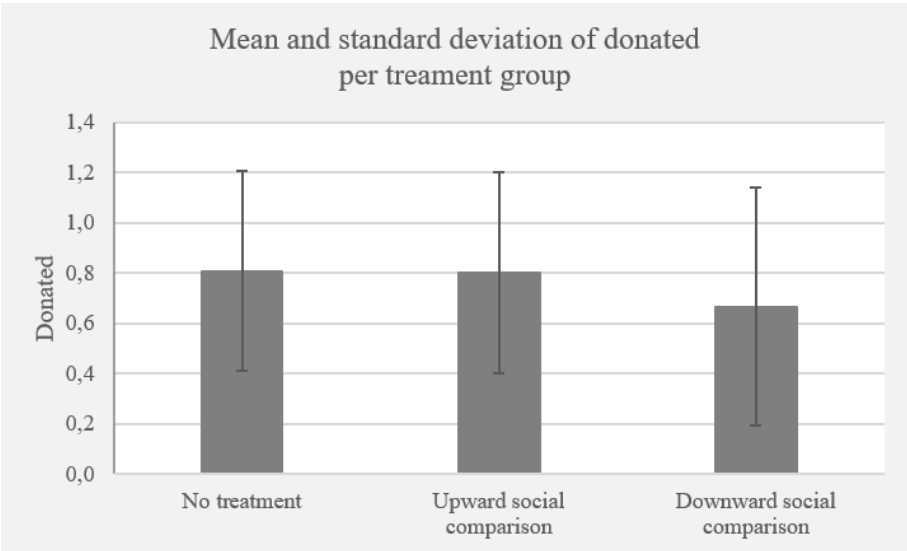

Figure 5. Bar graphs of the means of donated per treatment group

Notes: Figure 5 shows the bar graph for *donated* for the no treatment group (=0), the upward social comparison group (=1) and the downward social comparison group (=2), respectively. The bar graph shows the mean of each group together with the standard deviation indicated by the standard deviation error bar.

4.3 The effect of social comparison on prosocial behavior based on demographics

This section provides insights in the effect of social comparison based on age and gender. Firstly, age was investigated by making a distinction between older adults (above 25 years old) and younger adults (between 18 and 25 years old). The results of the associated regression can be found in Table 3. For this regression again, the robustness of the results to including covariates was checked by running the regression model both run with and without control variables. Similarly, the estimated impact between both models was relatively equal, but the inclusion of the covariates reduced the standard errors. Therefore, it was also chosen for this case to only present the results of the full model including the control variables. Table 3 shows no statistically significant effects for prosocial behavior based on age, at the 5% level, thus not allowing for further analysis. As no evidence was found for a statistically significant effect, the third hypothesis, if presenting relative performance rankings to older adults has a stronger effect on prosocial behavior than for younger adults, is rejected.

Table 3. Regression results for prosocial behavior

	(1) Prosocial behavior
Upward comparison	0.532
	(0.661)
Downward comparison	-1.270*
	(0.683)
Older adults	0.869
	(0.733)
Upward comparison * Older adults	-0.451
	(1.127)
Downward comparison * Older adults	-0.538
	(1.095)
Female	0.844*
	(0.460)
Education	-0.234
	(0.274)
Score	0.144
	(0.145)
Constant	4.088***
	(1.230)
Observations	208
R-squared	0.090

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The variable *all treatment* is presented in the table by "upward comparison" and "downward comparison" and has "no treatment" as the

baseline category. The variable *older adults* has younger adults (between 18 and 25 years old) as the baseline category.

Then moving on to the effect of gender on prosocial behavior. The results of the associated regression can be consulted in Table 4. Following the same reasoning as for hypothesis two and three, here it was also chosen to only present the results of the full model including the control variables. In contrast to the effects of age on prosocial behavior, there seems to be an effect of gender on prosocial behavior. Specifically, the coefficient for downward comparison is statistically significant at the 5% significance level, implying that, on average, prosocial behavior decreases by 2.70 euros if the individual was exposed to the downward comparison compared to no treatment, ceteris paribus. This reflects the same effect as has been found for the second hypothesis. However, the table also shows that the coefficient for the interaction term of upward comparison and female is statistically significant at the 5% level. It can thus be concluded that, on average, the prosocial behavior increases by 2.18 euros if an individual is female compared to male, when being exposed to the upward social comparison, ceteris paribus. This effect is economically relevant, as 2.18 euros is a noteworthy difference in prosocial behavior given that the total amount to be divided was only 10 euros. As the interaction effect for the downward social comparison is statistically significant at the 10% significance level, but not at the 5% significance level, insufficient evidence is collected to not reject the fourth hypothesis. Therefore, the fourth hypothesis, whether presenting relative performance rankings to females has a stronger effect on prosocial behavior than for males, is rejected. However, the result that females significantly increase their donation amount compared to males in the upward social treatment, is interesting and should be considered.

