Thesis

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The effect of overconfidence on the willingness to cooperate.

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Abstract

In this thesis, a new effect of overconfidence is investigated. There is a growing literature on overconfidence, but not yet on its effect on cooperation. This research answers the question if overconfidence lowers someone's willingness to cooperate with others. Based on a review of the literature on overconfidence, an online survey was distributed. Through an experiment that manipulates participants' confidence levels using the hard-easy method, their preferences of working alone or in a team on a real effort task are tested. Results provide empirical evidence that overconfidence lowers the willingness to cooperate among participants. This indicates that overconfident people choose to work alone more often. This research answers the question of the correlation between overconfidence and willingness to cooperate and is a stepping stone for future literature about the effects of overconfidence. Insights of this research have various implications for organizations to optimize teamwork and interpersonal relations.

1. Introduction

Cooperation is important in many situations, occupations, and sectors. Teamwork could quite literally save lives, for example in aviation (Bennet, 2015). The crew of US Airways Flight 1549 managed to rescue all passengers with an emergency landing after engine failure, something that no employee could have done on their own. The lessons about teamwork drawn from the Flight 1549 case can be translated into the medical world (Eisen & Savel, 2009). Working together is extremely important in the healthcare sector as no one person can guarantee the safety of patients and provide the best possible care (Rosen et al., 2018). Healthcare (Gittell et al., 2012; Manser, 2009; Schmutz et al., 2019) is not the only sector that requires employees to work together. Also, in teaching positions, it is important for educators to work together in order to provide students with the best possible education and study opportunities (Brownell et al., 1997; DuFour, 2011). Cooperating with other teachers is even found to have an on influence student performance, teacher confidence, and job satisfaction (Reeves et al., 2017). Working together has also been highlighted on the other side of teaching, the pupils. Cooperating among students has been researched for years. The importance of studying in groups, in the literature often referred to as cooperative learning (Slavin, 1980; Johnson & Johnson, 2009), has been thoroughly studied for decades. Cooperative learning is widely used in education and has proven to be an effective learning tool for students (Johnson & Johnson, 2009).

Great teamwork can be the key to growing an organization. It can lead to higher job satisfaction and improved work allocation (Morley & Heraty, 1995). Katzenbach and Smith (2015) explain in their book the role of teamwork in high-performance organizations how they think that there is more need today for team performance in organizations in order to maintain high performance and with that outperform competing organizations in the long run. One reason they give for this is changes in individual behavior.

A form of non-cooperation is free-riding. Free-riding is a tendency to contribute disproportionally little effort to the group, thus benefitting from the effort of others (Albanese & Van Fleet, 1985). This is a problem for companies as full employee potential cannot be reached and with that, too many costs are made for too little benefit. And besides that, it is unfair to those who do put in the required effort. Research by Fehr and Gächter (2000) shows us that people are willing to punish free riders. This reveals that people will even punish the free riders if it is costly for them.

Group dynamics and teamwork have been studied for a great many years (Lewin, 1945; Bion, 1952). Pynadath and Tambe (2002) designed a model to help improve teamwork and to understand what factors are in play to make a team of individual agents work well. The model builds on the works of Ho (1980). The model however, assumes selfless behavior of team members, while historically many

economic models assume self-interest (Rothschild, 1994; Boudon, 1998; Feldman, 1982). The assumption of selflessness may be too implausible to depend on. There may be other factors influencing a person's behavior in a group. Jehn and Shah (1997) did research about factors of interpersonal relationships influencing the effectiveness of groups. They found that friendship improved group performance through improvement of cooperation among other things. In their definition of cooperation, they mention both offering help and asking for help, asking for help is something that requires self-confidence. Adams and Anantatmula (2010) argue that when working in groups, showing low self-confidence will lead to being a low-status member of the group.

Apart from group performance, individual performance is also affected by behavior and belief. Moores and Chang (2009) conducted research among students about the influence self-efficacy has on performance. Self-efficacy was positively related to performance. However, when including overconfidence in the model, self-efficacy became negatively related to performance. Other research suggests that by setting strongly negative expectations as a condition, overconfidence levels are reduced, but with that performances can be reduced too (Stone, 1994).

High levels of self-confidence can often lead to overconfidence. Overconfidence can be distinguished in two ways, overestimation of someone's individual performance and overestimation of someone's performance relative to others (Moore & Small, 2007). The latter distinction was later called overplacement (Moore & Healy, 2008) The two interpretations of overconfidence can have diverging effects on a person's estimation depending on the difficulty of the task.

The main research question of this thesis is: "*Does overconfidence lower someone's willingness to cooperate with others?"*

Various effects of self-confidence have already been studied over the years. Woodman and Hardy (2003) did a meta-analysis that shows that self-confidence has a significant relationship with competitive sports performance. The study presents that outcomes of both individual and team-based sports are dependent on the self-confidence of the athletes. They also found that the results are significantly higher for men than for women on average, suggesting men are more sensitive to the effects of self-confidence.

In research about overconfidence conducted among recreational basketball players, McGraw et al. (2004) found that players who showed overconfidence had less joy in their performance outcomes than players who were not overconfident. They estimated that most players would experience more enjoyment if their self-assessment had been better.

Research from Chuang et al. (2017) shows that there is a relationship between self-confidence and the compromise effect, through uncertainty and risk preferences. Results show that people with high self-confidence are less likely to compromise or take the middle option, and people with low self-confidence are more likely to do so. And Moore and Healy (2008) state that after deficient performance people tend to overestimate themselves, but overestimate others even more, leading them to believe that they are worse than others. And when performance is high, the other way around. This confirms earlier research by Moore et al. (2006), who proved that people estimate the achievements of others differently for easy tasks than they do for hard tasks. After completing an easy task, people underestimate others and with hard tasks, people over-estimate others.

Trust is positively correlated to cooperation (Doyle, 2021). Higher trust would result in a higher willingness to cooperate. It seems that levels of trust affect cooperation through peoples' beliefs about the general trust others have. Poon (2006) found a modest but significant relationship between having trust in your supervisor with the willingness to help your coworkers, meaning that having higher trust in a supervisor on average leads to higher cooperation between coworkers. Miller (1992) found a similar relationship, where he finds that trust in management influences cooperation between employees.

Currently, there is no existing literature directly researching any effects of overconfidence on people's willingness to cooperate with others, so this research contributes to the existing literature by introducing a new effect of overconfidence that has not been investigated. It can help understand how people vary in their willingness to cooperate with others on tasks, both on the work floor and in classrooms. The results can provide information on underlying mechanisms behind people's behavior, to understand why people make certain choices. If an effect of overconfidence on willingness to cooperate is proved, this research would be a reason to investigate this matter further and expand the literature on the topic of self-confidence.

Insights from this research can be of use to organizations in multiple ways. The effect of overconfidence should be considered when working in team-based work environments, as it may be needed to raise self-awareness among team members in order to improve cooperation. When there are problems or conflicts with coworkers, it is important to understand the drivers of the conflict and know what factors could be of influence. Knowing overconfidence has something to do with it could help resolve problems that arise while working with coworkers. For people in leadership roles, this possible effect of overconfidence can be important to understand and to be considered when allocating work to employees and forming groups on the work floor. The effect of overconfidence on willingness to cooperate can also be of importance to decision-making processes and even to interpersonal

relationships, although that would require additional psychological research. Free-riding could also be better understood if an added factor of willingness to cooperate is proven. Then riders should not have to be punished like people are willing to (Fehr & Gächter, 2000), but they could be incentivized differently or allocated elsewhere. So, practically this research could be used as a steppingstone to improve workplace or classroom dynamics to help elevate corporate and academic achievements.

