

Personality Testing and the Public Goods Game

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Abstract

Personality tests are commonly used to hire suitable employees but this process is susceptible to strategic misrepresentation by job-seekers. This paper uses a lab experiment as an analogy of such a hiring process by using the Public Goods Game (PGG) as a proxy for a cooperative work environment. Subjects first complete a Big Five personality test, focusing on the trait of “Agreeableness”, which previous studies have linked to prosocial cooperation in the PGG. Two groups are formed: a high Agreeableness group and a low Agreeableness group. The high Agreeableness group should contribute more to the public good. The experiment manipulates the timing of revealing the group formation rule, as knowing the rule before the personality test allows for misrepresentation of Agreeableness. I find no evidence of misrepresentation when the group formation rule is revealed before the personality test. I also find that Agreeableness group formation increases contributions for both high and low groups, but only when it is described to subjects before the PGG. Contrary to the existing literature, I find no evidence that Agreeableness influences contributions in the PGG.

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1 Introduction

Psychometric tests, designed to measure a person’s personality or other latent aspects that cannot be directly observed, are an established standard in many firms’ hiring procedures. Firm hiring processes are so intertwined with psychometric testing, it even pervades its dictionary definition.¹ Psychometric tests are used on approximately 60 to 70% of US job-seekers (Weber & Dwoskin, 2014), and 75% of international firms either use or plan to use them in the future (Kantrowitz, Tuzinski, & Raines, 2018). Psychometric tests are a multi-billion dollar industry globally, with expenditure reaching 12.32 billion USD in 2021 and forecast to hit 23.28 billion in 2030 (Emergen Research, 2022). It remains an open question whether this expenditure is justified. Finally, it has been suggested that psychometric testing is unfair or discriminatory against minorities or those with disabilities (Weber & Dwoskin, 2014; Hawkins & Monroe, 2021; McGee & McGee, 2022a). All of these elements illustrate the economic importance of psychometric testing, and why it is crucial to understand their efficacy, impacts, and any unintended consequences.

The problem with using psychometric personality tests for hiring is that potential employees have a material incentive to misrepresent their responses on the tests in order to more closely align towards what they perceive an employer is looking for. When completing a job application, job-seekers know they are being evaluated at every step. Job-seekers tailor their cover letters, embellish their CVs, and curate their references, all to paint themselves in the best light possible. It is no stretch of the imagination that they also adjust their responses to personality questions. After all, no one would willingly state they ‘insult people’ or ‘get irritated easily’ during a job interview, so why would they in a job personality test? Therefore, using personality tests during the hiring process may be uninformative of the potential employee’s true personality. Such tests introduce further frictions and inefficiencies into the labor market, which must function smoothly for the overall well-being of society and the economy. Therefore, it is important to study whether personality testing maintains its effectiveness given the incentive to misrepresent.

¹*‘Psychometric test: A test that is designed to show someone’s personality, mental ability, opinions, etc., often used by companies when they are deciding whether or not to employ someone.’* (Cambridge Business English Dictionary, 2023)

There is some evidence that using psychometric personality testing is effective in job hiring processes (Autor & Scarborough, 2008; Hoffman, Kahn, & Li, 2018), but it is not clear why. One proposed channel is that it puts more weight on objective measures rather than subjective opinions, but that would still require job seekers to represent themselves honestly. Another channel is that misrepresentation on personality tests could be attenuated by a preference for honesty, meaning the signal-to-noise ratio may be good enough for it to remain a useful metric. The challenge of accurately identifying what an employer is seeking would also decrease the likelihood of misrepresentation. On this note, it is possible that testing might instead be capturing some measure of intelligence (Borghans, Duckworth, Heckman, & Weel, 2008). Those that are smart enough to identify what the employer wants could also be more effective workers based on that intelligence. More negatively, those that are cunning enough to shape their personality responses may be ruthless enough to achieve results. Such workers would not value the firm’s reputation or sustainability, and potentially drive out more genuine workers. Therefore, selecting workers in this fashion may be beneficial in the short-term but problematic in the longer-term, something that previous studies have not considered. The effects of personality testing in job hiring are multifaceted and warrant further study. There are still open empirical questions on whether such tests are effective, why they are effective, and if there are unintended consequences arising from their use.

In this paper, I design a laboratory experiment to evaluate under what conditions personality testing is effective. Lab experiments are becoming a common method to help inform firm personnel and hiring processes. Experiments are a cost-effective tool to evaluate potential firm policies and why they work, without confounds like employee self-selection and while still retaining good external validity (Villeval, 2016). I design the experiment to closely mirror the important elements of hiring using personality testing, and the subsequent work output. The experiment consists of two main parts, a personality test followed by a cooperation task. For the personality test, I elicit the ‘Big Five’ personality traits, which are widely employed in both hiring procedures and academic research in economics.² For the

²The psychometric testing firms Big Five Assessments, Hogan Assessments, and SHL, among others, incorporate elements of the Big Five as part of their battery of psychometric testing services that they offer to firms. For a variety of examples of the Big Five in economics research, see (Bartling, Fehr, Maréchal, & Schunk, 2009; Fréchette, Schotter, & Trevino, 2017; Donato, Miller, Mohanan, Truskinovsky, & Vera-Hernández, 2017; Gill & Prowse, 2016; Holmén, Holzmeister, Kirchler, Stefan, & Wengström, 2021).

cooperation task, I use the Public Goods Game (PGG) as an representation of a cooperative work environment. In the PGG subjects can make socially-optimal contributions to a public good, but face a personal incentive to free-ride and contribute less. I interpret contributions to the public good as effort at work, which is something an employer would like to encourage. I focus on the Big Five personality trait of ‘Agreeableness’, the tendency to act in a cooperative, unselfish manner, as research finds it positively impacts contributions in the PGG and other similar social dilemmas (Perugini, Tan, & Zizzo, 2010; Volk, Thöni, & Ruigrok, 2012; Kagel & McGee, 2014; Thielmann, Spadaro, & Balliet, 2020). I sort subjects into groups for the PGG based on their Agreeableness score, to mimic the role of an employer hiring based on personality tests in an attempt to maximize their firm’s success.

The crucial treatment dimension in the experiment is the timing of information about the purpose of the initial personality questionnaire, i.e., the group formation rule for the PGG. There are three treatments on the time dimension, *Before* the personality test, *After* the personality test (but before the PGG), and *Never*. In the *Before* treatment, subjects have an incentive to misrepresent their personality in order to try and get into a more cooperative group. This situation is similar to the current status quo, where job seekers are aware they are being evaluated for the job by the test. The compression of Agreeableness scores, alongside any mistrust stemming from the potential for strategic misrepresentation, makes this a challenging environment for personality testing to be effective in increasing PGG contributions. Whereas in the *Never* Treatment, subjects are never informed about how groups are formed, and therefore have no material incentive to misrepresent their personality. Without strategic misrepresentation, forming groups by the elicited Agreeableness scores is more likely to be effective in increasing PGG contributions in high Agreeableness groups. Finally, in the *After* treatment, subjects also have no material incentive to misrepresent their personality as the group formation rule is only revealed directly after the personality test. If subjects know that they are in a group with similarly cooperative people, then they can be more confident of current and future cooperation. Combined with the absence of strategic misrepresentation, this scenario is the most favorable environment for personality testing to be effective. The situations represented by *After* and *Never* are not particularly realistic, but are important in exploring the necessary conditions for the effectiveness of

personality testing. They highlight a strength of economic experiments, in that it allows for an exploration of counterfactuals that would otherwise not occur.

The second treatment dimension is the group formation rule itself. Groups are typically randomly assigned in economics experiments, which makes a *Random* treatment a natural baseline for the *Agreeableness* group formation rule. The experiment is a 3x2 design, so subjects in the *Random* treatment also have the group formation rule revealed to them either *Before* or *After* the personality test, or *Never*. With this battery of treatments, I aim to address the following research questions:

Question 1 *To what extent do individuals misrepresent their personality when they have strategic reasons to do so?*

Question 2 *Under what conditions are personality tests effective in encouraging cooperative behavior?*

Question 3 *Does using personality tests in an unexpected way influence responses in later tests?*

I address Question 1 by comparing the responses to the personality test between the treatment with *Agreeableness* group formation rule that is revealed *Before* to all other treatments, as strategic misrepresentation can only be present in the former. I find no evidence of misrepresentation of any personality trait in the *Before* treatment. A preference for honesty is the most likely explanation for this result.

I address Question 2 by comparing the impact of each treatment dimension on contributions in the PGG while holding the other dimension fixed. This approach allows me to isolate and identify the most significant empirical factors influencing behavior. I find that the *Agreeableness* group formation rule increases contribution rates in the *Before* and *After* treatments. However, I also find that contributions increase regardless of whether the group is of high or low *Agreeableness*, and I find no evidence that the *Agreeableness* group formation rule is effective in the *Never* treatment. Therefore, sorting groups by *Agreeableness* is ineffective by itself. Rather, it is the knowledge that groups will be formed by *Agreeableness* that drives increased contributions. One possibility is that personality testing may induce

a form of group or team identity, so the knowledge that it is used for hiring may enhance, rather than diminish, its effectiveness.

I answer Question 3 by conducting another personality test after the PGG, and focus on subject responses when the *Agreeableness* group formation rule is revealed *After* the personality tests, as these subjects have their personality responses used in an unannounced way. Question 3 addresses an important methodological question in experimental economics: whether the unexpected use of previous responses changes how subjects behave in the future. I find no evidence that withholding information about the group formation rule until *After* the personality test affects responses to subsequent personality tests. Unless contradicted by future evidence, this design feature remains an appropriate option for experimental economists when their research question requires it.

1.1 Contribution to the Literature

I contribute to the voluminous literature on the PGG, and the related Repeated Prisoner's Dilemma (RPD). When I refer to the PGG in this paper, I am using this as a shorthand reference for the commonly studied Linear Voluntary Contribution Mechanism, although it is worth noting other formulations exist (Ledyard, 1995). A typical pattern of behavior in the PGG starts out with average contributions to the public good of around 50%, which decays steadily over time (Ledyard, 1995; Chaudhuri, 2011; Villeval, 2020). The socially optimal contribution level is 100%, but subjects face an individual incentive to free-ride off the contributions of others. One area of research in the PGG has centered on mechanisms or interventions aimed at enhancing contributions in the PGG. Examples include allowing for punishment (Fehr & Gächter, 2000) or facilitating endogenous group formation (Ahn, Isaac, & Salmon, 2009). I contribute to this strand of the PGG literature by considering exogenous group formation through personality sorting. Prior studies on exogenous group formation have sorted subjects based on their previous contribution behavior in a PGG, and found that this type of sorting is effective (Burlando & Guala, 2005; Gächter & Thöni, 2005; Gunthorsdottir, Houser, & McCabe, 2007; Ones & Putterman, 2007). I contribute to this line of literature by sorting subjects in the PGG by indirect measures of their contribution rate, namely their personality traits. In the RPD, Proto, Rustichini, and Sofianos (2019) find

that sorting by the Big Five trait of Conscientiousness is effective in encouraging cooperative behavior, suggesting something similar should be possible in the PGG. Typically in these experiments that exogenously sort subjects, information about the sorting rule is withheld. In all of the mentioned research the information (or lack thereof) provided about the sorting rule remains constant across all treatments. I contribute to this literature by varying the timing and presence of information about the sorting rule, and examining how this affects contributions in the PGG.