Table 4. Regression results of prosocial behavior

	(1) Prosocial behavior
Upward comparison	-1.002
	(0.876)
Downward comparison	-2.701***
	(0.841)
Female	-0.510
	(0.711)
Upward comparison * Female	2.178**
	(1.096)
Downward comparison * Female	1.837*
	(1.090)
Age	0.00666
	(0.0177)
Education	-0.291
	(0.290)
Score	0.159
	(0.150)
Constant	5.173***
	(1.474)
Observations	208
R-squared	0.104

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The variable *all treatment* is presented in the table by "upward comparison" and "downward comparison" and has "no treatment" as the baseline category. The variable *female* has male as the baseline category.

4.4 Competitiveness as the mechanism for prosocial behavior

This section discusses the feeling of competitiveness towards others in the reference group, due to being exposed to relative performance rankings, as a possible mechanism for prosocial behavior. In order to investigate this effect a mediation analysis was performed. Firstly, the treatment (upward and downward social comparison) should affect the outcome variable (prosocial behavior). As can be noticed from Table 2, only downward treatment has a statistically significant effect on prosocial behavior. As it is not possible to have a mediation effect if there is no statistically significant effect of the treatment on the outcome, which is the case for upward social comparison, the rest of the analysis was focused on the downward comparison treatment.

Next to the effect of the treatment on the outcome variable, there should also be an effect of the treatment on the mediator (competitiveness). Therefore, hypothesis 5a was investigated.

In order to see if there was a statistically significant difference in competitiveness between the groups, a Kruskal Wallis test was performed. The results of this test showed that there was no statistically significant difference in competitiveness between the three groups ($\chi^2(2)= 2.119$, $p= 0.347$). Also, when performing a Mann Whitney U test including only the no treatment group and the downward social comparison group, no statistically significant difference was observed ($z= -0.730$, $p= 0.466$).

It can thus be concluded that hypothesis 5a, if exposing individuals to social comparison increases their feeling of competitiveness in their reference group, can be rejected. The feeling of competitiveness is just a third variable that may or may not be associated with prosocial behavior. Therefore, hypothesis 5b, if the feeling of competitiveness serves as a mechanism for prosocial behavior through treatment, is also rejected.

5. Discussion

The current study examined the impact of social comparison on the prosocial behavior of individuals towards others in their reference group. The data was collected by means of an experiment. Specifically, respondents completed a general knowledge quiz from which they obtained a score and were thereafter randomly assigned to one of the three treatments: no social comparison, upward social comparison or downward social comparison. In order to accommodate these social comparisons, either upward or downward, the respondents were shown relative performance rankings based on their own score and the score of the two others of their hypothetical group. The no treatment group was only shown their own score and no relative performance rankings. Thereafter, the prosocial behavior of the respondents was measured by means of a dictator game. With this data, different tests and regressions were executed to form conclusions on the relationship between social comparison and prosocial behavior. The main findings are presented in the next section.

5.1 Main findings and their relation to previous literature

The results of the data analysis show that if the effect of social comparison on prosocial behavior is investigated based on the pooled upward and downward social comparison, no statistically significant effect is obtained. This contradicts the expectations of there being a decrease in prosocial behavior when relative performance rankings are shown, as found by