The rest of the thesis is structured as follows. In chapter 2 the conceptual framework is laid out, including the conducted experiment. Based on the literature exploration, the research questions guiding this research are introduced. Moreover, this chapter presents the research method, including the main research strategy, a measurement plan, and the method of analysis. Chapter 3 is a description of the sample whereas chapter 4 discusses the results using the statistical analysis and positions them in the existing body of literature. Lastly, chapter 5 contains a discussion of the limitations of this study, possible areas for future research, and the conclusion. The references and appendices can be found at the end of this thesis.

2. Experimental design and conceptual framework

In this chapter, I explore the research methods and tools, the outcome and control variables, and the research hypothesis.

2.1 Online experiment

To conduct this research about willingness to cooperate with others, an online experiment was set up, using the Qualtrics survey tool. After a brief introduction and some demographic questions; age, gender, and occupational status, the experiment begins with the first task. The experiment will be as follows: the first task serves as a manipulation of the self-confidence of participants. Then a checkpoint to measure beliefs about relative performance, to measure overconfidence. After that, the outcome variable is measured by presenting an incentivized choice. This is followed by the incentivized task, a trivia quiz. Lastly, the participants are tested for their risk attitude and trust level.

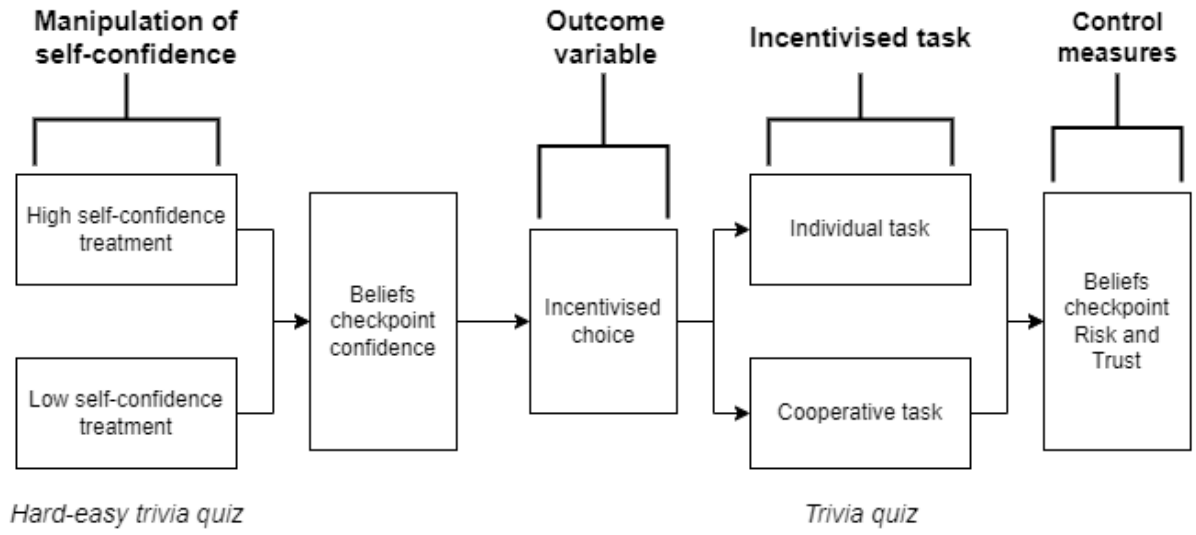

Figure 1: Schematic flow of experiment.

2.1.1 Manipulation of self-confidence

The fundamental method used in this experiment is based on the concept of self-confidence manipulation using the hard-easy effect (Lichtenstein & Fischhoff, 1977). This is a commonly used technique for manipulating someone's beliefs about their own capabilities and for them to make assumptions about their abilities compared to others with a similar task. The manipulation divides the sample into groups, the low confidence group (from now on referred to as LOW), and the high confidence group (from now on referred to as HIGH). Participants in LOW get difficult questions in the first task, and participants in HIGH get easy questions in the first task. Assuming the hard-easy method is effective, LOW indeed has a lower level of self-confidence after completing the questions in comparison to HIGH. The assumption is based on earlier research using a similar method (Dargnies et

al., 2019; Hansson & Sund, 2023; Kruger, 1999). The questions used are from the experiment of Hansson and Sund (2023). Some questions are altered to fit the sample demographics. An example of an easy question is: 'Which is the largest ocean in the world?'. One of the hard questions is: 'A Gastroenterologist is a specialist doctor of what subject?'. All questions are multiple-choice. A full list of the questions can be found in Appendix A.

2.1.2 Overconfidence

To check if the manipulation was effective, participants were asked for beliefs about their performance in comparison to others completing a similar task. This also served as a measure of overconfidence. It is measured on a five-point Likert scale. Participants selecting a value equal to or greater than 4, above average or way above average, while scoring below average, are overconfident. This estimation is a comparison to the other participants, so an estimation of someone's performance relative to others or overplacement. Therefore, the expectation is that people in HIGH, who completed an easy task, are on average more often overconfident than the people in LOW, who completed a hard task (Moore & Healy, 2008).

2.1.3 Outcome variable

The main outcome variable is whether or not participants want to cooperate with others on the next task. It is a binary variable. The task is a trivia quiz consisting of ten questions. Cooperating with two others means only one of the three group members has to correctly answer the question. If the participants choose to work alone, only they are responsible for their own score. Working in a team yields a lower reward per team member, otherwise, everyone would choose to cooperate. The benefit of working together is the increased chance of correctly answering the question and the cost is a lower number of points per question per group member. The benefit of working alone is the higher amount of earned points per correct answer, but the cost is having to depend on only yourself to get the correct answer. This choice mirrors real-life scenarios in which someone can choose to work together for a shared fee instead of an independent reward. Working together on small tasks like this quiz can be done, but it often lowers the productivity per worker. Labor productivity is a main driver for income, so by cooperating you choose to potentially lower your income. The choice is up to the participant, and it depends on their belief about their efficacy and productivity that is possibly altered by the self-confidence manipulation. In order for this presented choice to be of worth to the analysis, it has to be incentivized. If there is no incentive to choose, any rationally behaving individual following a maximum utility function will choose to cooperate as this increases the chance of correctly answering the questions and thus it increases expected utility. Further than that, incentivization is necessary because respondents do not know how they would actually behave under incentivized conditions if not

incentivized (Holt & Laury, 2002). To incentivize correctly, one must take various task characteristics into account, and like in the work of Bonner and Sprinkle (2002), I focus on task complexity. Task complexity, in this case, is up to the interpretation of the respondents. Respondents will only know the fact that the task is a trivia quiz but have no information about the complexity of the questions. Assuming that respondents will think the coming questions will be similar to the questions from the first quiz, where self-confidence was manipulated, there are two groups: a group that will think the trivia questions will be hard (LOW), and a group that thinks the trivia questions will be easy (HIGH).

Incentives are as follows, working alone will yield ten points per correctly answered question with a maximum of 100 points. Cooperating with two others yields six and a half points per correctly answered question with a maximum of 65 points. Under maximum utility, it is obvious that giving a person correctly answers all questions, working alone would be the best choice and therefore rational. In the experiment of Moore and Healy (2008) people's prior belief was that they on average would score 5.36 out of 10. Assuming most people in this experiment do not believe they will correctly answer all questions, they will not all choose to work alone to maximize their utility. When assuming participants calculate the equilibrium between working alone and cooperating, they know that if they work alone, they will have to score at least seven points to be better off than to work together with an increased chance to score all points.

The second and last trivia quiz consists of 10 questions. For example: 'What's the second most populous continent?'. These questions do not function as a manipulation as the first quiz does. The score for this task is used to test effort.