Another strand of the PGG literature considers the effects that individual characteristics have on contribution behavior in the PGG. Of particular interest to the current paper are studies that elicit Big Five personality characteristics.³ The Big Five personality trait of Agreeableness has been found to be a significant predictor of contribution behavior in the PGG. Volk et al. (2012) and Perugini et al. (2010) find Agreeableness to be correlated with contributions in the PGG, although the latter only observe this relationship in men. In terms of Agreeableness in the RPD, Kagel and McGee (2014) find a positive correlation with cooperation, while Proto et al. (2019) observe this only in early periods. Additionally, Gill and Rosokha (2020) find that the trust facet of Agreeableness facilitates cooperation through learning. There are also non-incentivized studies that find a positive relationship between Agreeableness and prosocial actions in cooperative games (for a meta-analysis, see Thielmann et al. (2020)). I aim to tackle the logical next question in this line of research: given our understanding that Agreeableness influences contributions, how can we leverage this insight? Creating PGG groups by Agreeableness in order to improve contributions is a natural next step, and is analogous to role of employers using personality testing to select well-suited employees.

Naturally, I also contribute to the literature on psychometric personality testing. Misrepresentation, regardless of the motivation behind it, has been a longstanding concern in psychology due to the threat it poses to the validity of psychometric testing.⁴ The main limitation of psychology studies on misrepresentation is the absence of monetary incentives. Subjects are typically explicitly instructed to misrepresent themselves in a particular way,

³Some other relevant papers on individual characteristics and the PGG are (Anderson, Mellor, & Milyo, 2004; Carpenter, Daniere, & Takahashi, 2004; Catola, D'Alessandro, Guarnieri, & Pizziol, 2021).

⁴For select examples see (Braun & Gomez, 1966; Velicer & Weiner, 1975; Kroger & Wood, 1993)

which effectively gives permission to lie. As a result, this type of research fails to capture the significant trade-off between honest representation and material gain. Furthermore, it is cognitively costly to determine which questions coincide with a specific personality trait. Without the incentive to do so, individuals will put less effort into this task. The use of incentives is a key difference between the fields of experimental psychology and experimental economics.

The most closely related paper in economics on personality testing using incentivized experimental methods is by McGee and McGee (2022b) (henceforth MM). In their experiment, they first elicit subjects' Big Five personality traits in an initial baseline session. In a follow-up session a week later, subjects complete a second Big Five assessment. Before taking the second personality test, subjects are informed that they will receive an extra payment if they are 'hired' for a hypothetical job. The hiring process is based in part on their Big Five characteristics as elicited in the second personality test. Subjects are given a job description that is designed to indicate that Big Five personality trait of Extroversion would be ideal.⁵ MM find that subjects misrepresent their personality in the presence of incentives.

I take a different approach from MM which makes a complementary but distinct contribution to the literature. Firstly, my focus is on how misrepresentation impacts subsequent work behavior. An employee is likely to behave differently when it comes to cooperative team decisions if they suspect their colleagues are manipulative, dishonest, and ill-suited for their roles due to misrepresentation. MM focus on the magnitude of misrepresentation given the incentive of being hired for a job that is never undertaken. Whereas, I extend the hiring process analogy to include the ensuing job effort decisions, in order to focus on the effects of misrepresentation. My main goal is to uncover whether personality testing is effective in fostering cooperative environments, and under what conditions. Secondly, I consider the misrepresentation of personality traits in a between-subject design rather than within-subjects as in MM. In this regard, I follow the experimental literature on dishonesty, which emphasizes that dishonest behavior is difficult to observe at the individual level (Fischbacher & Föllmi-Heusi, 2013). Comparing individual responses across two personality tests introduces a potential confounding factor. Subjects might be concerned that any substantial misrepre-

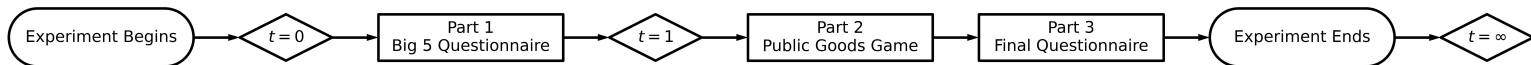
⁵MM also use a job description aimed at Introversion as well as a neutral description as robustness checks.

sentation will be detected by comparing the two tests, leading them to be more honest than they would otherwise be. Finally, this paper contributes by proving a conceptual replication of some of the elements in MM. Replication is not the primary purpose of this study, but the externality is a welcome one given the current credibility crisis in the social sciences (Butera, Grossman, Houser, List, & Villeval, 2020). Independent replications can greatly increase the likelihood that any detected effect is actually true (Maniadis, Tufano, & List, 2014).

2 Experimental Design

I first briefly describe the experiment and its treatments, so that the necessity of some of the finer design elements are more apparent. The experiment consists of three parts that are common to all treatments. Part 1 is a Big Five questionnaire, Part 2 is a PGG, and Part 3 is a short questionnaire that elicits four other personality traits. The first treatment dimension is how groups are formed in Part 2, the PGG. In the *Random* (R) treatments, groups of three are formed randomly from all subjects in the session. In the *Agreeableness* (A) treatments, subjects are first randomly shuffled into silos of six. Within each silo, the three subjects with the highest Agreeableness scores (as elicited in Part 1) are assigned to one group, while the remaining three are assigned to another group. The second treatment dimension is the timing of when information about the group formation rule is provided. This is either *Before* Part 1 ($t = 0$), *After* Part 1 but before Part 2 ($t = 1$), or *Never* ($t = \infty$). An illustration of the timing of the experiment is presented in Figure 1. The experiment is a 3x2 design, meaning all combinations of the two treatment dimensions are considered, as summarized in Table 1. Henceforth, I denote each treatment with two characters as in Table 1, with the letter representing either the A (greeableness) or R (andom) group formation rule, and the number representing $t = 0$, $t = 1$, or $t = \infty$.

Figure 1: Timeline of Experiment



A diamond (\diamond) represents a possible treatment point at which the group assignment rule for Part 2 is revealed.

Table 1: Treatments

	$t = 0$ (<i>Before</i>)	$t = 1$ (<i>After</i>)	$t = \infty$ (<i>Never</i>)
<i>Agreeableness</i> (A)	$A0$	$A1$	$A\infty$
<i>Random</i> (R)	$R0$	$R1$	$R\infty$

2.1 Part 1 - Big Five Elicitation

Part 1 consists of 50 questions designed to elicit the Big Five personality traits (McCrae & John, 1992). These traits are Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. As the experiment is conducted in Austria, the questions (and the rest of the experiment) are in German. Each Big Five characteristic is elicited using the 30 question ‘BFI-2-S Inventory’ (Soto & John, 2017; Rammstedt, Danner, Soto, & John, 2020). The remaining 20 questions are all on Agreeableness, and sourced from the International Personality Item Pool’s (IPIP) ‘100-Item Lexical Big-Five Factor Markers’ (Goldberg, 2002; Goldberg et al., 2006; Streib & Wiedmaier, 2001). The Agreeableness trait is disproportionately weighted (26/50) as it is of primary interest and used for group formation in Part 2 in the A treatments. Subjects are asked to answer the personality questions accurately, and enter their responses using a 5-point Likert scale (Likert, 1932). Agreeableness is calculated based on each subject’s numerical responses on the relevant questions.⁶

In all treatments, subjects are given a short overview of the PGG in Part 2 before completing the Part 1 questions. If information about the group formation rule is provided (i.e. $t \leq 1$), it is provided either directly before or directly after subjects complete the 50 questions. The *Agreeableness* treatments have an in-depth description of the group formation rule, which outlines the Agreeableness trait, its positive relationship to cooperative decisions (with academic references), and that the three subjects with the highest Agreeableness scores from a random silo of six will be grouped together.⁷ A high level of detail is provided to help subjects understand the specific personality trait that is being used in the group formation rule, and why it could be beneficial or desirable to be in the high Agreeableness group.

⁶See Appendix E for details on the personality trait questions and their scoring.

⁷The instructions for Parts 1 and 3 are presented in Appendix D.

2.1.1 Predictions: Misrepresentation

When it comes to strategic misrepresentation in the Big Five questionnaire of Part 1, there are three treatment groups of interest. The first are those that know in advance that their Part 1 responses will be used to form groups in Part 2 ($A0$). The second are those that know in advance that their Part 1 responses will not be used to form groups in Part 2 ($R0$). The final group are those that do not know in advance about the group formation rule in Part 2 ($t > 0$). The first two groups are aware of how their Part 1 responses affect Part 2 while answering Part 1, while the third group is unaware of this while answering Part 1.

I propose two behavioral channels that could influence Part 1 responses: the incentive to misrepresent Agreeableness, and the suspicion that Part 1 answers may be used in some way for Part 2. An incentive to misrepresent Agreeableness exists when it is known groups will be formed based on this trait. Suspicion occurs only when subjects are not aware of the purpose of the questionnaire. Subjects may believe (sometimes correctly) that the questionnaire will be used in some relevant way in the future, as they know there will be a following Part 2. Each of the comparisons between the relevant groups and the differences in operative channels between them are summarized in Table 2.

Table 2: Misrepresentation of Agreeableness - Treatment Comparisons

Treatment Comparison	Incentive	Suspicion
$A0$ to $R0$	–	0
$R0$ to $t > 0$	0	+
$A0$ to $t > 0$	–	+

Going from the first treatment to the second, + indicates that channel has been added, 0 indicates no change, and – indicates that channel has been taken away. The $t > 0$ grouping includes all treatments except for $A0$ and $R0$.

Table 2 demonstrates clean tests that isolate either channel, incentives through comparing $A0$ and $R0$, and suspicion through $R0$ and $t > 0$. Both channels have the potential to influence Agreeableness. Incentives should increase the reported Agreeableness scores, as subjects will prefer to be in H groups (or avoid L groups). I propose that suspicion leads to more socially acceptable responses, thereby increasing reported Agreeableness scores. There are many possibilities of what a subject might be suspicious of, but the obvious candidates of group formation or having answers revealed to others in Part 2 would both suggest a

tendency towards more socially acceptable responses. Hypotheses 1 and 2 formalizes the conjecture that the reported Agreeableness scores in Part 1 in the presence of incentives or suspicion respectively.