Charness et al. (2014) and Riyanto and Zhang (2013). Specifically, Charness et al. (2014) show that relative performance rankings can lead to costly unethical behavior towards the reference group. In addition, Riyanto and Zhang (2013) show that because of status concerns, individuals transfer less money to others when being exposed to relative performance ranking compared to when they are not. The discrepancy in results can mainly be explained by the fact that both papers do not make a clear distinction between upward and downward social comparison. As the papers mention, individuals are more likely to make upward, rather than downward social comparisons. The reason for this is that individuals most of the time choose to make comparisons to others that are slightly better off, as more lessons can be taken from this in their self-evaluations. However, as the papers also mention, this can lead to negative emotions because of the feeling of inferiority and therewith lead to decreasing prosocial behavior towards others. It thus has to be mentioned that although these papers do not make a clear distinction between upward and downward social comparisons, it is more likely that the results were driven by upward social comparisons. This gives a possible explanation for why these papers do find statistically significant results, thus mostly based on upward social comparisons, and the current paper does not find any statistically significant results. Specifically, in the current study, both downward and upward social comparisons were forced, leaving the possibility for the effects to possibly cancel out each other. For this exact reason it was chosen in the current study to investigate the results of upward and downward social comparison separately, allowing for more detailed results.

As discussed, the effect of social comparison on prosocial behavior was further investigated by making a distinction between upward and downward social comparison instead of pooling them together. The findings show that a statistically significant effect on prosocial behavior was found when taking the downward social comparisons into account. Specifically, it was found that, on average, being in the downward social comparison group decreased the respondent's prosocial behavior by 1.53 euros, compared to when being in the no treatment group, ceteris paribus. Based on the previous literature (Van de Ven et al., 2010; Isen, 1970; Zheng et al., 2015), it was expected to find the opposite result, namely that downward comparisons would lead to an increase in prosocial behavior. One possible explanation for this follows the reasoning of Yip and Kelly (2013). Their research finds that downward comparisons decrease empathy due to scorn and therefore lead to less prosocial behavior. Another possible explanation is that if an individual makes a downward comparison, this individual might feel

more deserving of the money as he or she feels superior in the group, due to their higher score (Riyanto & Zhang, 2013).

As opposed to the predictions in the papers of Van de Ven et al. (2010), Isen (1970) and Zheng et al. (2015), no decrease in prosocial behavior was found for upward social comparisons. Specifically, no statistically significant effect was found for upward comparisons compared to no social comparisons. A possible explanation for this discrepancy could be in the design of the experiment. As the other members of the group were hypothetical, respondents might have tried to soften their negative emotions of feeling inferior. This could for example been done by telling themselves the others were just hypothetical and not actual individuals to consider. Furthermore, it has to be noticed that the standard deviation error bars from the bar graphs of the means of all treatment groups were large (Figure 4). Specifically, this indicates that there was a lot of variance in the observed data around the mean. The data thus was spread out, showing that the estimated mean might not be very representative of the whole group. This could have possibly caused the statistically insignificant result.

Moreover, it was investigated if the difference in effect of social comparison on prosocial behavior was statistically significant when looking at the respondents' age and gender. Specifically, for age it was investigated whether there was a difference in the prosocial behavior of younger adults (18-25 years old) compared to older adults (above 25 years old). The results showed that there is no statistically significant difference between these two age groups. This result opposes the expected effect from previous literature. Rosi et al. (2019), Rieger and Mata (2013) and Roalf et al. (2011) namely find that older adults engage in more prosocial behavior than younger adults. The lack of finding statistically significant results could be possibly explained by the group structures. Both groups, older and younger adults, were evenly large in terms of number of respondents. However, in the group of younger adults the average age leaned more towards the higher end of the age region, while for the older adults' group, the average age leaned more towards the lower end of the age region. Consequently, it is not surprising that these groups do not show statistically significant differences, considering their limited divergence.

On the other hand, a statistically significant difference was found concerning the gender of the respondents. It was found that, on average, prosocial behavior increases by 2.18 euros if the respondent was female, compared to male, when being in the upward social comparison group, ceteris paribus. Furthermore, the same association was found for when being in the downward comparison group, however this result was not statistically significant at the 5%

significance level, but at the 10% significance level. There thus is an indication that no matter in which direction the social comparison flows, women seem to be more prosocial than men. This is in line with the findings of Eckel and Grossman (1998), Dufwenberg and Muren (2006), Gilligan (1982) and Eagly (2009). However, as not enough evidence is found to be conclusive about this statement in the current paper for the case of the downward comparison, future research should be exploited in this realm. This future research should aim at more evenly large groups of respondents for males and females, increasing the internal validity.