2.1.4 Risk and trust

To ensure that the outcome variable is not biased, there will be control variables for risk attitude and trust level. In the incentivized decision to work alone or together, working alone can be seen as taking a risk to win more points at a smaller chance. Risk attitude could therefore influence the outcome and should be controlled for. Although Dargnies et al. (2019) found only marginally significant effects of risk aversion.

Risk attitude is measured following the method of Hartog et al. (2000) and adjusted to the setting and context of this experiment. Participants are asked the following question: *"If among 50 people 100 points are disposed, how many points are you willing to pay to join the lottery?"* This question gives them the choice to join a lottery to win 100 points. 100 points are given to one of 50 people. Paying to join the lottery is a risky choice as 49 people will lose their entry price. Following an expected utility function, a risk-neutral person would be willing to pay 100/50 = 2 points. A risk-seeking person would be willing to pay anything over two points. Then the higher the number, the more risk-seeking a person

is. A risk-averse person would be willing to pay something between zero and two points. However, I assume that not all respondents will behave according to the expected utility function. Prospect theory explains that people tend to be risk-seeking in small probabilities to gain, as they overweight these probabilities (Tversky & Kahneman, 1992). I therefore expect a majority of respondents to be risk-seeking.

To measure the participants' level of trust in the capabilities of the other participants and potential teammates, they will be asked to estimate the average score of the other participants on the trivia quiz. Outcome is a number between zero and ten, a higher number will stand for a higher level of trust. The two measures of risk and trust have also been incentivized to ensure active participation and to control participation bias in the participants' reports (Hsieh & Kocielnik, 2016).

With the option to cooperate, there is also an opportunity for participants to free-ride, in other words, not make an effort on the trivia quiz because two other people can make up for you. Andreoni (1995) found that some people will choose to cooperate in a public-goods experiment despite knowing about free-riding because of kindness to others. To limit kindness as a factor in the decision to cooperate or not, it will be explicitly made known before deciding, that respondents will not know with whom they will work together. Another reason for doing this is that it takes away the chance of there being interpersonal relationships between participants. Jehn and Shah (1997) found that friendship can cause better communication and cooperation.

2.2 Statistical testing

Based on the literature about the effect of self-confidence on the compromise effect (Chuang et al., 2017) and the insights about over- or underestimation following the self-confidence manipulation of the hard-easy effect (Moore & Healy, 2008; Moore et al., 2006), I expect that people in the LOW treatment will on average choose to cooperate more often than people receiving the HIGH treatment. Assuming that the behavior of the participants of this experiment is similar to that of the participants in previous studies, I predict that after receiving LOW treatment, respondents will overestimate others and therefore want to work together as they believe the other respondents can help them on the next task because of their assumed superior knowledge. And vice versa, I predict that people receiving HIGH treatment will underestimate others' performance and would therefore rather work alone. My main hypothesis is thus:

H1: Overconfidence lowers the willingness to cooperate.

This first hypothesis will be tested using a two-sample proportion test and a logistic regression analysis. As both the outcome variable and the predictive variable are binary variables, a normal two-sample t-test cannot be done. Because both variables are not continuous, the normality assumption does not

apply. A two-sample proportional test is a non-parametric test with the independence assumption and the assumption of a binomial distribution. The size of the effect of overconfidence will be estimated with a logistic regression. A logistic regression is used, again because the outcome variable is binary. For the estimation to stand, three assumptions must be true: the independence assumption, no multicollinearity, and the linearity assumption.

As said, participants choosing to work together with others may take advantage of their teammates and decide to free-ride. In addition, the reward per correct answer is lower for cooperating people than for individuals, causing the individuals to have more incentive to put in their best effort. A phenomenon called social loafing occurs when people work in groups instead of working alone (Liden et al., 2004). Social loafing decreases individual effort in group tasks, for example, because of a lack of identifiable individual contribution (Williams et al., 1981). That is why the second hypothesis is as follows:

H2: Participants working individually score higher on incentivized task.

This hypothesis will be tested using a regression analysis and a t-test to compare means between the two groups, individuals and cooperators. For a regression analysis, the linearity, independence, normality, homoscedastic, and multicollinearity assumptions need to be checked. For the t-test, the following assumptions must be checked: independence, normality, homogeneity of variances, and random sampling. However, this approach will not be sufficient to claim causality as there might be self-selection, people choose to cooperate because they know they score lower. To prevent this, I will do an instrumental variable (IV) approach to the regression. The treatment variable HIGH will serve as the IV for the endogenous variable willingness to cooperate.

This experiment will also control for gender as gender differences in economic cooperation games have been proved before in the literature (Charness & Rustichini, 2011; Molina et al., 2013). On average males are less cooperative than females. This leads to the third and final hypothesis:

H3: Males will choose to cooperate less often than females.

This hypothesis will be tested using a two-sample proportion test and a logistic regression analysis. Again, for the proportion test the independence assumption and the assumption of a binomial distribution should stand. For the logistic regression independence assumption, no multicollinearity and the linearity assumption.

3. Sample description

3.1 Data collection

The data was collected between May 10th, 2024, and May 18th, 2024 through the Qualtrics Survey tool. There is a total of 122 observations of which one did not consent and thus did not take part in the experiment and an additional 23 responses were incomplete. After excluding these 24 insufficient observations, the final dataset consists of 98 observations. The sample consists mostly of people living in the Netherlands. 87 people speak Dutch and 11 English speakers, experiment was available in both languages. The online experiment was distributed by social media. The median time spent on the experiment is 4.75 minutes. Participants of the experiment had a chance to win a monetary reward using a point system where participants were able to collect points throughout the experiment. The points served as incentives. Participants could earn up to 110 points, yielding €11. No reward for participation.

Table 1: Descriptive statistics

	Mean	SD	Min	Max
Age	27.91837	12.09215	18	66
Female	.4795918	.5021519	0	1
Student	.622449	.4872669	0	1
N	98			

Note: Age is given in years. Female is the proportion of the sample that is female, the rest is male. Student is the proportion of the sample that is a student, the rest is either working or unemployed. SD is the standard deviation, Min is the minimum and Max is the maximum. N is the number of observations.

Table 1 displays the descriptive data for three demographical variables of the full sample. The sample consists of 98 observations. Respondents are on average 28 years old with a minimum of 18 years old and a maximum of 66 years old and a standard deviation of 12 years. 47 of the 98 participants are female and 61 participants are students.

4. Results

This chapter first presents a randomization and manipulation check, then it explores the hypothesis tests to find the main results of this experiment and to derive a conclusion.

4.1 Randomization and manipulation

Before we look at the main results and the hypothesis testing, we check if the randomization is successful and if the self-confidence manipulation worked.

Table 2: Balance among treatments

	LOW	HIGH	Total	Test
N	46 (46.9%)	52 (53.1%)	98 (100.0%)	
Age	27.696 (12.229)	28.115 (12.086)	27.918 (12.092)	0.865
Gender				
Male	28 (60.9%)	23 (44.2%)	51 (52.0%)	0.100
Female	18 (39.1%)	29 (55.8%)	47 (48.0%)	
Occupation				
Worker	16 (34.8%)	21 (40.4%)	37 (37.8%)	0.568
Student	30 (65.2%)	31 (59.6%)	61 (62.2%)	

Note: The table contains the descriptive data for both treatments and the complete sample. Age in years, Gender is male or female and occupation is worker or student. LOW represents the low-confidence treatment, HIGH the high-confidence treatment, and total the full sample. For Age, the standard deviation is given in the parentheses, for all other variables the parentheses contain the proportions. A regression test is performed for Age and a Pearson's chi-squared test of independence for Gender and Occupation.

The p-value of .865 (regression test) suggests that there is no significant difference in the mean age between treatment groups. The p-value of .100 (Pearson's chi-squared test) suggests that there is some difference in gender proportions between treatment groups, but this is not significant at the 5% level. The p-value of .568 (Pearson's chi-squared test) suggests that there is no significant difference in occupation between treatment groups. It appears that randomization was a success.