Hypothesis 1 *Agreeableness scores are higher in A0 than in R0*

Hypothesis 2 *Agreeableness scores are higher in $t > 0$ treatments than in R0*

2.2 Part 2 - Public Goods Game

Part 2 consists of a PGG adapted from the version used by Lugovsky, Puzzello, Sorensen, Walker, and Williams (2017). Groups of three are assigned from silos of six subjects by the group formation rule (i.e. randomly or by Agreeableness). Each group of three remains together for 15 ‘group cooperation decisions’. In each decision, each subject has 25 tokens they can allocate to either a Private account or a ‘Cooperation’ account.⁸ Each token a subject allocates to the Private account earns that subject 10 points. Each token a subject allocates to the Cooperation account earns each of the three group members (i.e. including the subject in question) 4 points each. In other words, one token allocated to the Cooperation account earns the group 12 points overall. I refer to tokens allocated to the Cooperation account as ‘contributions’. The marginal per-capita return (the ratio of the private benefit of one token to the Cooperation account to the opportunity cost of that token) is $MPCR = \frac{4}{10} = 0.4$. For $MPCR = \frac{4}{10} = 0.4$, it is a well-replicated result that groups’ average contribution rates typically start at around 50% and then decline steadily over time (Ledyard, 1995; Chaudhuri, 2011). This $MPCR$ was chosen so that any intervention that increases contributions would have plenty of room to do so without censoring at full contributions. Subjects make their decision by deciding how many tokens to allocate to the Cooperation account, with the remainder being allocated to their Private account. After making their decision, subjects are reminded of their own contribution, and also told the total group contribution in that round. These round summaries are also available at any time during Part 2 in a history table that is displayed at the bottom of the screen.

⁸Framing the PGG in terms of group cooperation is likely to increase contributions (Dufwenberg, Gächter, & Hennig-Schmidt, 2011). This is not an issue as all treatments are framed in the same way.

2.2.1 Predictions: Efficiency

I define efficiency as the number of tokens allocated to the Cooperation account, as full contributions are the first-best social optimum (i.e. socially efficient). One important distinction to make is that in any treatment that sorts by Agreeableness (i.e. A treatments), one group will have higher Agreeableness than the other. The high group is predicted to have higher contributions than the low group. I therefore consider these two types of groups separately, as I would like to observe the positive effects of personality sorting.⁹ I denote the two types of groups H and L for high and low Agreeableness respectively. In the following discussion, I take the viewpoint of the H group when describing potential effects.

I conjecture that there are three main factors at play here: the group formation rule itself, strategic misrepresentation of Agreeableness, and knowledge of the group formation rule. The Agreeableness (A) group formation rule should be effective in increasing contributions, as this personality trait is linked with cooperation and generosity. Hypothesis 3 tests this conjecture under each timing ($t = i$) condition.

Hypothesis 3 *The number of tokens contributed in AiH is greater than in Ri .*

The number of tokens contributed in Ri is greater than in AiL .

The number of tokens contributed in AiH is greater than in AiL .

However, the effectiveness of the Agreeableness group formation rule will differ depending on when information about the rule is revealed. Consider comparing $t = 0$ to $t = 1$, two treatments where subjects know the group formation rule before the PGG. In $t = 0$ the group formation rule is known prior to when Agreeableness is measured. Subjects have an incentive to misrepresent themselves in the Agreeableness elicitation to try and be placed in the H group (or to avoid the L group). Agreeableness scores will be compressed and the end result would be more similar to random group formation in terms of each group's true level of Agreeableness. Whereas in $t = 1$, the group formation rule is only revealed after the Agreeableness elicitation, precluding strategic misrepresentation. The Agreeableness group formation rule should be more effective in the absence of strategic misrepresentation.

⁹In the employment framing of this environment, the low group would simply not be hired. However, given the expectations of lab subjects this is not practical to implement.

In terms of the Random group formation rule, I posit that t has no effect. Hypothesis 4 formalizes these conjectures.

Hypothesis 4 *The number of tokens contributed in $A0H$ is lower than in $A1H$.*

The number of tokens contributed in $R0$ is the same as in $R1$.

The number of tokens contributed in $A0L$ is higher than in $A1L$.

Now consider comparing $t = 1$ to $t = \infty$, two treatments that do not have strategic misrepresentation but differ in whether subjects know the group formation rule prior to the PGG. Knowing that the Agreeableness group formation rule is in effect means that subjects are aware they are grouped with similarly cooperative people. Such confidence will increase initial contributions if subjects are concerned about being taken advantage of by lower contributors. Higher initial contributions will have a flow-on effect if subjects are conditional cooperators. Therefore, Agreeableness group formation should be more effective when the rule is known in the absence of strategic misrepresentation. Hypothesis 5 formalizes these conjectures.

Hypothesis 5 *The number of tokens contributed in $A1H$ is higher than in $A\infty H$*

The number of tokens contributed in $R1$ is the same as in $R\infty$

The number of tokens contributed in $A1L$ is lower than in $A\infty L$

Table 3 presents especially interesting treatment comparisons that isolate the impact of a particular effect while holding other factors constant. This is under the assumption that effects are additively separable, but potential interactions means a full factorial design is prudent.

2.3 Part 3 - Final Questionnaire

Table 3: Efficiency - Selected Treatment Comparisons

Treatment Comparison	Incentive to misrepresent	Knowledge of group formation rule	Agreeableness group formation
$A0$ to $A1$	–	0	0
$A1$ to $A\infty$	0	–	0
$A0$ to $R0$	–	0	–
$A1$ to $R1$	0	0	–
$A\infty$ to $R\infty$	0	0	–

Going from the first treatment to the second, + indicates that channel has been added, 0 indicates no change, and – indicates that channel has been taken away.

In Part 3, subjects are first informed that they are to complete a final survey, and that their final earnings for the experiment have already been set. Subjects then answer 16 personality questions using the same 5-point Likert scale format as the questions in Part 1, and a standard demographic questionnaire. The 16 questions elicit the three elements of the ‘Dark Triad’ (Paulhus & Williams, 2002), and the ‘Honesty-Humility’ trait from ‘HEXACO’ (Ashton & Lee, 2009). The three Dark Triad measures are ‘Machiavellianism’ (Christie & Geis, 1970), ‘Narcissism’ (Raskin & Hall, 1979), and ‘Psychopathy’ (Hare, 1985). Machiavellianism is marked by a calculating, manipulative, and deceitful nature towards other people. Narcissism is defined as being egotistic and prideful with limited empathy for others. Psychopathy is characterized by selfishness, impulsiveness and a lack of remorse for ones actions. Honesty-Humility is a personality trait where people avoid manipulating others for personal gain, and feel little temptation to break rules.

Part 3 investigates an important methodological issue in experimental economics: whether omission of information leads to a loss of control over subjects’ beliefs and expectations. There is a strong norm against using deception in economics experiments, which has existed from the inception of the field (Svorenčík, 2016). If a subject becomes aware they were deceived in an economics experiment, then they should not believe all of what they are told in experiments after that point in time. Subjects would adjust their responses to account for the fact that the underlying rules may suddenly change in a way that may be detrimental to them. Therefore, they would not reveal what they would actually do if the situation were exactly as described, resulting in a loss of experimental control. The current experiment does

not use deception (it cannot - it is an economics experiment). Every piece of information provided to subjects, whether in the instructions or elsewhere, is literally correct. However, there are ‘gray-areas’ where full consensus among researchers about their acceptability has not yet been reached (Cason & Wu, 2019; Charness, Samek, & van de Ven, 2022). A relevant scenario is ‘unexpected data use’, when responses are used in a way not described or revealed to subjects. Charness et al. (2022) find that this technique is generally regarded by researchers as non-deceptive and is assessed as appropriate and useful. However, they also find that of the scenarios they consider, student subjects state that unexpected data use is the most likely to influence their future responses and perceive it as more deceptive than researchers do. If subjects do change their future responses based on unexpected data use, this is a methodological problem on a similar scale as outright deception, despite what researchers may believe.

Part 3 provides a very conservative test of whether unexpected data use affects subjects’ subsequent responses. It is conservative as subjects are explicitly informed that Part 3 is the last part of the experiment and that their final payments are already set. If this statement is taken seriously, then subjects have no material incentive to misrepresent their personality in their Part 3 responses. However, in the *A1* treatment, information about how the earlier Part 1 responses would be used in Part 2 was initially withheld and then later disclosed to subjects. The unexpected data use from Part 1 may cause subjects to change their Part 3 responses in anticipation of additional unexpected data use, despite explicit statements to the contrary. It would be concerning if subjects in the *A1* treatment responded in a different fashion than those in the other treatments, as it would imply a loss of experimental control. Such a finding would raise strong objections about using unexpected data use as a design feature in economics experiments going forward.

The traits elicited in Part 3 all have a clear direction in terms of social desirability. Narcissism, Machiavellianism, and Psychopathy are clearly negative traits from the perspective of society, while Honesty/Humility is considered a positive trait. I propose that if a subject anticipates unexpected data use, then they would misrepresent themselves towards what is more socially acceptable. I propose two channels that would influence a subject’s beliefs that their Part 3 responses will be used to affect something in the experiment. The first channel

is whether subjects are aware that the data from personality questions have been used for something in the experiment. These are subjects in the *A0* and *A1* treatments, as they know the group formation rule in Part 2 was based on their Agreeableness score from Part 1. The subjects in the other treatments remain *Unaware* that personality responses could be used in other parts of the experiment. Subjects that know their personality questions in Part 1 were used in Part 2 could suspect that their personality responses in Part 3 are also used in some fashion, and misrepresent themselves accordingly. The second channel is whether the use of the personality data was unexpected. Subjects in *A0* expected this data use when completing Part 1, as they were told of the Agreeableness group formation rule in advance. Whereas, subjects in *A1* did not expect it, but found out about it after completing Part 1. Subjects in the *A1* treatment have a justified belief that their Part 3 responses may be used in some way that has not yet been revealed, and thus would be the most likely to misrepresent themselves in Part 3. Table 4 describes which channels are present between each group of treatments.

Table 4: Misrepresentation in Part 3 - Treatment Comparisons

Treatment Comparison	Unexpected Data Use Revealed	Knowledge of Personality Data Use
<i>A0</i> to <i>A1</i>	+	0
<i>A0</i> to <i>Unaware</i>	0	–
<i>A1</i> to <i>Unaware</i>	–	–

Going from the first treatment to the second, + indicates that channel has been added, 0 indicates no change, and – indicates that channel has been taken away. The *Unaware* grouping includes all treatments except for *A0* and *A1*.

I aggregate each individual into one measure of ‘Positive Perception’, which positively weights Honesty/Humility and negatively weights the Dark Triad traits. Based on my previous reasoning, I posit the following Hypotheses about Positive Perception:

Hypothesis 6 *Reported Positive Perception is higher in A1 than in A0*

Hypothesis 7 *Reported Positive Perception is higher in A1 than in Unaware treatments*

Hypothesis 8 *Reported Positive Perception is higher in A0 than in Unaware treatments*

2.4 Procedures

The data collection was conducted at the EconLab at the University of Innsbruck (UIBK) and the Vienna Center for Experimental Economics (VCEE) at the University of Vienna. 20 sessions (366 subjects) were run at the UIBK EconLab, and 4 sessions (60 subjects) were run at VCEE.¹⁰ There are observations from 432 subjects, i.e., 144 groups of three. Each R treatment has observations from 16 groups of three, and each A treatment has observations from 32 groups of three. I collected a different number of groups by treatment as observations in the A treatments are split between L and H groups.