In addition, it was investigated if the feeling of competition could be the possible mechanism explaining why individuals behave more or less prosocial, when being exposed to social comparison. The results show that the treatment, both upward and downward social comparison, do not statistically significantly influence the feeling of competitiveness. Therefore, it was concluded that the feeling of competitiveness is just a third variable that may or may not be associated with prosocial behavior. This finding is not in line with the findings of Heursen (2019) and Woike and Hafenbrädl (2020) which show that a feeling of competition arises from social comparisons. The potential reason for not finding statistically significant results in the current paper, can be that the measurement for competition was not detailed enough. This limitation is further explained in the limitation section, together with a possible recommendation for future research.

5.2 Limitations and potential future research directions

The results of this study should be considered in the light of some limitations. The first limitation concerns the design of the experiment. The respondents were told that they were placed in a hypothetical group with two others: Person HYJ and Person KJH. They then had to imagine themselves being in this group for the whole experiment. However, the respondents might not really have seen these hypothetical individuals as their group as they did not know or were shown any characteristics of these individuals. Therefore, it might be the case that not actual behavior towards group members was measured, but behavior towards unrelated strangers, as people did not really feel the group component. This creates an opportunity for future research. Specifically, the group component should be stressed more to the respondents, by for example conducting the experiment with real people in a room and placing them in random groups. Given that the respondents can then actually see their group members, they

may experience the group component more strongly. This would allow for estimating results based on this group feeling more accurately.

Furthermore, the second limitation concerns the measure for prosocial behavior. This variable was measured by executing a dictator game and adding the donations to the other group members. However, this way only one aspect of prosocial behavior was addressed, namely giving behavior. Though, it would also be interesting to measure more aspects of prosocial behavior and estimating the effects on all these measures together. Future research can for example combine the results of giving money to others (as done in the current research), helping others (as done for example by Heursen (2019)), cooperating with others (as done for example by Frey and Meier (2004)) and comforting others (as done for example by Dunfield (2014)). This way a more detailed measure for prosocial behavior can be obtained, which may lead to more insightful results.

In addition, subsequent to the previous limitation, the third limitation concerns the measurement of the variable for the feeling of competition. This variable was measured by asking one question on to what extent the respondents felt competition within their group. This measurement might have been too incomplete to actually measure if people felt competition in their group. As this may have been the cause for not finding any statistically significant effect of social comparison on the feeling of competition, future research can address this issue. This way the feeling of competition can be further investigated as a possible mechanism for prosocial behavior. Specifically, it is recommended to assess competition by evaluating actual behavior of the individuals within the group. For example, it can be noticed if there are physical confrontations, withholding information or excessive comparisons within the group, as this could be signs of a competitive environment. If this would not be possible, another solution would be to ask multiple questions on the feeling of competition before and after the survey to assess the actual feeling of competition within the group. Both ways, a more reliable variable for competitiveness can be obtained, allowing for more insightful results.

Moreover, the final limitation of this study concerns the data collection. As the responses were collected via the distribution networks of the experimenter, most respondents were likely to know the experimenter. This might have influenced the choices these respondents made in the dictator game, due to possible experimenter demand effects. Furthermore, due to the possible social desirability bias, because of the social norms connected to the act of giving. It is therefore recommended for future research to collect the data via an external data collection agency to make sure the above-mentioned biases do not influence the results. Another

advantage of collection data through an external agency is that a larger and more diverse sample can be collected, which might allow for a better internal and external validity of the results.

5.3 Implications of the findings

The implications of this research extend to various domains, including education and the workplace. Recognizing the possible negative effect of downward social comparisons on prosocial behavior is necessary in educational institutions and companies. As earlier mentioned, more and more schools and companies make use of these social comparisons to strive their students and employees to achieve the highest possible results. However, as being concluded in this paper, this can have negative effects on the prosocial behavior in groups. As people aim at comparing themselves to others that are worse off to avoid negative feelings (downward social comparison), this can lead them to being less prosocial towards those others. However, this is at the expense of what most of these organizations want to achieve; becoming better together and work effectively in groups. Therefore, these organizations should aim at not using relative performance rankings that can lead to downward social comparisons. However, if avoiding this would not be possible, it should be promoted to learn from each other and help each other to become better, even if one thinks to be better than another. Specifically, males should be encouraged to focus more on being prosocial to others around them and not focus too much on their own goals only. Informational campaigns can be held to make individuals, but more importantly organizations, more aware of the possible negative effect of social comparisons.