To check if the manipulation of participants' self-confidence has worked, I performed a two-sample proportion test on overconfidence grouped by the two treatments. The variable overconfidence is a binary variable taking value 1 if a subject is overconfident. The results of the test suggest that the difference in means of overconfidence between low-confidence treatment and high-confidence treatment is -0.138796 with a p-value of .0889, making it partially significant at the 10%-level. This suggests that the proportion of overconfidence is higher in the group that received the high-confidence

treatment, making the manipulation slightly successful. The difference in the mean of overconfidence is visualized in Figure 2. A clear difference in overconfidence is seen between HIGH and LOW.

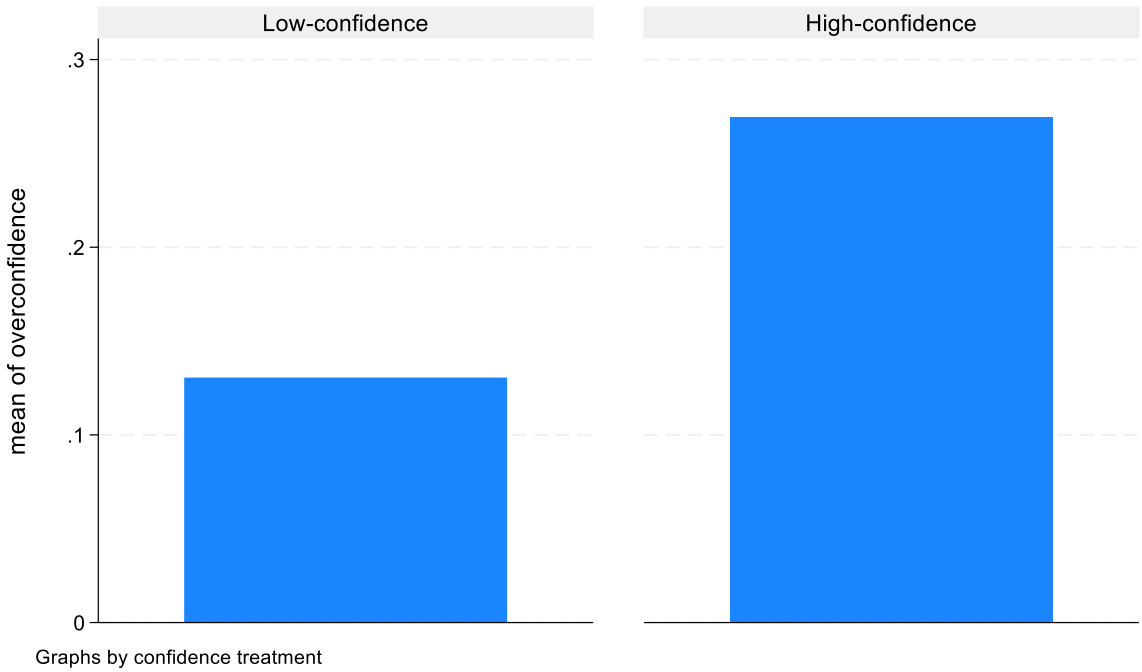

Figure 2: Proportion of overconfidence across treatment.

4.2 Hypothesis testing

In this section, the hypotheses are tested and conclusions are drawn about the results. Starting with the main hypothesis.

4.2.1 Overconfidence lowers the willingness to cooperate

To test the first hypothesis '*Overconfidence lowers the willingness to cooperate'* with a two-sample proportion test, the independence assumption and the binomial distribution assumption must hold, and it must be a random sample. We have already proved that randomization was successful. Observations should be independent as the experiment was individually taken and could not be repeated. And because willingness to cooperate, now WTC, is a binary variable and reasonably balanced in both groups of overconfident and not overconfident, the last assumption also holds. For a logistic regression analysis, there are two other assumptions in addition to the independence assumption, namely the no multicollinearity and the linearity assumption. Linearity is checked using a scatterplot and a linear prediction line for each continuous predictive variable. These scatterplots are shown in Appendix B, both continuous variables risk and age seem to have a linear relationship with WTC. After running the logistic regression, multicollinearity was checked with variance inflation factors for independent variables (vif) test.

The two-sample proportion test shows the mean proportion of WTC of two groups. The sample is grouped by overconfidence. The group that is not overconfident has a mean WTC proportion of .2948718, the overconfident group has a mean WTC proportion of .05. This yields a difference of .2448718. This difference has a p-value of .0231 for the two-sided test, meaning there is a significant difference between the two groups. The positive difference tells us that the proportion of WTC is significantly higher in the not overconfident group, or the proportion of WTC is significantly lower in the overconfident group. The proportions are illustrated in Figure 3, clearly showing a difference in the mean of WTC between the two groups.

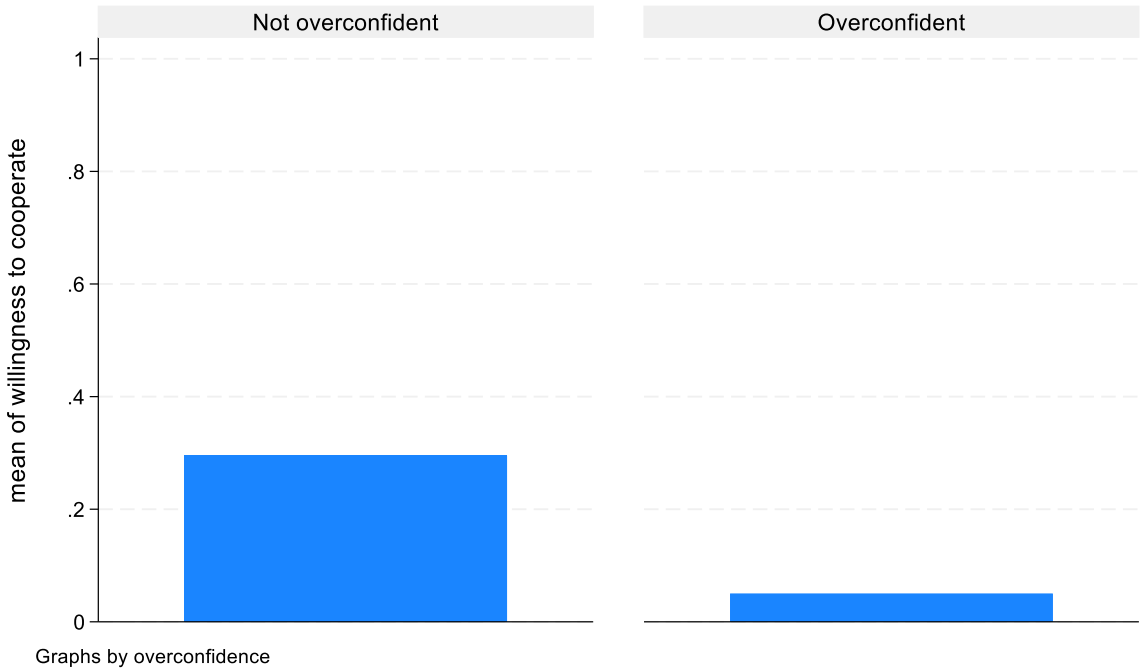

Figure 3: Proportions of the mean of WTC by overconfidence.

Three logistic regressions will be performed. The first logistic regression has dependent variable WTC and independent variable overconfidence:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 Overconfidence$$

Where $\log\left(\frac{p}{1-p}\right)$ stands for the log-odds of WTC being equal to 1, where WTC is a binary variable measuring a participant's willingness to cooperate. Overconfidence is a binary variable that has value 1 if a participant is overconfident. β's are the regression coefficients. No error term as it is a logistics regression. The second logistic regression includes a control for risk aversion:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 Overconfidence + \beta_2 Risk$$

The variable Risk is a continuous variable measuring a participant's risk attitude.