Subjects were recruited using the online database hroot (Bock, Baetge, & Nicklisch, 2014) at the UIBK EconLab, and ORSEE at VCEE (Greiner, 2015). The experiment was computerized using oTree (D. L. Chen, Schonger, & Wickens, 2016). A session consisted of 6, 12, 18, or 24 subjects (depending on how many subjects showed up for a session), as multiples of six are required for the A treatments.¹¹ All subjects within a session faced the same treatment. The experiment took 45-60 minutes and the average earnings were 16.03 Euros. Treatments were randomly assigned to sessions by randomly shuffling a list of the treatments and then sampling without replacement. The list of treatments included two entries for each A treatment as twice as many groups are required for this treatment. I did this in order to avoid A treatments being disproportionately represented in the latter part of the data collection.

3 Statistical Analysis

The statistical analysis proceeds in three sections. Section 3.1 presents all of the analysis that is in the Primary Analysis section of the pre-registration document. Section 3.2 presents pre-registered analysis, but in a different, more prominent order than in the pre-registration document as it suits the exposition of the paper. Finally, Section 3.3 reports exploratory analysis, that is, analysis that was not pre-registered but is instead inspired by the data. I delineate these sections for transparency and to help the reader assess the strength and valid-

¹⁰I thank the lab managers and research assistants at VCEE. An additional lab was used due to exhausting the subject pool at UIBK. Using another German-speaking lab in this situation was pre-registered.

¹¹ R sessions also used multiples of six for consistency even though only multiples of three would be needed.

ity of these results. Throughout this paper, I report conservative two-sided tests regardless of whether the associated hypothesis is directional or not.

3.1 Primary Analysis

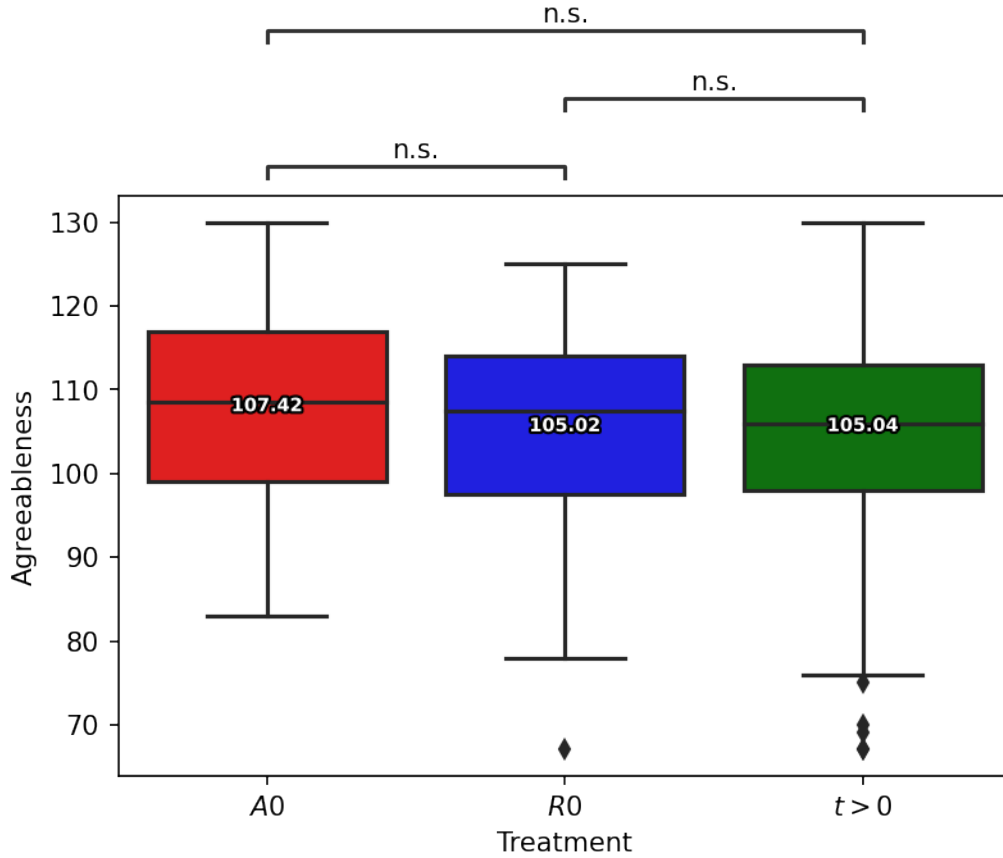
3.1.1 Part 1: Strategic Misrepresentation of Agreeableness

As described in Section 2.1.1, there are three major groups of treatments: $A0$, $R0$, and all $t > 0$ treatments, because treatment differences can only impact Part 1 responses if they occur before Part 1. The outcome of interest is each subject's Agreeableness score, calculated from their responses to the Part 1 questions. Each of the three groups of treatments is compared using a Mann-Whitney test, with each subject being an independent observation. The comparison between $R0$ and $A0$ tests Hypothesis 1, and the comparison between $R0$ and all $t > 0$ treatments tests Hypothesis 2. I report these results alongside summary statistics in Figure 2.

Figure 2 shows that Agreeableness scores do not substantially differ between treatments. This is evidence against Hypothesis 1, which suggests that strategic misrepresentation is not present when subjects know they will be sorted by Agreeableness. By visual inspection, $A0$ looks slightly higher in the direction we would expect if there were strategic misrepresentation, however, the magnitude is small and not statistically significant. Figure 2 also provides evidence against Hypothesis 2, which suggests that any suspicion from not explicitly stating the Part 2 group formation rule does not impact Part 1 responses to Agreeableness questions.

I also consider whether misrepresentation is sophisticated or not. If misrepresentation is sophisticated then subjects only misrepresent the relevant trait of Agreeableness. However, if misrepresentation is unsophisticated, then responses could also change for other Big Five characteristics. Table 5 presents the analysis of the Big Five personality traits, indicating that there are no differences in most personality traits. There is some evidence for suspicion from subjects in the $t > 0$ treatments, as they report different levels of 'Open Mindedness' and 'Extroversion' than subjects in the $A0$ and $R0$ treatments respectively.

Figure 2: Agreeableness by Treatment



Mean Agreeableness overlaid. Statistical results are based on a two-sided Mann Whitney test. ***= $p < 0.01$, **= $p < 0.05$, *= $p < 0.10$, and n.s.= $p \geq 0.10$.

Table 5: All Big Five characteristics by Treatment

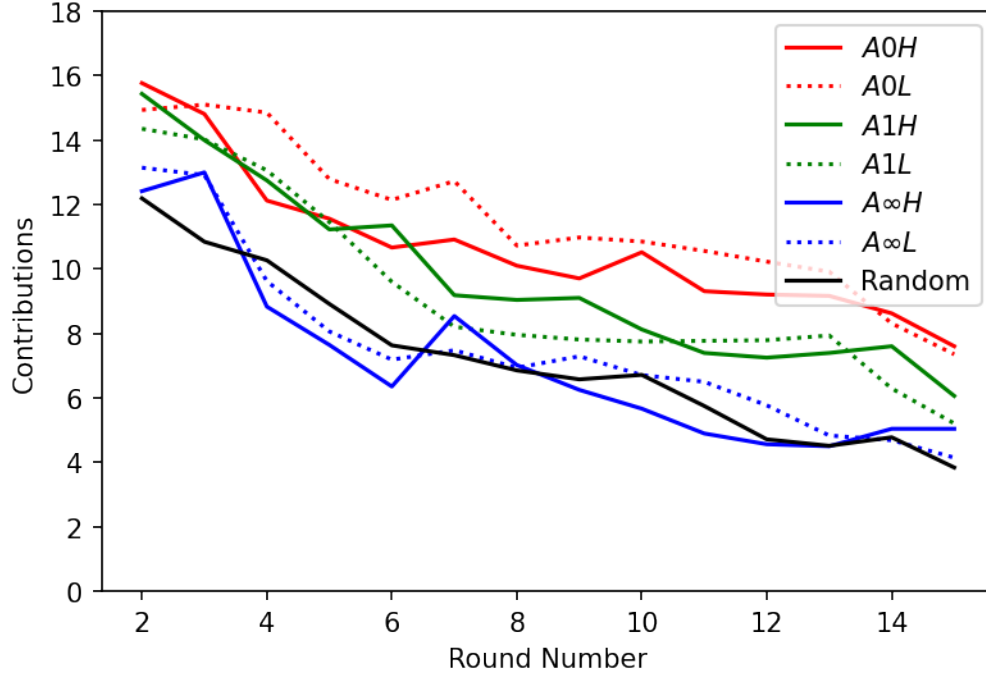
Characteristic	R0	A0	t > 0	p-values
Agreeableness	105.02	107.42	105.04	0.37, 0.81, 0.10
Open Mindedness	21.69	22.80	21.70	0.21, 0.72, 0.02
Negative Emotionality	16.48	15.64	15.70	0.54, 0.52, 0.90
Extroversion	19.44	20.05	20.91	0.30, 0.01, 0.12
Conscientiousness	22.25	21.96	21.25	0.59, 0.14, 0.29

The treatment columns report the average score of the given personality trait. Agreeableness $\in [26, 130]$ and all other personality traits $\in [6, 30]$. The p-values column reports the results from Mann-Whitney tests on the pairs: R0 to A0; R0 to t > 0; and A0 to t > 0 respectively.

3.1.2 Part 2: PGG Contributions

Figure 3 graphically illustrates average contributions over time by treatment and group type, while Table 6 numerically reports average contributions over all 15 rounds. Figure 3 shows

Figure 3: Average Contributions by Round



declining contributions over time, which is typical in this type of PGG. By visual inspection, the Agreeableness group formation rule can be effective in increasing contributions when compared to Random group formation. Figure 3 shows that $A0$ and $A1$ increase contributions by 2-4 tokens on average when compared to R , and that this level shift is sustained over time. However, this increase is observed regardless of whether the group is of H or L Agreeableness. In addition, $A\infty$ appears to be mostly ineffective as it is quite close to R . From the patterns observed in Figure 3, it follows that the Agreeableness group formation rule does not increase contributions by creating groups with high levels of Agreeableness. Rather, any increased contributions are driven by describing the personality trait of Agreeableness and how previous studies have found it to have a positive impact on prosocial actions.