6. Conclusion

Social comparison is a commonly occurring psychological phenomenon in day-to-day life. It entails that individuals compare themselves to others, either upwards or downwards. Literature suggests that this social comparison has many different consequences, both advantageous and disadvantageous. The current paper investigated the effect of social comparison on prosocial behavior of individuals, by means of an experiment. The results showed that downward social comparisons significantly decrease prosocial behavior of individuals. Moreover, the findings show that the prosocial behavior of females is significantly higher than that for males, when being in the upward social comparison treatment. No significant effects were found when considering upward comparisons and when older and younger adults were compared. Furthermore, it was shown that competitiveness does not serve

as a mechanism for prosocial behavior, but just serves as a third variable that may or may not influence prosocial behavior. The current research thus concludes that social comparison can have negative effects on the prosocial behavior towards the reference group. The implications of the findings are to avoid relative performance rankings in groups that can lead to downward social comparisons and if not possible, providing information on the potential consequences of these social comparisons.

Overall, this experimental study contributes to the growing knowledge on social comparison. The more that is known about this daily occurring psychological phenomenon and its influence on daily traits like prosocial behavior, the better possible negative consequences of it can be avoided in this society.

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8. Appendix

8.1 Appendix A

Link to the survey:

https://erasmusuniversity.eu.qualtrics.com/jfe/form/SV_3xv6F22Evwf2K7Y

Social comparison and prosocial behavior in the Netherlands

Start of Block: Screening and information **(Stage 1)**

[info survey] Thank you in advance for participating in this survey for my master's Thesis! It will take approximately 6 minutes to finish.

Your answers will be handled with trust and are completely anonymous. You can quit the survey at any point if you do not want to continue.

For any questions, please contact: 506084jm@student.eur.nl

[consent] Do you give your consent for participating in this research study?

○ Yes (1)

○ No (2)

Skip To: End of Survey If consent = No

[living in Netherlands] Are you currently living in the Netherlands?

○ Yes (1)

○ No (2)

Skip To: End of Survey If living in Netherlands = No

[info groups] This survey studies behavior in groups, therefore you will be randomly assigned to a group of 3 people. These people are anonymized, only showing a random letter combination that belongs to them.

Imagine you are placed in a group with: **Person HYJ** ,and: **Person KJH**. The group thus consists of 3 members: You, Person HYJ and Person KJH.

[info test] For the next step you will be asked to perform a general knowledge quiz consisting of 9 multiple-choice questions and 1 open question. Your score for this quiz will be determined based on the number of correct answers. For each correct answer, 1 point will be added to your score. For each incorrect answer no points will be added to your score.

 You will have 20 seconds per questions to answer. After this, the correct answer will be shown, and you can continue to the next question.
 Please click on the arrow below to start the quiz.

End of Block: Screening and information

Start of Block: General knowledge quiz (Stage 2)

[Q1 test] What is the name of the largest ocean on earth?

○ Pacific (1)

○ Atlantic (2)

○ Indian (3)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

[Q2 test] What is the name of the comic strip character who eats spinach to increase his strength?

○ Popeye (1)

○ Garfield (2)

○ Batman (3)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

[Q3 test] What is the name of the brightest star in the sky excluding the sun?

○ Capella (1)

○ Sirius (2)

○ Arcturus (3)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

[Q4 test] What is the highest mountain in South America?

○ Ojos del Salado (31)

○ Monte Pissis (32)

○ Aconcagua (33)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break —————————————————————————————————

[Q5 test] What is the capital of Australia?

○ Sydney (1)

○ Melbourne (2)

○ Canberra (3)

[timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break —————————————————————————————————

[Q6 test] What is the last name of the artist who painted "Guernica" ?

○ Picasso (1)

○ Dalí (2)

○ Da Vinci (3)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break ———————————————————————————

[Q7 test] What animal runs the fastest?

○ Antelope (1)

○ Cheetah (2)

○ Lion (3)

[timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break ———————————————————————————

[Q8 test] How many bones does an adult human body contain?
 (type your answer in the box below)

_____

[timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

[Q9 test] What sport uses the terms "stones" and "brooms"?

○ Polo (1)

○ Curling (2)

○ Cricket (3)

[Timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

[Q10 test] What is the last name of the man who invented the telegraph?