Age, gender, and occupation are added to the third logistic regression:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 Overconfidence + \beta_2 Risk + \beta_3 Age + \beta_4 Female + \beta_5 Student$$

Age is a continuous variable. Female is a binary variable taking value 1 if the participant is female, and 0 if the participant is male. Student is a binary variable taking value 1 if the participant is a student and 0 if the participant is either working or currently unemployed.

Table 3: Logistic regression results for the relationship between overconfidence and willingness to cooperate.

Variables	(1) WTC	(2) WTC	(3) WTC
OVERCON	-2.073**	-2.077**	-2.076*
	(-1.96)	(-1.97)	(-1.92)
RISK		0.00520	0.00511
		(0.44)	(0.40)
AGE			0.0401
			(1.53)
FEMALE			0.175
			(0.33)
STUDENT			0.108
			(0.16)
CONSTANT	-0.872***	-0.926***	-2.242*
	(-3.51)	(-3.31)	(-1.83)
N	98	98	98

t statistics in parentheses

** p < 0.1, ** p < 0.05, *** p < 0.01*

Table 3 shows three logistic regressions for the relationship between overconfidence and willingness to cooperate. The first regression shows a significant relationship between the independent variable and the explanatory variable at the 5%-level. The constant has a statistically significant value of -0.872 with p<.001. This model has a likelihood ratio chi-squared value of 6.56 with a p-value of .0104 making the model statistically significant at the 5%-level.

The second regression shows a larger coefficient for Overconfidence after adding Risk to the model. Overconfidence is still statistically significant at the 5%-level, but Risk is not. The constant has a

statistically significant value of -0.926 with p<.001. This model has a slightly higher likelihood ratio chi-squared value, 6.65 (p-value = 0.0343).

The third and most extensive model has no statistically significant results at the 5%-level. Only Overconfidence is partially significant at the 10%-level (p-value = .054), so there is still some evidence of overconfidence lowering the odds of wanting to cooperate. The constant has a marginally significant value of -2.242 (p-value = 0.068). The other explanatory variables are all not statistically significant and can therefore not be interpreted. The regression has a likelihood ratio chi-square statistic of 10.67, the model is partially significant at the 10%-level (p-value = .0583).

After the logistic regressions were run, a variance inflation factors for independent variables (vif) test was performed. The mean VIF value was 1.73 and the highest VIF value was 2.39 for Age. This indicates that multicollinearity is not a significant issue for this model.

Taking both the two-sample proportion test and the logistic regressions into account, I find statistically significant results, but not consistent across all models. The two-sample proportion test supports the hypothesis at the 5% significance level, as do the first and second logistic regressions. When adding more explanatory variables, however, overconfidence only has a marginal statistically significant effect on the willingness to cooperate, but this could be due to a lack of statistical power and not due to evidence against the hypothesis. I can therefore accept the hypothesis that overconfidence lowers the willingness to cooperate.

4.2.2 Participants working individually score higher on incentivized task

For a regression analysis, the independence, normality, homoscedastic, and multicollinearity assumptions need to be checked. For the t-test, the following assumptions must be checked: independence, normality, homogeneity of variances, and random sampling.

For the t-test to hold these assumptions must be true: independence, normality, homogeneity of variances, and random sampling. Observations are collected independently for each participant and the sample is random. Normality is checked using a Shapiro-Wilk test for normality. The normality assumption holds for both the group of individuals (p-value = .96866) and the group of cooperators (p-value = .93478). Following a Levene's test for homogeneity of variances, this assumption also holds. The null hypothesis of equal variances cannot be rejected at the 5%-level (p-value = .0609). So, a two-sample t-test with equal variances can be performed. The null hypothesis of equal means can also not be rejected. The t-statistic of .0320 (p-value = .9746) suggests that there is no significant difference between the mean score of individuals and cooperators. The two groups seem to perform equally with a mean score of 5.013514 for individuals and a mean score of 5.0 for cooperators.

For the regression analysis, homoscedastic, multicollinearity, and linearity assumptions need to be checked, independence and normality were already checked for the t-test. For homoscedasticity, a Breusch–Pagan/Cook–Weisberg test is performed. A chi-squared value of 3.20 (p-value = 0.0738) means that we cannot reject the null hypothesis of constant variance, so the homoscedastic assumption is satisfied. Since there is only one explanatory variable, multicollinearity cannot be an issue. There is no need to perform a variance inflation factors for independent variables (vif) test. Linearity is checked by making a scatterplot of Score on WTC, you can find this scatterplot in Appendix B. There does not seem to be a linear relationship between WTC and the score on the incentivized task. This was to be expected after the results of the two-sample t-test.

The IV approach using the random assignment to high and low confidence conditions as an instrument for whether participants worked together or individually did not yield statistically significant results. The tests of endogeneity (Durbin and Wu-Hausman) failed to reject the null hypothesis that the regressor WTC is actually exogenous. This suggests that an IV approach may not be required to address endogeneity concerns. Furthermore, the first-stage regression results indicate that the instrument High treatment is weak and only weakly correlated with the endogenous regressor WTC. The partial R-squared and F-statistic are very low and fall below the critical values for instrumental relevance. So, the IV regression results should not be interpreted, and causality cannot be claimed. Instead, the standard regression results and the t-test can be used to examine correlational relationships between working together and performance.

As the regression will not be completed, because the assumptions do not hold, the t-test is the most suitable method to test the relationship. The results of the t-test reveal that there is no significant difference between the mean scores of individuals and cooperators. Although the IV approach did not yield significant results and the instrument was weak, I cannot rule out the possibility of self-selection bias. The second hypothesis that participants working individually score higher on incentivized task is therefore rejected.

4.2.3 Males will choose to cooperate less often than females.

For this hypothesis, I first performed a two-sample proportion test. As this proportion test uses the same sample as before, the independence assumption, the random sample assumption, and the binomial distribution are still satisfied. Grouped by gender, which takes on value 0 if an observation is male and 1 if an observation is female, the two-sample proportion test leads to a negative difference in mean proportions. That would indicate that on average females are more willing to work together than males. However, the result is not statistically significant. The null hypothesis of no difference in mean proportion between males and females cannot be rejected (p-value = 0.4836). Figure 4 illustrates

the difference in means of willingness to cooperate by gender. The proportion of females is slightly higher, but not significantly higher.