Table 6: Average Contributions by Treatment

	$t = 0$	$t = 1$	$t = \infty$
AH	10.35	9.37	6.81
R	6.91	8.00	5.65
AL	11.25	8.79	7.21

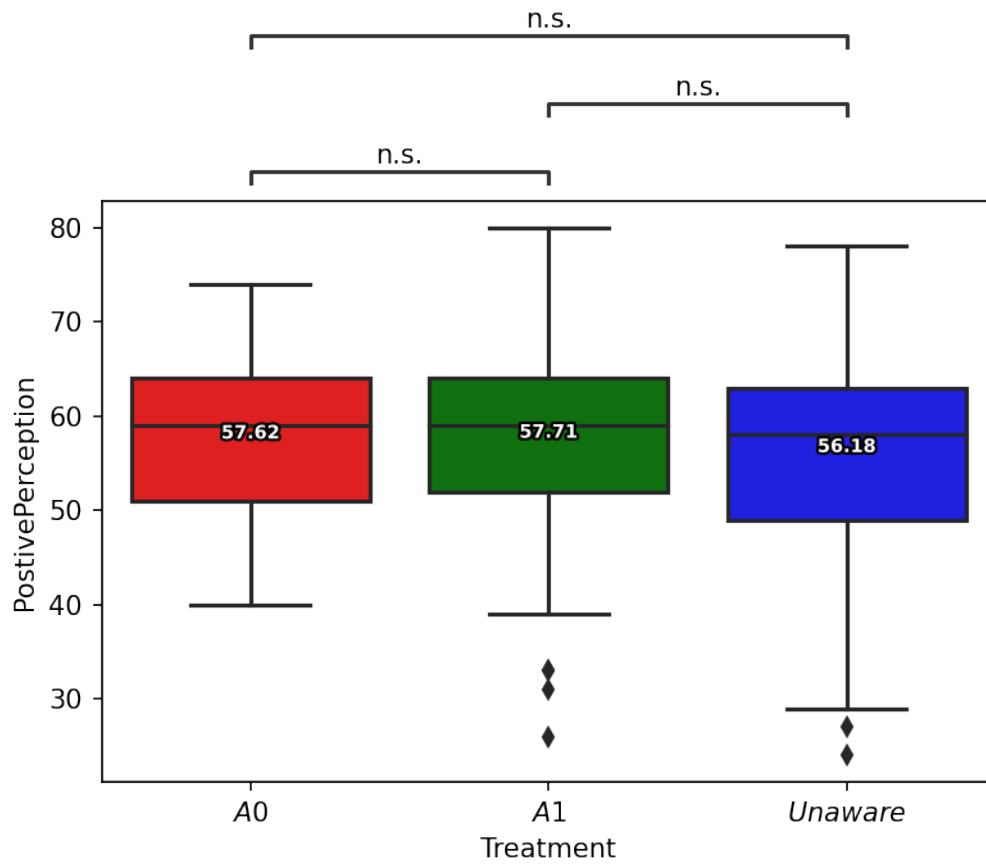
To test for the statistical significance of treatment effects, I use a panel data approach

at the group level that accounts for the possibility of decreasing contributions over time. I use the group's average contribution in a period as the dependent variable, and a treatment dummy and the period as the independent variables. I use a panel-data Tobit regression for the possible censoring that occurs at 0 and 25 tokens for lower and upper limits respectively. For each relevant comparison between two treatments (or group types within a treatment), I run the regression using data only from the two treatments under consideration. Table 7 summarizes the results from the comparisons that are relevant for testing the proposed Hypotheses. Table 7 provides no support for Hypotheses 3. Although two treatment differences show statistical significance, their directions contradict the part of the hypothesis that states that L groups should contribute less. In terms of Hypotheses 4 and 5, there is no evidence that contributions differ between $A0$ and $A1$ or $A1$ and $A\infty$ for any group type. There is support for the conjecture that when the group formation rule is revealed is irrelevant for R treatments. Overall, Table 7 partially confirms what Figure 3 suggested, in that Agreeableness sorting can have a positive impact regardless of group composition, but only when it is described before playing the PGG.

3.1.3 Part 3: Other Personality Measures

The main test in Part 3 is to detect whether 'Data Use' of questionnaires to sort groups affects future responses. There are three groups, 'Expected' Data Use (of their Part 1 personality responses) ($A0$), 'Unexpected' Data Use ($A1$), and all treatments where subjects are *Unaware* of Data Use. I combine all of the characteristics elicited in Part 3 into one measure based on how likely it is they would be positively perceived by an observer. That is, I reverse code the Dark Triad as these traits are negative, and leave the coding for Honesty-Humility as it is. I call this combined measure 'Positive Perception'. As there are 16 questions elicited on a 5-point Likert scale, it can take a minimum value of 16, and a maximum of 80. I use a Mann-Whitney test to test for differences between the three relevant subject groups. Figure 4 summarizes the results of these comparisons. Figure 4 provides no support for Hypotheses 8, 6 and 7. There is no evidence that Data Use, Expected or Unexpected, of Part 1 responses influences subject responses to the Part 3 personality test.

Figure 4: Positive Perception by Treatment



Positive Perception mean overlaid. Statistical results are based on a two-sided Mann Whitney test. ***= $p < 0.01$, **= $p < 0.05$, *= $p < 0.10$, and n.s.= $p \geq 0.10$.

Table 7: Efficiency - Regressions

Pairwise Comparison	Coefficient	Hypothesis
<i>Within t = 0</i>		
<i>A0H - R0</i>	4.34*	H3 +
<i>A0L - R0</i>	5.19**	H3 -
<i>A0H - A0L</i>	-0.81	H3 +
<i>Within t = 1</i>		
<i>A1H - R1</i>	2.18	H3 +
<i>A1L - R1</i>	1.36	H3 -
<i>A1H - A1L</i>	0.85	H3 +
<i>Within t = ∞</i>		
<i>A∞H - R∞</i>	1.65	H3 +
<i>A∞L - R∞</i>	1.59	H3 -
<i>A∞H - A∞L</i>	0.16	H3 +
<i>Within A</i>		
<i>A0H - A1H</i>	1.26	H4 -
<i>A0L - A1L</i>	2.97	H4 +
<i>A1H - A∞H</i>	2.78	H5 +
<i>A1L - A∞L</i>	2.19	H5 ~
<i>Within R</i>		
<i>R0 - R1</i>	-0.92	H4 ~
<i>R1 - R∞</i>	2.42	H5 ~

Second group in the pair is the omitted dummy. *Within X* are the groups of hypotheses holding *X* fixed. +, -, and ~ indicate a positive, negative, or neutral predicted effect respectively. ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.10$.

3.2 Secondary Analysis

The results suggest that the Agreeableness group formation rule is not effective in increasing contributions by creating groups with higher levels of Agreeableness. This follows from the observation that there is no difference between *H* and *L* groups, and that the *A∞* treatment is not effective. A natural question is why this is the case, especially considering that previous studies identified a positive relationship between Agreeableness and contributions in the PGG.

To address this question, I regress an individual's Agreeableness on their contributions in the PGG, alongside other personality traits and controls. This analysis was pre-registered in the 'Conceptual Replication' section, because it addresses the broader research question of which individual characteristics affect prosocial contribution behavior, which was not of

primary interest to the current paper. As it proves useful for the exposition of the paper, I have moved this analysis to this section.

I use a mixed-effects panel Tobit regression (censored at 0 and 25) clustered at the individual and group levels. This regression incorporates all elicited personality characteristics and demographic data, along with controls for treatment effects and the average group contribution from the previous period.¹² I exclude the *A0* treatment data from this regression, as I anticipated misrepresentation in Agreeableness in this treatment.¹³ Table 8 lists the relevant coefficients from this regression, and suggests that an individual’s Agreeableness score has essentially no impact on their contribution behavior. This is a surprising result as it is in contrast to previous studies that find Agreeableness is positively related to prosocial actions, including in the PGG. However, it is unsurprising then that the Agreeableness group formation rule by itself proved ineffective in increasing group contributions.

In terms of the other personality traits, Table 8 suggests that higher levels of Open Mindedness increase an individual’s contributions. Table 8 also suggests that higher levels of Conscientiousness decrease contributions. The other personality traits and demographics do not appear to substantially impact an individual’s contribution rate. These results on individual characteristics should be viewed with an appropriate amount of skepticism given I did not form hypotheses for them in the pre-registration document.

3.3 Exploratory Analysis

Naturally, the empirical findings of the experiment suggests additional analysis that is unanticipated and thus not in the pre-registration document. It would be remiss to not follow the data where interesting results lie.

The results indicate that the operative channel for the Agreeableness group formation rule differs from what was initially proposed. Therefore, the appropriate tests of said channel would also differ from what was initially proposed. An updated conjecture is that it is just being told about the personality trait of Agreeableness that increases contributions

¹²Following Bardsley and Moffatt (2007), the initial lagged contribution in period 1 is found using a grid search.

¹³Despite the absence of evidence for misrepresentation, I adhere to the pre-registered analysis. However, I relax this approach in the exploratory Section 3.3.

Table 8: Individual Characteristics on Contributions

Ind. Variable	Coefficient
Lagged Avg. Group Cont.	0.55***
Agreeableness	0.00
Open Mindedness	0.29***
Negative Emotionality	0.11
Extroversion	0.13
Conscientiousness	-0.26***
Honesty Humility	-0.07
Machiavellianism	-0.09
Narcissism	-0.13
Psychopathy	-0.08
Female	-0.59
2nd Year at Uni.	0.25
3rd Year at Uni.	-2.34*
4th+ Year at Uni.	-1.67
Grad. Student	-2.26
GPA	0.27
Economics	-0.07
Arts and Humanities	1.78
Natural Sciences	3.29*
Education	3.23
Engineering	4.08
Law	0.09
Social Sciences	0.63
Medicine	0.18
Other	1.05

An individual's contribution to the public good is the dependent variable. Results are from a mixed-effects panel tobit regression (censored at 0 and 25) clustered at the individual and group levels. Controls for Treatment and Period are included in the regression but their coefficients are not reported. Observations from the A0 treatment are excluded. ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.10$.

in the PGG. As this new conjecture makes no distinction between H and L groups, and that empirically speaking these groups exhibit similar behavior, the observations from these groups can be combined. A similar rationale applies to pooling data from all R treatments.¹⁴ I report tests of this conjecture with various combinations of pooled observations in Table 9. Table 9 provides evidence in support of the conjecture, and there appears to be an increase of around 3 or 4 tokens on average when subjects are told about Agreeableness prior to

¹⁴This also has the added benefit of increasing power, which is particularly important as the actual data turned out to be noisier than what was assumed in the initial power analysis.

taking part in a PGG. I hold my post-hoc conjecture to be valid and I consider pooling observations justifiable. However, by being transparent and categorizing this as exploratory analysis, readers can assess the credibility of this analysis themselves.

Table 9: Efficiency - Exploratory Hypothesis

Pairwise Comparison	Coefficient
$A0 - R0$	4.76**
$A0 - R$	4.93***
$A1 - R1$	1.76
$A1 - R$	2.84*
$A_{\{0,1\}} - R$	3.89***
$A_{\{0,1\}} - A_{\infty}$	3.51**

Reported coefficients are from a panel Tobit regression with the group's average contribution as the dependent variable, and a treatment dummy and the period as independent variables. Second group in the pair is the omitted dummy. $A0$ and $A1$ pool observations across H and L groups. R pools all observations from $R0$, $R1$, and R_{∞} . $A_{\{0,1\}}$ pools observations from $A0$ and $A1$ ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.10$.

Finally, I examine the robustness of the finding that Agreeableness does not affect contributions, a result that contrasts with the existing literature. For this purpose, I have conducted several robustness checks on the analysis presented in Table 8. There are a variety of different specifications, which I describe in more detail in Appendix B.2, but I briefly explain their rationale here.

Firstly, as there was no detected misrepresentation, then the initial logic behind excluding $A0$ observations is no longer valid. Therefore, I re-run the analysis with all data included. Conversely, as Agreeableness Sorting did increase contributions, it is natural to suggest that the subset of data from both $A0$ and $A1$ is different and should be excluded. Thirdly, Perugini et al. (2010) find a relationship between Agreeableness and contributions in the PGG, but only for men. Therefore, I re-run the analysis excluding everyone but men. Finally, Proto et al. (2019) find that Agreeableness only impacts cooperative behavior in initial decisions in the RPD. Therefore, I re-run the analysis using only early subsets of the data. Table A2 presents the results of these analyses, but they all report that the coefficient attached to Agreeableness is effectively zero. It is only marginally statistically significant in one case, a simple regression that is misspecified as it does not account for censoring or the panel nature of the data. The finding that we cannot reject the null hypothesis, i.e. the

coefficient on Agreeableness is zero, is robust across various specifications. This suggests that Agreeableness has little to no influence on individuals' contribution behavior in the PGG.