○ Edison (1)

○ Bell (2)

○ Morse (3)

[timer Timing]

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: General knowledge quiz

[upward 1 info] Your score on the general knowledge quiz is: **1 out of 10**

Below you see the ranking of your group:

1. Person HYJ with score: **8 out of 10**

2. Person KJH with score: **7 out of 10**

3. You **with score:** 1 out of 10

[determine upward 1] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 2 info] Your score on the general knowledge quiz is: **2 out of 10**

Below you see the ranking of your group:

1. Person HYJ with score: **8 out of 10**

2. Person KJH with score: **7 out of 10**

3. You with score: 2 out of 10

[determine upward 2] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 3 info] Your score on the general knowledge quiz is: **<u>3 out of 10</u>**

Below you see the ranking of your group:

1. Person HYJ with score: **9 out of 10**

2. Person KJH with score: **8 out of 10**

<u>3. You with score: 3 out of 10</u>

- -

[determine upward 3] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 4 info] Your score on the general knowledge quiz is: **<u>4 out of 10</u>**

Below you see the ranking of your group:

1. Person HYJ with score: **10 out of 10**

2. Person KJH with score: **8 out of 10**

3. You with score: 4 out of 10

- -

[determine upward 4] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

End of Block: Score 4 - upward comparison

Start of Block: Score 5 - upward comparison

[upward 5 info] Your score on the general knowledge quiz is: **5 out of 10**

Below you see the ranking of your group:

1. Person HYJ with score: **10 out of 10**

2. Person KJH with score: **8 out of 10**

3. You with score: 5 out of 10

- -

[determine upward 5] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

End of Block: Score 5 - upward comparison

Start of Block: Score 6 - upward comparison

[upward 6 info] Your score on the general knowledge quiz is: **6 out of 10**

Below you see the ranking of your group:

1. Person HYJ with score: **10 out of 10**

2. Person KJH with score: **9 out of 10**

3. You with score: 6 out of 10

[determine upward 6] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 7 info] Your score on the general knowledge quiz is: **7 out of 10**

Below you see the ranking of your group:

1. Person HYJ with score: **10 out of 10**

2. Person KJH with score: **9 out of 10**

3. You with score: 7 out of 10

[determine upward 7] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 0 info] Your score on the general knowledge quiz is: <u>**0 out of 10**</u>

Below you see the ranking of your group:

 1. Person HYJ with score: **8 out of 10**

 2. Person KJH with score: **6 out of 10**

 <u>3. You **with score: 0** out of 10</u>

[determine upward 0] This question is solely here to check if you read the information above:

 What is **your rank** in your group?

   ○ 1 (1)

   ○ 2 (2)

   ○ 3 (3)

[upward 8 info] Your score on the general knowledge quiz is: <u>**8 out of 10**</u>

Below you see the ranking of your group:

 1. Person HYJ with score: **10 out of 10**

 2. Person KJH with score: **10 out of 10**

 3. You with score: 8 out of 10

[determine 8 upward] This question is solely here to check if you read the information above:

 What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[upward 9 info] Your score on the general knowledge quiz is: **9 out of 10**

Below you see the ranking of your group:

 1. Person HYJ with score: **10 out of 10**

 2. Person KJH with score: **10 out of 10**

 3. You **with score: 9** out of 10

[determine 9 upward] This question is solely here to check if you read the information above:

 What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[absolute 10 info] Your score on the general knowledge quiz is: **10 out of 10**.

[downward 1 info] Your score on the general knowledge quiz is: **1 out of 10**

Below you see the ranking of your group:

 1. You with score: 1 out of 10

 2. Person HYJ with score: **0 out of 10**

 3. Person KJH with score: **0 out of 10**

[determine downward 1] This question is solely here to check if you read the information above:

What is **your rank** in your group?

  ◯ 1 (1)

  ◯ 2 (2)

  ◯ 3 (3)

[downward 2 info] Your score on the general knowledge quiz is: **2 out of 10**

Below you see the ranking of your group:

 1. You with score: 2 out of 10

 2. Person HYJ with score: **0 out of 10**

 3. Person KJH with score: **0 out of 10**

[determine downward 2] This question is solely here to check if you read the information above:

What is **your rank** in your group?

◯ 1 (1)

◯ 2 (2)

◯ 3 (3)

[downward 3 info] Your score on the general knowledge quiz is: **3 out of 10**

Below you see the ranking of your group:

1. You with score: 3 out of 10

2. Person HYJ with score: **1 out of 10**

3. Person KJH with score: **0 out of 10**

[determine downward 3] This question is solely here to check if you read the information above:

What is **your rank** in your group?