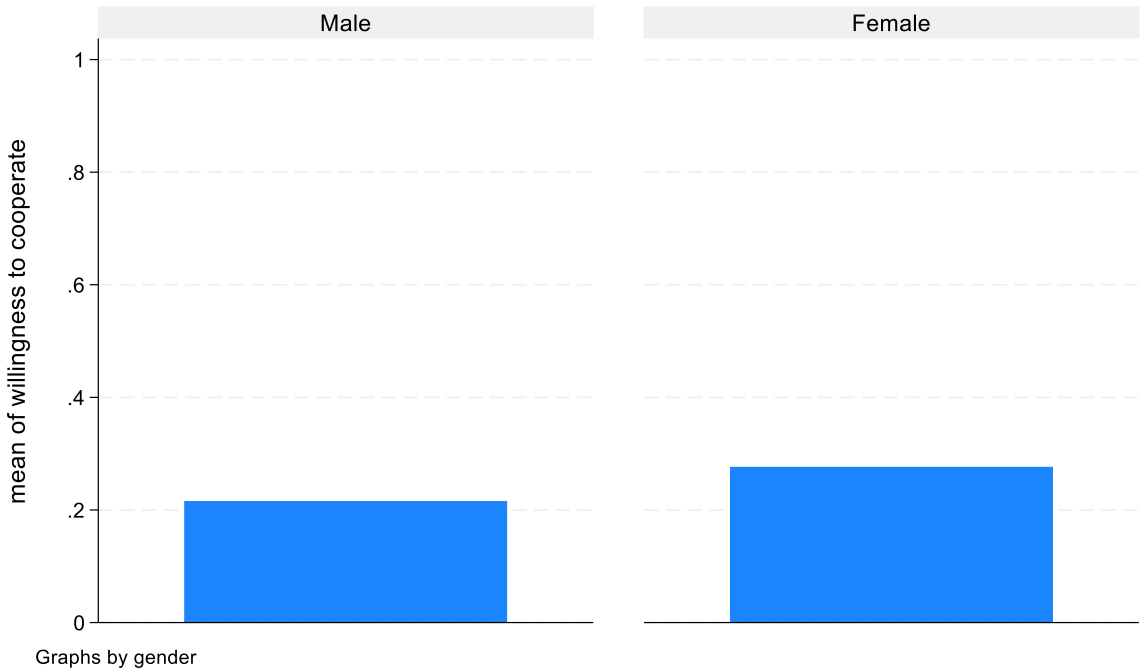

Figure 4: Proportions of the mean of WTC by gender.

For the logistic regression, the independence assumption is satisfied just as with the proportion test. The linearity assumption is tested using a scatterplot, there seems to be a linear relation. The scatterplot can be found in Appendix B. Like before, there is only one explanatory variable, multicollinearity cannot be an issue. There is no need to perform a variance inflation factors for independent variables (vif) test after the regression. The logistic regression can thus be written as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 Gender$$

Where $\log\left(\frac{p}{1-p}\right)$ again represents the log-odds of WTC being equal to 1. Gender is a binary variable that has value 1 if a participant is female. β's are the regression coefficients. No error term. The logistic regression shows that being a female seems to have a positive effect on the odds of being willing to cooperate. However, the coefficient is not statistically significant (p-value = 0.484). The constant term with value -1.290984 represents the logistic odds of WTC for males, the constant is statistically significant (p-value < 0.001).

Despite seeming like there is some evidence of females willing to cooperate more often, the results of both the two-sample proportion test and the logistic regression are not statistically significant so there

is not enough evidence for the third hypothesis that Males will choose to cooperate less often than females to be accepted.

5. Discussion and conclusion

5.1 Research findings

In this research, I investigated the question if overconfidence lowers someone's willingness to cooperate with others. My theory builds on literature investigating the effects of overconfidence (Moore & Healy, 2008; Moore et al., 2006), self-confidence in general, the effects of it on the compromise effect (Chuang et al., 2017), and other researched factors influencing cooperation (Andreoni, 1995; Doyle, 2021; Molina et al., 2013). However, in a sense, this is a completely new direction of research as there is no previous literature suggesting that there is a direct relationship between overconfidence and willingness to cooperate, so the findings of this paper are an almost completely new insight into the effects of overconfidence and the determinants of cooperation. The main results of this experiment present evidence of overconfidence leading to a lower willingness to cooperate, which is in accordance with my main hypothesis: *Overconfidence lowers the willingness to cooperate.* The results are not consistently statistically significant at the 5%-level across all models, but this could be due to a lack of statistical power after adding more explanatory variables, rather than evidence against the hypothesis. The hypothesis is therefore accepted. As said, there is no previous literature that proved or disproved the relationship between overconfidence and willingness to cooperate, although I did expect a significant relation, as that is in accordance with the findings of Chuang et al. (2012), where a relationship between self-confidence and the compromise effect was found. They found that people with higher self-confidence tend to compromise less.

The second finding was that of the effect of individual workers versus cooperators on their performance. No statistical evidence was found to support the hypothesis of individuals scoring higher on the incentivized task in comparison to cooperators. This is not in accordance with existing literature (Liden et al., 2004; Williams et al., 1981). It could be that there was no social loafing due to unidentifiable individual effort as the literature described, because observations were taken individually and not with group members together, making efforts individually identifiable. Another explanation could be that there was no free-riding due to the small groups. Groups in the experiment consisted of only three people. Albanese and Van Fleet (1985) suggest that free-riding is not really a problem in small groups. A single participant has a lot to contribute to a small group, increasing the motivation to exude a sufficient amount of effort.

Also, no statistical evidence was found to support the final hypothesis of men choosing to cooperate less often than women. There seemed to be some relation between gender and willingness to cooperate, but this was not statistically significant. This is not in accordance with existing literature on

cooperation games, where evidence was found of men being less cooperative (Charness & Rustichini, 2011; Molina et al., 2013)

5.2 Research limitations

This research had its limitations. One is the sample size; with 98 observations the effect has to be really clear to get significant results. The experiment should have been more widely distributed. The incentive for the measurement of the outcome variable is not completely backed up by existing literature. It is based on findings in other results (Moore & Healy 2008) and real-life intuitions, but it is still not a proven method. Therefore, it could be that the measuring of the outcome variable was suboptimal. It is possible that a different measurement would have resulted in a clearer effect. The measurement for overconfidence was also flawed. I tested the participants of the experiment for one form of overconfidence, overplacement, but it would have been better to have measured overestimation. Overplacement measures how confident someone is about their performance relative to others performing the same task. Overestimation measures someone's beliefs about their performance in comparison to their actual performance. Now participants were asked how they think they performed compared to other participants. As it was now, participants' beliefs about their relative performance could have been biased. Being in the low-confident treatment could have led subjects to believe that all participants performed poorly, making them believe that there was a relatively low difference in performance in comparison with other participants. An overestimation measure would leave out this bias, as it does not require a relative comparison to others.

5.3 Research contributions

This research contributes to the existing literature by introducing a new effect of overconfidence that has yet to be investigated. This is a chance to expand the field of literature on self-confidence and might pave the way for future studies about its effect on willingness to cooperate. The results of this experiment were not consistently significant, but there is some empirical evidence to serve as motivation. This research can be used as an example of hypotheses for new research questions about this topic, it can be improved and built on further. With an improved methodology or new proof that the methods used in this experiment are sufficient, the relationship between overconfidence and willingness to cooperate can be further established. For further research, I suggest collecting a bigger sample to gain statistical power. Other than that, it can be useful to include more measurements for overconfidence instead of one, to investigate the differing effects on the distinct types of overconfidence, namely overestimation and overplacement (Moore & Healy 2008). Another improvement would be to do a pilot for the measurement of the outcome variable in order to adjust

the incentive to the average behavior. That way the decision to cooperate is more dependent on overconfidence and less on other personal beliefs.

The insights gained from this research on the effect of overconfidence on the willingness to cooperate with others have practical implications that can benefit organizations. The effect of overconfidence should be considered in team-based work environments. Promoting self-awareness among team members about their self-confidence could create a more collaborative and productive atmosphere. Furthermore, in interpersonal conflicts and decision-making processes, this research could offer valuable insights for conflict resolution and effective communication. For leaders, acknowledging the influence of overconfidence could help with strategies for team formation and task allocation. Moreover, these findings could help more with the understanding of free-riding. Instead of punishment, incentivizing or reallocating individuals with a lower willingness to cooperate might be a more constructive approach. Ultimately, this research serves as a stepping stone toward improving workplace dynamics, developing collaboration strategies, and elevating corporate and academic achievements by addressing the factor of overconfidence when it comes to cooperative behavior.

5.4 Conclusions

In conclusion, this thesis examined the question if overconfidence lowers someone's willingness to cooperate with others. Some evidence was found in support of this question, but the outcomes were not consistently significant. There was no significant evidence for gender differences in willingness to cooperate and no performance differences between cooperators and individuals.