4 Conclusion

Using psychometric personality testing in the context of job hiring is a complex and sometimes controversial topic. These tests have become integral to modern hiring processes, helping firms to evaluate potential employees. However, a challenge is the incentive for job-seekers to tailor their responses to align with their beliefs of the employers' expectations. The incentive to strategically misrepresent one's preferences undermines the validity of such tests and their usefulness for job hiring decisions.

To shed light on this issue, I design and conduct an incentivized laboratory experiment that mirrors real-world hiring scenarios. I first elicit Big Five characteristics through a questionnaire, much like what job-seekers have to fill out at some stage during the hiring process. I then use a standard PGG to represent a cooperative work environment. The Big Five characteristic of Agreeableness has been found to positively impact contributions in previous studies, so sorting (or hiring) based on this trait makes sense. By changing the timing of the revelation of the sorting rule to before or after the initial questionnaire, I am able to explore the level of misrepresentation and evaluate its subsequent impact on cooperative behavior.

I find that subjects do not misrepresent their personality in order to be placed into groups with higher levels of Agreeableness. There are two possible explanations for this finding. The most likely case is that a preference for honesty outweighs the indirect benefits of being in a High Agreeableness group.¹⁵ The indirect benefits turned out to be effectively zero, as High and Low Agreeableness groups achieved similar outcomes, and Agreeableness levels had no impact on contributions.¹⁶ Another possibility is that subjects were unable to identify Agreeableness questions, or that they otherwise find it an impossible task to misrepresent their personality. This seems unlikely, as McGee and McGee (2022b) find that

¹⁵See Abeler, Nosenzo, and Raymond (2019) for a meta-study on truth-telling preferences.

¹⁶However, it is not reasonable to suggest that subjects could have known either of these things.

subjects can misrepresent themselves from a more difficult task of inferring the personality trait in question from a job description.

I also find that the Agreeableness group formation rule increases contributions in the A_0 and A_1 treatments, but not in the A_∞ treatment. In addition, the increase in contributions occurs for both H and L groups. Therefore, in conjunction with the result that Agreeableness does not correlate with individual contributions, the higher contributions in A_0 and A_1 cannot be attributed to the formation of groups with higher Agreeableness. Instead, the operative factor must be the provision of information about the Agreeableness trait and the previous research on its relationship with contributions in the PGG.

The increase in contributions observed in A_0 and A_1 could be driven by group identity.¹⁷ Being matched with those of a similar personality score could create a group identity. Cooperation and prosocial actions have been found to increase within such ‘in-groups’ (Eckel & Grossman, 2005; Y. Chen & Li, 2009). Alternatively, going through the personality test could be seen as a team-building exercise, which has been found to increase contributions in the PGG (Charness, Cobo-Reyes, & Jiménez, 2014). Another explanation follows from the literature on self-image and prosocial behavior (e.g. Bénabou and Tirole (2006, 2011)). In this experiment, I tell subjects that high Agreeableness is associated with positive traits, and that those with high Agreeableness contribute more.¹⁸ Subjects could contribute more in order to create or maintain a positive self-image that they possess the positive personality traits encapsulated by Agreeableness.

Lastly, I find that using personality tests in an unannounced way does not affect subsequent personality tests. Withholding information about the group formation rule did not influence later behavior, suggesting that experimental control was maintained. Therefore, ‘unexpected data use’ remains a valid methodological tool for economics experiments when required by the study design.

My paper highlights the importance of pre-registration, power analysis, and replication. My design is built upon the previous findings that Agreeableness is related to individual contributions in a PGG, and prosocial behavior more generally. This relationship has a

¹⁷See Charness and Chen (2020) for a survey on group identity.

¹⁸The words used were: selfless, trusting, good-natured, generous, and forgiving.

handful of conceptual replications, however, they were conducted before the necessity of pre-registration and power analysis was widely known. In a pre-registered and well-powered study, I fail to replicate any substantial relationship between Agreeableness and contributions in a PGG. Had this been established earlier, the rationale for forming groups based on Agreeableness would not exist, making an alternative design more suitable. In this project I have gone to great lengths to create an exhaustive pre-registration that has been public from the first day of data collection. In addition, I have made my data publicly available piece-by-piece during the data collection. I hope this level of transparency serves as an example for future studies to try to emulate and improve upon. My findings raise a challenge to the broader literature on personality traits and economic behavior, as well as any other established literature that was published prior to the proliferation of pre-registration. We need to be sure that ‘classical’ results that are generally accepted have been independently replicated by more than one pre-registered study.

References

- Abeler, J., Nosenzo, D., & Raymond, C. (2019). Preferences for Truth-Telling. *Econometrica*, *87*(4), 1115–1153. doi: 10.3982/ECTA14673
- Ahn, T., Isaac, R. M., & Salmon, T. C. (2009, 2). Coming and going: Experiments on endogenous group sizes for excludable public goods. *Journal of Public Economics*, *93*(1-2), 336–351. doi: 10.1016/j.jpubeco.2008.06.007
- Anderson, L. R., Mellor, J. M., & Milyo, J. (2004, 4). Social Capital and Contributions in a Public-Goods Experiment. *American Economic Review: Papers & Proceedings*, *94*(2), 373–376. doi: 10.1257/0002828041302082
- Ashton, M., & Lee, K. (2009, 7). The HEXACO-60: A Short Measure of the Major Dimensions of Personality. *Journal of Personality Assessment*, *91*(4), 340–345. doi: 10.1080/00223890902935878
- Autor, D. H., & Scarborough, D. (2008, 2). Does Job Testing Harm Minority Workers? Evidence from Retail Establishments. *Quarterly Journal of Economics*, *123*(1), 219–277. doi: 10.1162/qjec.2008.123.1.219
- Bardsley, N., & Moffatt, P. G. (2007, 3). The experimetrics of public goods: Inferring motivations from contributions. *Theory and Decision*, *62*(2), 161–193. doi: 10.1007/s11238-006-9013-3
- Bartling, B., Fehr, E., Maréchal, M. A., & Schunk, D. (2009, 4). Egalitarianism and Competitiveness. *American Economic Review*, *99*(2), 93–98. doi: 10.1257/aer.99.2.93
- Bénabou, R., & Tirole, J. (2006). Incentives and Prosocial Behavior. *American Economic Review*, *96*(5).
- Bénabou, R., & Tirole, J. (2011, 5). Identity, Morals, and Taboos: Beliefs as Assets. *The Quarterly Journal of Economics*, *126*(2), 805–855. doi: 10.1093/qje/qjr002
- Bock, O., Baetge, I., & Nicklisch, A. (2014, 10). hroot: Hamburg Registration and Organization Online Tool. *European Economic Review*, *71*, 117–120. doi: 10.1016/j.euroecorev.2014.07.003
- Borghans, L., Duckworth, A. L., Heckman, J. J., & Weel, B. t. (2008). The Economics and Psychology of Personality Traits. *Journal of Human Resources*, *43*(4), 972–1059. doi:

10.3368/jhr.43.4.972

- Braun, J. R., & Gomez, B. J. (1966, 10). Effects of Faking Instructions on the Eysenck Personality Inventory. *Psychological Reports*, 19(2), 388–390. doi: 10.2466/pr0.1966.19.2.388
- Burlando, R. M., & Guala, F. (2005, 4). Heterogeneous Agents in Public Goods Experiments. *Experimental Economics*, 8(1), 35–54. doi: 10.1007/s10683-005-0436-4
- Butera, L., Grossman, P. J., Houser, D., List, J. A., & Villeval, M. C. (2020). *A New Mechanism to Alleviate the Crises of Confidence in Science With An Application to the Public Goods Game*.
- Cambridge Business English Dictionary. (2023, 7). *Psychometric Test - English Meaning - Cambridge Dictionary*. Retrieved from <https://dictionary.cambridge.org/dictionary/english/psychometric-test>
- Carpenter, J. P., Danieri, A. G., & Takahashi, L. M. (2004, 12). Cooperation, trust, and social capital in Southeast Asian urban slums. *Journal of Economic Behavior & Organization*, 55(4), 533–551. doi: 10.1016/j.jebo.2003.11.007
- Cason, T. N., & Wu, S. Y. (2019, 7). Subject Pools and Deception in Agricultural and Resource Economics Experiments. *Environmental and Resource Economics*, 73(3), 743–758. doi: 10.1007/s10640-018-0289-x
- Catola, M., D’Alessandro, S., Guarnieri, P., & Pizziol, V. (2021, 10). Personal norms in the online public good game. *Economics Letters*, 207, 110024. doi: 10.1016/j.econlet.2021.110024
- Charness, G., & Chen, Y. (2020, 8). Social Identity, Group Behavior, and Teams. *Annual Review of Economics*, 12(1), 691–713. doi: 10.1146/annurev-economics-091619-032800
- Charness, G., Cobo-Reyes, R., & Jiménez, N. (2014, 9). Identities, selection, and contributions in a public-goods game. *Games and Economic Behavior*, 87, 322–338. doi: 10.1016/j.geb.2014.05.002
- Charness, G., Samek, A., & van de Ven, J. (2022, 4). What is considered deception in experimental economics? *Experimental Economics*, 25(2), 385–412. doi: 10.1007/s10683-021-09726-7
- Chaudhuri, A. (2011, 3). Sustaining cooperation in laboratory public goods experi-