◯ 1 (1)

◯ 2 (2)

◯ 3 (3)

[downward 4 info] Your score on the general knowledge quiz is: **4 out of 10**

Below you see the ranking of your group:

1. You with score: 4 out of 10

2. Person HYJ with score: **1 out of 10**

3. Person KJH with score: **0 out of 10**

[determine downward 4] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[downward 5 info] Your score on the general knowledge quiz is: **<u>5 out of 10</u>**

Below you see the ranking of your group:

<u>1. You with score: 5 out of 10</u>

2. Person HYJ with score: **2 out of 10**

3. Person KJH with score: **0 out of 10**

[determine downward 5] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[downward 6 info] Your score on the general knowledge quiz is: **6 out of 10**

Below you see the ranking of your group:

1. You with score: 6 out of 10

2. Person HYJ with score: **2 out of 10**

3. Person KJH with score: **0 out of 10**

[determine downward 6] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[downward 7 info] Your score on the general knowledge quiz is: **7 out of 10**

Below you see the ranking of your group:

1. You with score: 7 out of 10

2. Person HYJ with score: **2 out of 10**

3. Person KJH with score: **1 out of 10**

[determine downward 7] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[Absolute 0 info] Your score on the general knowledge quiz is: **0 out of 10**.

[downward 8 info] Your score on the general knowledge quiz is: **8 out of 10**

Below you see the ranking of your group:

1. You with score: 8 out of 10

2. Person HYJ with score: **3 out of 10**

3. Person KJH with score: **2 out of 10**

[determine downward 8] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[downward 9 info] Your score on the general knowledge quiz is: **<u>9 out of 10</u>**

Below you see the ranking of your group:

<u>1. You with score: 9 out of 10</u>

2. Person HYJ with score: **3 out of 10**

3. Person KJH with score: **2 out of 10**

[determine 9 downward] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[downward 10 info] Your score on the general knowledge quiz is: **<u>10 out of 10</u>**

Below you see the ranking of your group:

<u>1. You with score: 10 out of 10</u>

2. Person HYJ with score: **4 out of 10**

3. Person KJH with score: **2 out of 10**

[determine 10 downward] This question is solely here to check if you read the information above:

What is **your rank** in your group?

○ 1 (1)

○ 2 (2)

○ 3 (3)

[absolute 1 info] Your score on the general knowledge quiz is: **1 out of 10**.

[absolute 2 info] Your score on the general knowledge quiz is: **2 out of 10**.

[absolute 3 info] Your score on the general knowledge quiz is: **3 out of 10**.

[absolute 4 info] Your score on the general knowledge quiz is: **4 out of 10**.

[absolute 5 info] Your score on the general knowledge quiz is: **5 out of 10**.

[absolute 6 info] Your score on the general knowledge quiz is: **6 out of 10**.

[absolute 7 info] Your score on the general knowledge quiz is: **7 out of 10**.

[absolute 8 info] Your score on the general knowledge quiz is: **8 out of 10**.

[absolute 9 info] Your score on the general knowledge quiz is: **9 out of 10**.

[prosocial] At the end of this research, 3 people of different groups will be randomly chosen to each **receive 10 euros.** The winners may decide to what extent they want to split this money with their group members. This money will actually be split following your division amongst you and respondents of this survey that resemble Person HYJ and Person KJH in their choices.

If you are one of the randomly assigned winners, how would you like to divide the 10 euros in your group: **You, Person HYJ and Person KJH**?
Please indicate this below by typing any amount from 0 to 10 euros for each group member, adding up to 10 euros in total.

You : _____   (1)
Person HYJ : _____   (2)
Person KJH : _____   (3)
Total : _____

[competition] Please answer to what extent you agree/disagree with the following statement.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I felt in competition with the other two members of my group. (1)	○	○	○	○	○

End of Block: Feeling of competition

Start of Block: Demographics (Stage 6)

[info] You have reached the last part of the survey. Please answer the questions below.

[age] What is your age? (In years)

_____

[gender] What is your gender?

○ Male (1)

○ Female (2)

○ None of the above (3)

[education] What is your highest current/obtained level of education?

○ High school (1)

○ MBO (middle vocational education) (2)

○ HBO (higher vocational education) (3)

○ WO (university) (4)

[email] If you want to participate in the lottery to be paid out the amount you kept to yourself in the division of the 10 euros, please enter your e-mail address. The lucky winners will receive an e-mail with more information. Good luck!