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7. Appendix

7.1 Appendix A: survey

Self-confidence

Start of Block: Intro

Welcome to this experiment about your willingness to cooperate! Throughout this experiment, you will collect points. Afterwards, I will randomly pick 3 winners to receive a ***cash prize!*** 10 points = 1 euro. So make sure to put in some effort, because you have a real chance to win! This experiment will take less than 10 minutes of your time, but your contribution will be of great value for my research. Thank you in advance!

End of Block: Intro

Start of Block: Consent

Consent For this experiment I ask that you provide me your age, gender and work status (e-mail address is optional if you want to get a chance to win the prize money). I will not use your information for anything other than this research, and you will not be personally linked to the results. Nobody but me has access to the data. Do you consent and with that participate in this experiment?

Yes, I consent (1)

No, I do not consent (2)

End of Block: Consent

Start of Block: Demographics

First, I would like to ask you some basic information about yourself. This will only take a few seconds.

AGE What is your age?

_____

GENDER To which gender identity do you most identify?

Male (1)

Female (2)

Non-binary / third gender (3)

Prefer not to say (4)

OCCUPATION What are you primarily?

Student (1)

Worker (2)

Other (3)

End of Block: Demographics

Start of Block: Info block 1

Info1 For the next part, I ask you to answer 10 trivia questions. All are multiple choice and you are obligated to answer all. No points to earn yet.

End of Block: Info block 1

Start of Block: High confidence treatment

H1 What was the name of the world's first cloned mammal?

Millie (1)

Tetra (2)

Carrel (3)

Dolly (4)

H2 From what trees do acorns grow?

Oak (1)

Maple (2)

Walnut (3)

Beech (4)

H3 Who is the patron saint of Ireland?

St. David (1)

St. Andrew (2)

St. George (3)

St. Patrick (4)

H4 What color are emeralds?

Blue (1)

Green (2)

Red (3)

Purple (4)

H5 Which of the following animals sleep standing up?

Gorillas (1)

Flamingos (2)

Cows (3)

Ravens (4)

H6 Which of the following metals has the symbol Fe?

Copper (1)

Iron (2)

Nickel (3)

Lead (4)

H7 What monkey is the closest related to humans?

Bonobo (1)

Baboon (2)

Gorilla (3)

Macaque (4)

H8 Which famous ocean liner sank on her first voyage in 1912?

Europa (1)

Saxonia (2)

Titanic (3)

Laconia (4)

H9 Which planet in our Solar System is known for having a ring?

Uranus (1)

Neptune (2)

Mars (3)

Saturn (4)

H10 Which is the largest ocean in the world?

Atlantic (1)

Indian (2)

Pacific (3)

Arctic (4)

End of Block: Treatment HIGH

Start of Block: Low confidence treatment

L1 A Gastroenterologists is a specialist doctor of what subject?

Respiratory system (1)

Digestive organs (2)

Heart and blood vessel (3)

Reproductive system (4)

L2 In what year did Freddie Mercury, the lead singer of the band Queen, die?

1985 (1)

1989 (2)

1991 (3)

1993 (4)

L3 What is one full of when one is gambrinous?

Joy (1)

Beer (2)

Hatred (3)

Regret (4)

L4 What is England's largest landlocked county?

Derbyshire (1)

Oxfordshire (2)

Staffordshire (3)

Shropshire (4)

L5 How many Apollo missions landed humans on the moon?

Two (1)

Five (2)

Six (3)

Nine (4)

L6 Where was Che Guevara killed?

Bolivia (1)

Argentina (2)

Cuba (3)

Mexico (4)

L7 Suharto held the office of president in which Asian nation?

Malaysia (1)

Japan (2)

Indonesia (3)

Thailand (4)

L8 What does a person with hormephobia fear?

Saliva (1)

Shock (2)

Worms (3)

Silence (4)

L9 Ouagadougou is the capital city of which African country?

Chad (1)

Burkina Faso (2)

Eritrea (3)

Djibouti (4)

L10 What two letters are both symbols for the number 1,000?

K and T (1)

T and M (2)

K and M (3)

M and O (4)

End of Block: Treatment LOW

Start of Block: Confidence

CON How do you think you have scored on the previous questions compared to others who had similar questions?

Far below average (1)

Somewhat below average (2)

Average (3)

Somewhat above average (4)

Far above average (5)

End of Block: Confidence

Start of Block: OUTCOME VARIABLE

WTC For the next part, you have to choose to either work in a group or do the task individually. If you choose to work together, you will be matched to two other participants after the experiment is done. You will not know with whom you are matched and how they did on the last task. *The benefit of working together* is that only one of the three group members has to answer the question correctly, so even if you are wrong you can still get the points. *The downside is* that for every correct answer, you will receive less points working in a group than when you choose to work individually. Every correct answer yields 10 point if you are on your own and 6.5 points if you cooperate with others.

Remember: there is a now real chance to win money! 10 points = €1

I want to work alone (for 10 points per correct answer) (1)

I want to cooperate with others (for 6.5 points per correct answer) (2)

End of Block: OUTCOME VARIABLE

Start of Block: Timer explanation

Before we start, on each question you have *only 6 seconds* to answer and there is no going back. There is a total of 10 questions. There are now points to earn. If you understand, please continue to the quiz.

End of Block: Timer explanation

Start of Block: Trivia questions

T1 Who won the 1988 EUFA European Championship?

- Germany (1)
- The Netherlands (2)
- France (3)
- Spain (4)

T2 What is the name of the most important Dutch stock market index?

- Amsterdam Exchange indeX (1)
- Amsterdam Everyday indeX (2)
- All Exchange indeX (3)
- All day Everyday indeX (4)

T3 What's the second most populous continent?

- Africa (1)
- Asia (2)
- Europe (3)
- North-America (4)

T4 What country is only bordered by Spain?

- Andorra (1)
- Portugal (2)
- Marocco (3)
- France (4)

T5 The island of Rhodes belongs to which Mediterranean country?

Bosnia and Herzegovina (1)

Croatia (2)

Greece (3)

Malta (4)

T6 What weather phenomenon is measured by the Beaufort scale?

Earthquakes (1)

Wind (2)

Rain (3)

Typhoons (4)

T7 Of how many states does the United States of America consist?

50 (1)

48 (2)

49 (3)

51 (4)

T8 Who led the fleet to Nova Zembla in 1596-97?

Michiel de Ruyter (1)

Willem Blaeu (2)

Willem Barentsz (3)

Cornelis de Houtman (4)

T9 Who sings the hit song “Rehab”?

Mariah Carey (1)

Whitney Houston (2)

Janet Jackson (3)

Amy Winehouse (4)

T10 Who was not one of the Three Musketeers?

Athos (1)

D'Artagnan (2)

Aramus (3)

Porthos (4)

End of Block: Trivia questions

Start of Block: TRUST AND RISK

TRUST For an additional 10 points:

How many questions do you think the two other teammates answered correctly on average? If you worked alone: How many questions do you think everybody answered correctly on average? If your answer matches the actual average, you earn the 10 points.

	0	1	2	3	4	5	6	7	8	9	10
Correct answers ()											

RISK If among 50 people 100 points are disposed, how much points are you willing to pay to join the lottery?

_____

End of Block: TRUST AND RISK

Start of Block: Debriefing

You have reached the very end of this study conducted by Quinten van der Elst, for his Bachelor study at Erasmus School of Economics, Erasmus University Rotterdam.

Thank you for your participation. Your answers are very valuable to me. I urge you not to discuss this study with anyone else who is currently participating or might participate at a future point in time. You may decide that you do not want your data used in this research. If you would like your data removed from the study and permanently deleted, please contact me via the address listed below. If you have any questions or concerns regarding this study, its purpose or procedures, please feel free to contact me at 574192qe@eur.nl. Thank you!