- ments: a selective survey of the literature. *Experimental Economics*, 14(1), 47–83. Retrieved from <http://link.springer.com/10.1007/s10683-010-9257-1> doi: 10.1007/s10683-010-9257-1
- Chen, D. L., Schonger, M., & Wickens, C. (2016, 3). oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9, 88–97. Retrieved from <https://www.sciencedirect.com/science/article/pii/S2214635016000101?via%3Dihub> doi: 10.1016/J.JBEF.2015.12.001
- Chen, Y., & Li, S. X. (2009, 3). Group identity and social preferences. *American Economic Review*, 99(1), 431–457. doi: 10.1257/aer.99.1.431
- Christie, R., & Geis, F. L. (1970). *Studies in Machiavellianism*. Elsevier. doi: 10.1016/C2013-0-10497-7
- Donato, K., Miller, G., Mohanan, M., Truskinovsky, Y., & Vera-Hernández, M. (2017, 5). Personality Traits and Performance Contracts: Evidence from a Field Experiment among Maternity Care Providers in India. *American Economic Review: Papers & Proceedings*, 107(5), 506–510. doi: 10.1257/aer.p20171105
- Dufwenberg, M., Gächter, S., & Hennig-Schmidt, H. (2011, 11). The framing of games and the psychology of play. *Games and Economic Behavior*, 73(2), 459–478. doi: 10.1016/j.geb.2011.02.003
- Dylman, A. S., & Zakrisson, I. (2023, 3). The effect of language and cultural context on the BIG-5 personality inventory in bilinguals. *Journal of Multilingual and Multicultural Development*, 1–14. doi: 10.1080/01434632.2023.2186414
- Eckel, C. C., & Grossman, P. J. (2005, 11). Managing diversity by creating team identity. *Journal of Economic Behavior & Organization*, 58(3), 371–392. doi: 10.1016/j.jebo.2004.01.003
- Emergen Research. (2022, 2). *Assessment Services Market, By Product Type (Psychometric Test, Aptitude Tests, Coding Tests), By Service Type, By Medium (Online, Offline), By Sectors (K-12, Higher Education, Corporate, Government), and By Region Forecast to 2030* (Tech. Rep.).
- Fehr, E., & Gächter, S. (2000, 9). Cooperation and Punishment in Public Goods Experiments. *American Economic Review*, 90(4), 980–994. Retrieved from <http://>

pubs.aeaweb.org/doi/10.1257/aer.90.4.980 doi: 10.1257/aer.90.4.980

- Fischbacher, U., & Föllmi-Heusi, F. (2013, 6). Lies in Disguise - An Experimental Study on Cheating. *Journal of the European Economic Association*, 11(3), 525–547. doi: 10.1111/jeea.12014
- Fréchette, G. R., Schotter, A., & Trevino, I. (2017, 7). Personality, Information Acquisition, and Choice Under Uncertainty: An Experimental Study. *Economic Inquiry*, 55(3), 1468–1488. doi: 10.1111/ecin.12438
- Gächter, S., & Thöni, C. (2005, 5). Social Learning and Voluntary Cooperation among like-Minded People. *Journal of the European Economic Association*, 3(2-3), 303–314. doi: 10.1162/jeea.2005.3.2-3.303
- Gill, D., & Prowse, V. (2016, 12). Cognitive Ability, Character Skills, and Learning to Play Equilibrium: A Level-k Analysis. *Journal of Political Economy*, 124(6), 1619–1676. doi: 10.1086/688849
- Gill, D., & Rosokha, Y. (2020). Beliefs, Learning, and Personality in the Indefinitely Repeated Prisoner’s Dilemma. *SSRN Electronic Journal*. doi: 10.2139/ssrn.3652318
- Goldberg, L. (2002). *Big Five Factor Markers*. Retrieved from <https://ipip.ori.org/newBigFive5broadKey.htm>
- Goldberg, L., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006, 2). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40(1), 84–96. doi: 10.1016/j.jrp.2005.08.007
- Greiner, B. (2015, 7). Subject pool recruitment procedures: organizing experiments with ORSEE. *Journal of the Economic Science Association*, 1(1), 114–125. Retrieved from <http://link.springer.com/10.1007/s40881-015-0004-4> doi: 10.1007/s40881-015-0004-4
- Gunthorsdottir, A., Houser, D., & McCabe, K. (2007, 2). Disposition, history and contributions in public goods experiments. *Journal of Economic Behavior & Organization*, 62(2), 304–315. doi: 10.1016/j.jebo.2005.03.008
- Hare, R. D. (1985, 2). Comparison of procedures for the assessment of psychopathy. *Journal of Consulting and Clinical Psychology*, 53(1), 7–16. doi: 10.1037/0022-006X.53.1.7

- Hawkins, T., & Monroe, M. (2021, 3). *Persona: The Dark Truth Behind Personality Tests*. HBO Max. Retrieved from <https://www.imdb.com/title/tt14173880/>
- Hoffman, M., Kahn, L. B., & Li, D. (2018, 5). Discretion in Hiring. *The Quarterly Journal of Economics*, *133*(2), 765–800. doi: 10.1093/qje/qjx042
- Holmén, M., Holzmeister, F., Kirchler, M., Stefan, M., & Wengström, E. (2021). *Economic Preferences and Personality Traits Among Finance Professionals and the General Population*. Innsbruck.
- Jonason, P. K., & Webster, G. D. (2010, 6). The dirty dozen: A concise measure of the dark triad. *Psychological Assessment*, *22*(2), 420–432. doi: 10.1037/a0019265
- Kagel, J., & McGee, P. (2014, 8). Personality and cooperation in finitely repeated prisoner's dilemma games. *Economics Letters*, *124*(2), 274–277. doi: 10.1016/j.econlet.2014.05.034
- Kantrowitz, T. M., Tuzinski, K. A., & Raines, J. M. (2018). *2018 Global Assessment Trends Report* (Tech. Rep.). SHL.
- Kroger, R. O., & Wood, L. A. (1993, 12). Reification, "faking," and the Big Five. *American Psychologist*, *48*(12), 1297–1298. doi: 10.1037/0003-066X.48.12.1297
- Küfner, A. C. P., Dufner, M., & Back, M. D. (2015, 1). Das Dreckige Dutzend und die Niederträchtigen Neun. *Diagnostica*, *61*(2), 76–91. doi: 10.1026/0012-1924/a000124
- Ledyard, J. (1995). Public Goods: A Survey of Experimental Evidence. In J. Kagel & A. Roth (Eds.), *The handbook of experimental economics* (pp. 111–194). Princeton: Princeton University Press.
- Lee, K., & Ashton, M. C. (2009). *HEXACO-PI-R Materials for Researchers*. Retrieved from <https://hexaco.org/hexaco-inventory>
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, *22* 140.
- Lugovskyy, V., Puzzello, D., Sorensen, A., Walker, J., & Williams, A. (2017, 3). An experimental study of finitely and infinitely repeated linear public goods games. *Games and Economic Behavior*, *102*, 286–302. doi: 10.1016/j.geb.2017.01.004
- Maniadis, Z., Tufano, F., & List, J. A. (2014, 1). One swallow doesn't make a summer: New evidence on anchoring effects. *American Economic Review*, *104*(1), 277–290. doi:

10.1257/aer.104.1.277

- McCrae, R. R., & John, O. P. (1992, 6). An Introduction to the Five-Factor Model and Its Applications. *Journal of Personality*, *60*(2), 175–215. doi: 10.1111/j.1467-6494.1992.tb00970.x
- McGee, A., & McGee, P. (2022a). *Gender and race differences on incentivized personality measures*. Retrieved from <http://www.hivereview.org/project/35>
- McGee, A., & McGee, P. (2022b). Whoever You Want Me to Be: Personality and Incentives. *SSRN Electronic Journal*. doi: 10.2139/ssrn.4163677
- Ones, U., & Putterman, L. (2007, 4). The ecology of collective action: A public goods and sanctions experiment with controlled group formation. *Journal of Economic Behavior & Organization*, *62*(4), 495–521. doi: 10.1016/j.jebo.2005.04.018
- Paulhus, D. L., & Williams, K. M. (2002, 12). The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality*, *36*(6), 556–563. doi: 10.1016/S0092-6566(02)00505-6
- Perugini, M., Tan, J. H. W., & Zizzo, D. J. (2010). Which is the More Predictable Gender? Public Good Contribution and Personality. *Economic Issues*, *15*(1), 83–110.
- Proto, E., Rustichini, A., & Sofianos, A. (2019, 6). Intelligence, Personality, and Gains from Cooperation in Repeated Interactions. *Journal of Political Economy*, *127*(3), 1351–1390. doi: 10.1086/701355
- Rammstedt, B., Danner, D., Soto, C. J., & John, O. P. (2020, 1). Validation of the Short and Extra-Short Forms of the Big Five Inventory-2 (BFI-2) and Their German Adaptations. *European Journal of Psychological Assessment*, *36*(1), 149–161. doi: 10.1027/1015-5759/a000481
- Raskin, R. N., & Hall, C. S. (1979, 10). A Narcissistic Personality Inventory. *Psychological Reports*, *45*(2), 590–590. doi: 10.2466/pr0.1979.45.2.590
- Soto, C. J., & John, O. P. (2017, 6). Short and extra-short forms of the Big Five Inventory–2: The BFI-2-S and BFI-2-XS. *Journal of Research in Personality*, *68*, 69–81. doi: 10.1016/j.jrp.2017.02.004
- Streib, H., & Wiedmaier, M. (2001). *German Translation of the 100-Item Lexical Big-Five Factor Markers*. Retrieved from <https://ipip.ori.org/German100-ItemBig>

[-FiveFactorMarkers.htm](#)

- Svorenčák, A. (2016, 12). The Sidney Siegel Tradition: The Divergence of Behavioral and Experimental Economics at the End of the 1980s. *History of Political Economy*, 48(suppl.1), 270–294. doi: 10.1215/00182702-3619310
- Thielmann, I., Spadaro, G., & Balliet, D. (2020, 1). Personality and prosocial behavior: A theoretical framework and meta-analysis. *Psychological Bulletin*, 146(1), 30–90. doi: 10.1037/bul0000217
- Velicer, W. F., & Weiner, B. J. (1975, 8). Effects of Sophistication and Faking Sets on the Eysenck Personality Inventory. *Psychological Reports*, 37(1), 71–73. doi: 10.2466/pr0.1975.37.1.71
- Villevall, M. C. (2016). Can lab experiments help design personnel policies? *IZA World of Labor*. doi: 10.15185/izawol.318
- Villevall, M. C. (2020). Public goods, norms and cooperation. In C. M. Capra, R. Croson, M. Rigdon, & T. Rosenblat (Eds.), *Handbook of experimental game theory* (chap. 7). Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
- Volk, S., Thöni, C., & Ruigrok, W. (2012, 2). Temporal stability and psychological foundations of cooperation preferences. *Journal of Economic Behavior & Organization*, 81(2), 664–676. doi: 10.1016/j.jebo.2011.10.006
- Weber, L., & Dwoskin, E. (2014, 9). *Are Workplace Personality Tests Fair?* Retrieved from <https://www.wsj.com/articles/are-workplace-personality-tests-fair-1412044257>

A Deviations from the Pre-registration Document

The text of this paper differs from the original pre-registration document, which was presented as a mostly complete paper. These changes are mostly as you would expect, such as adapting the text to the results, fixing errors, and adding citations as they were brought to my attention. A major deviation, bringing analysis in from the appendix to the main body of the text, is clearly signposted and labeled as such in the text.

The random ordering of treatments was not able to be followed perfectly near the end of the data collection, as the number of subjects that showed up could differ from what the next treatment required. For example, 18 subjects might show up for a session that only requires 12 more observations. In this case, the next treatment that required 18 subjects was conducted in that session, while the original assigned treatment was conducted in the next session that had 12 subjects. The treatments that were assigned to VCEE were done so as soon as the decision to employ them was made, but show-up rates also necessitated some changes. Given the large majority of sessions followed the random ordering, then the treatments that were in these later sessions were also random. Based on this, there is no reasonable threat to the randomization procedure.

B Additional Analysis

B.1 Conceptual Replication Results

The experimental design permits a conceptual replication of some elements of McGee and McGee (2022b). In particular, Research Questions 1 and 2 from that paper can be partially answered.

MM Research Question 1: *How important are incentives when measuring personality?*

The incentives in McGee and McGee (2022b) were a direct lump-sum payment if selected for a job. Whereas in the current study the incentive is indirect, as it is membership in the more cooperative H group that could increase earnings in the PGG. Research Question 1 is addressed by Hypothesis 1 and the comparisons in Figure 2. As there is no evidence for Hypothesis 1, I conclude that indirect incentives are not very important when measuring personality. The strength of the incentives appear to matter for misrepresentation in personality tests.