Note: If you do not want to participate, leave this question open. You will receive an error message, please click "continue without answering" here.

_____

[debriefing] Thank you for completing this survey. With your response, I hope to better understand the effect of social comparisons on prosocial behavior. If you have any questions, you can e-mail them to 506084jm@student.eur.nl

_____

Table 1. Multiple-choice questions with answers and probabilities of recall

Question	Probability of recall
What is the name of the comic strip character who eats spinach to increase his strength? (Popeye)	0.974
What is the name of the largest ocean on earth? (Pacific)	0.737
What animal runs the fastest? (Cheetah)	0.530
What is the last name of the man who invented the telegraph? (Morse)	0.300
Which sport uses the terms "stones" and "brooms"? (Curling)	0.222
What is the last name of the artist who painted "Guernica"? (Picasso)	0.111
What is the name of the brightest star in the sky excluding the sun? (Sirius)	0.078
What is the capitol of Australia? (Canberra)	0.015
What is the highest mountain in South America? (Aconcagua)	0.000

Notes: Table 1 shows the multiple-choice questions used in the survey with the answers between parentheses and the probabilities of recall. A higher probability of recall indicates an easier question than a lower probability of recall.

8.2 Appendix B

Table 1. Probit regression results for donated

	(1) Donated
Upward comparison	0.0383
	(0.248)
Downward comparison	-0.437*
	(0.231)
Age	-0.00483
	(0.00801)
Female	0.329
	(0.207)
Education	-0.0853
	(0.137)
Score	0.0784
	(0.0625)
Constant	0.554
	(0.626)
Observations	208

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The variable *all treatment* is presented in the table by "upward comparison" and "downward comparison" and has "no treatment" as the baseline category. The variable *donated* takes value 0 if no amount was donated by the individual and 1 otherwise.

Figure 1. Boxplot for prosocial behavior per treatment group

Notes: Figure 1 shows the boxplot for *prosocial behavior* for the no treatment group (=0) and the treatment group (=1), respectively. The boxplots indicate the minimum value, 25th percentile, median, 75th percentile and the maximum value of the variable *prosocial behavior* for both groups.
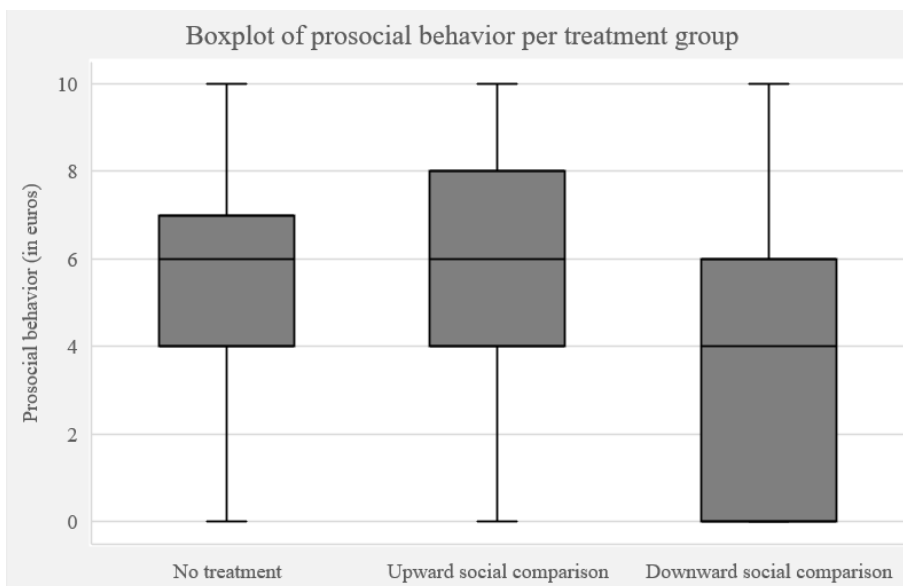

Figure 2. Boxplot for prosocial behavior per treatment group

Notes: Figure 2 shows the boxplot for *prosocial behavior* for the no treatment group (=0), the upward social comparison group (=1) and the downward social comparison group (=2), respectively. The boxplots indicate the minimum value, 25th percentile, median, 75th percentile and the maximum value of the variable *prosocial behavior* for the three groups.