End of Block: Debriefing

7.2 Appendix B

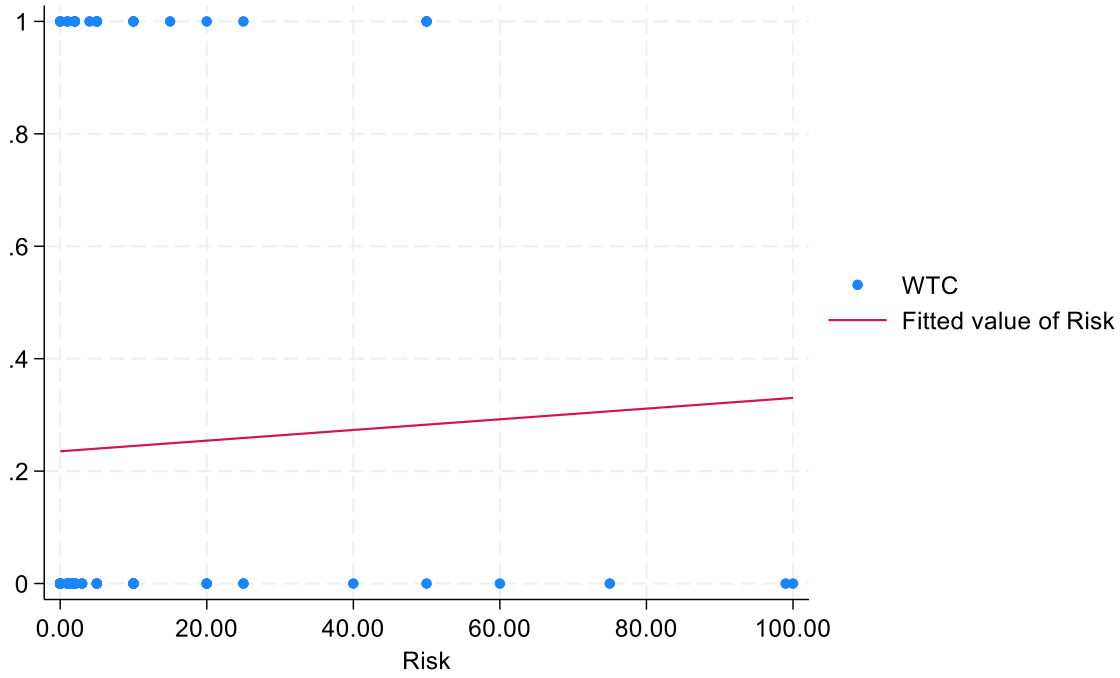

Figure 5: Linear relationship between risk and willingness to cooperate.

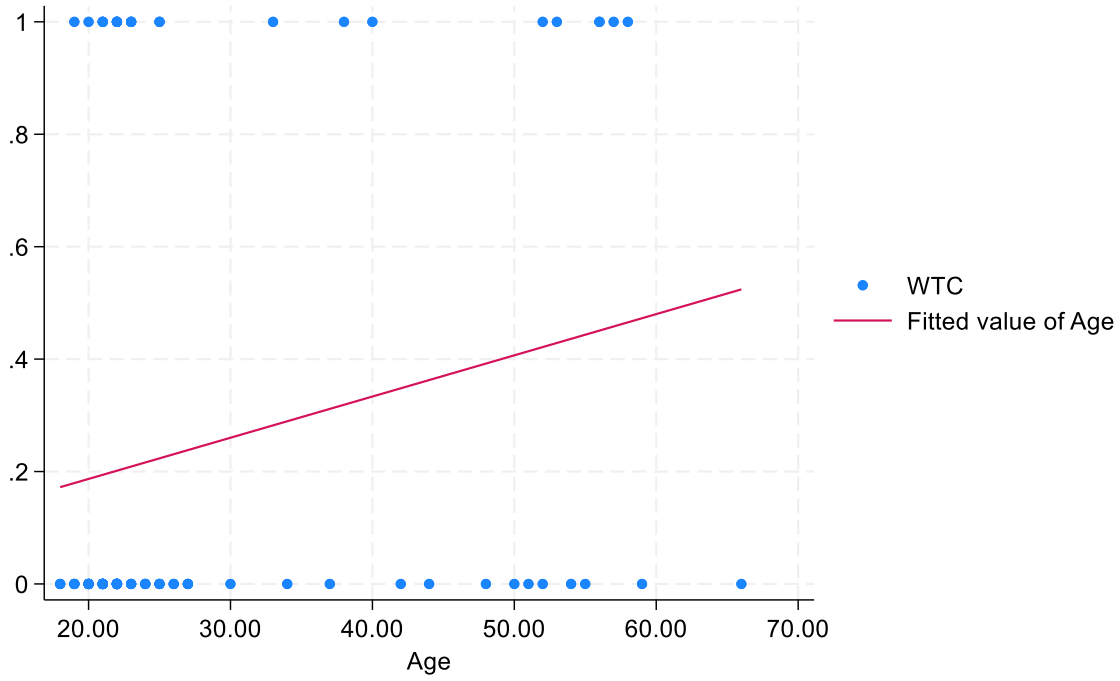

Figure 6: Linear relationship between age and willingness to cooperate.

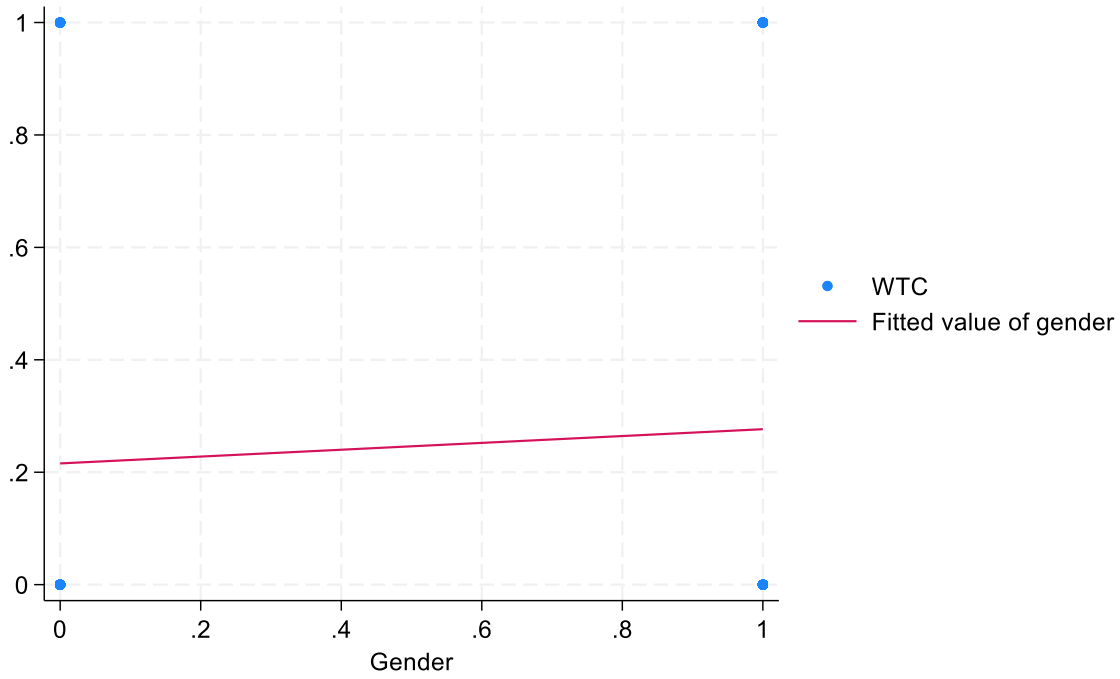

Figure 7: Linear relationship between gender and willingness to cooperate.