MM Research Question 2: *Are incentivized personality measures influenced by traits other than personality?*

McGee and McGee (2022b) posit that traits such as intelligence, Machiavellianism, self-deception, optimism, acceptability of lying, risk aversion, and locus of control could be correlated with misrepresentation. They find that most of these characteristics are uncorrelated with misrepresentation in all treatments of their experiment.

In particular, McGee and McGee (2022b) find no evidence that Machiavellianism is correlated with misrepresentation in any of their treatments. This is an interesting result, given that people high in Machiavellianism tend to be manipulative and strategically self-serving in their words and actions. In this paper, Part 3 elicits Machiavellianism using a different set of questions, and its relationship to misrepresentation of Agreeableness in Part 1 can be explored. I test this relationship with a Tobit regression censored at 26 and 130 of the following form $Agreeableness_i = \beta_0 + \beta_1 Machiavellianism + \beta_2 Machiavellianism \times A0 + \epsilon_i$. The coefficient β_1 represents the correlation between Agreeableness and Machiavellianism, and β_2 represents the increase (if > 0) in reported Agreeableness when there is an incentive to misrepresent (i.e. in $A0$).

Table A1: Personality Traits and Agreeableness Misrepresentation

Trait	β_1	β_2
Honesty Humility	0.42**	0.16
Machiavellianism	-1.00***	0.30**
Narcissism	-0.21	0.23**
Psychopathy	-1.87***	0.26*

β_1 represents the correlation between the trait and Agreeableness, and β_2 represents the correlation between the trait and misrepresentation of Agreeableness. ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.10$.

Table A1 summarizes and shows that Agreeableness is increasing in Honesty Humility and decreasing in the Dark Triad traits, as expected. Table A1 also provides evidence for the conjecture that those with higher Machiavellianism (and the other Dark Triad traits) are more willing or able to misrepresent their Agreeableness in Part 1 when they have the incentive to do so.

B.2 Robustness Checks

Table A2 presents various robustness checks on the Agreeableness coefficient in Table 8. Each robustness check follows the same analysis as in Table 8, except in the manner specified.

‘All Data’ includes A_0 observations. ‘No A_0 or A_1 ’ drops A_1 observations. ‘No other Ind. Charact.’ drops all other personality and demographic measures as independent variables (but retains treatment and period controls). ‘No Tobit’ does not control for censoring (i.e. it uses `xtmixed` instead of `xttobit`). ‘Only Agreeableness’ has Agreeableness as the only independent variable (i.e. it drops other personality traits, demographics, and treatment controls). ‘Simple Regression’ uses ‘reg PGGContribution Agreeableness’ in Stata. ‘Simple Regression, All Data’ is the same as ‘Simple Regression’ but includes A_0 observations. ‘Only Men’ excludes those who do not identify as men, while ‘Period $\leq x$ ’ excludes all periods greater than x .

Robustness Check	Coefficient (Std. err.)
All Data	0.01 (0.04)
No A_0 or A_1	-0.02 (0.05)
No other Ind. Charact.	0.02 (0.04)
No Tobit	0.00 (0.02)
Only Agreeableness	0.01 (0.04)
Simple Regression	0.00 (0.01)
Simple Regression, All Data	0.02* (0.01)
Only Men	-0.04 (0.08)
Period ≤ 2	-0.01 (0.07)
Period ≤ 5	-0.01 (0.06)

Table A2: Robustness checks on Agreeableness and Contributions

An individual's contribution to the public good is the dependent variable. The coefficient of Agreeableness as an independent variable is displayed. ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.10$.

C Power Analysis

For each statistical test, I conducted a simulation-based power analysis in order to determine the minimum detectable effect size that attains 80% power given a $\alpha = 0.05$ rejection threshold. The simulations were conducted in the same code as the statistical analysis that was attached to the pre-registration. I report the minimum effect size for each test below.

C.1 Part 1

The outcome of interest is each subject's Agreeableness score, calculated from their responses to the Part 1 questions. Each of the three groups of treatments is tested using a Mann-Whitney test, with each subject being an independent observation. The power analysis for the R_0 to A_0 comparison suggests a minimum detectable effect size of 7.7 units, and for

the *A0 Others* comparison it is 5.1. These minimum detectable effect sizes seem reasonable given they represent an average change of one or two out of the 26 Agreeableness questions being flipped from 1 to 5.

C.2 Part 2

I use the group's average contribution in a period as the dependent variable, and a treatment dummy alongside the period for the independent variables. I use a panel-data Tobit regression for the possible censoring that occurs at 0 and 25 tokens for upper and lower limits respectively. For each relevant comparison between two treatments (or group types within a treatment), I run the regression using only data from the pair that is being considered. I use the simulated data-set that was used in the initial pre-registration to get rough estimates of the period effect, σ_e , and σ_u . Using a Tobit regression as the underlying DGP, a simulation-based power analysis suggests a minimum detectable treatment effect size of around 1.7 tokens.

C.3 Part 3

I combine all of the characteristics elicited in Part 3 into one measure based on how likely it is they would be positively perceived by an observer. That is, I reverse code the Dark Triad as these traits are negative, and leave the coding for Honest-Humility as it is. I call this combined measure 'Positive Perception'. As there are 16 questions elicited on a 5-point Likert scale, it can take a minimum value of 16, and a maximum of 80. I use a Mann-Whitney test to test for differences between the three relevant subject groups. A power analysis suggests minimum detectable effect sizes of 6.3 and 5.2 respectively.

C.4 Conceptual Replication - MM Research Question 2

A simulation-based power analysis suggests a minimum detectable effect size of around 1 unit.

D Instructions

Full Instructions are provided in the OSF project and/or replication packet - either in the oTree code or a .docx file for the paper instructions. Selected parts of the Instructions that are particularly relevant for the understanding of the experiment are presented below.

D.1 Part 1

D.1.1 First Screen

This experiment will have two parts.

Part 1 will be a set of questions about yourself. We ask that you answer these questions accurately.

Part 2 has 15 decision rounds. A brief summary of one decision round follows:

- Subjects are in groups of 3
- Each subject has 25 tokens that they divide between their Private Account or a Cooperation Account
- Each token placed in their Private Account earns that subject 10 points.
- Each token placed in the Cooperation Account earns the entire group 12 points.
- Everyone in the group receives an equal portion of the earnings from the Cooperation account, that is, they earn $12 \cdot \frac{1}{3} = 4$ points per token in the Cooperation Account.

This is only a basic outline of Part 2. More instructions will be provided before starting Part 2.

[$t > 0$ Treatments:]

We will now start with Part 1 - the set of questions about yourself.

D.1.2 Second Screen

[Second Screen only in $t = 0$ Treatments]

[Random Treatments:] For Part 2, you will be assigned to a group of three **randomly**.

[Agreeableness Treatments:] For Part 2, you will be assigned to a group of three **based on your ‘Agreeableness’ score. Your Agreeableness score is determined by your responses to particular questions in Part 1.**

Agreeableness is a personality trait where people high in Agreeableness are often described as *selfless, trusting, good-natured, generous, and forgiving*. (Costa, McCrae, & Dembroski, 1989)

In scientific studies, **a high level of Agreeableness has been found to have a positive effect on group cooperation decisions** similar to the type in Part 2.

[References button with pop-up window that states:

Perugini, Tan, & Zizzo in *Economic Issues*, Volume 15, Part 1, 2010.

Volk, Thöni, & Ruigrok in the *Journal of Economic Behavior & Organization*, Volume 81, Issue 2, 2012.

Kagel & McGee in *Economics Letters*, Volume 124, Issue 2, 2014.

Thielmann, Spadaro, & Balliet in *Psychological Bulletin*, Volume 146, Issue 1, 2020.]

Each group of three is formed from six randomly selected subjects. **The three subjects with the highest Agreeableness scores will be assigned to one group, and the remaining three subjects to the other group.**

[All $t = 0$ treatments:] Each group of three will remain together for all 15 decisions in Part 2.

We will now proceed with Part 1 - the set of questions about yourself.

D.2 Part 2

[$t \leq 1$ Treatments:]

[Agreeableness treatments:] For Part 2, you will be assigned to a group of three **based on your ‘Agreeableness’ score. Your Agreeableness score is determined by your responses to particular questions in Part 1.** Agreeableness is a personality trait where people high in Agreeableness are often described as *selfless, trusting, good-natured, generous, and forgiving*. (Costa, McCrae, & Dembroski, 1989) In scientific studies, **a high level of Agreeableness has been found to have a positive effect on group cooperation decisions** similar to the type in Part 2.

Each group of three is formed from six randomly selected subjects. **The three subjects with the highest Agreeableness scores will be assigned to one group, and the remaining three subjects to the other group.**

[Random treatments:] For Part 2, you will be assigned to a group of three **randomly**.

D.3 Part 3

Parts 1 and 2 of the experiment are now complete.

We ask you to fill out a final short survey, before your final earnings are displayed. Your final earnings have already been calculated and set.

There are no further parts to the experiment after this final survey.

E Personality Questions

The 50 questions in Part 1 are taken from the 30 question ‘BFI-2-S Inventory’ (Soto & John, 2017), and the 20 questions on Agreeableness from the International Personality Item Pool’s (IPIP) ‘100-Item Lexical Big-Five Factor Markers’ (Goldberg, 2002; Goldberg et al., 2006). The 16 questions in Part 3 are taken from the ‘Dirty Dozen’ (Jonason & Webster, 2010) and four Honesty-Humility questions from HEXACO’s 60-item version (Lee & Ashton, 2009). Subjects are asked how much they agree each statement applies to them using a 5-point Likert scale (Likert, 1932). The 5 points are labeled: 1 = Disagree strongly, 2 = Disagree a little, 3 = Neither agree nor disagree, 4 = Agree a little, and 5 = Agree strongly. They are presented using horizontal radio buttons. Subjects face blocks of five questions on a page, and all questions are presented in a random order that differs across subjects.¹⁹ Personality traits are scored based on each subject’s numerical (i.e. 1-5) responses by the following formula: $Trait = \sum_{i \in Q} (LikertValue_{+veKey} + (6 - LikertValue_{-veKey}))$, where Q is the set of relevant questions to that trait. Appendices E.1 and E.2 report which questions are related to each trait and whether the questions are positively or negatively keyed.

As the experiment is conducted in Austria the experiment is conducted in German. While the majority of the university students that make up the subject pool are fluent in English, it is important to conduct personality tests in their native language. Firstly, there will be heterogeneity in subjects’ confidence or ability in using English. Secondly, there is a literature that suggests that elicited personality traits are different in bilingual speakers depending on what language is being used (see Dylman and Zakrisson (2023) for examples). I would rather observe a subject’s ‘regular’ personality rather than one that is shaped by a foreign language. Strategic misrepresentation of personality is already likely to be difficult enough as it is, let alone with an additional levels of complexity on top of that. The question sets used in Parts 1 and 3 all have pre-existing German translations. Rammstedt et al. (2020) translate the BFI-2-S. Streib and Wiedmaier (2001) translate the 100-Item IPIP. K ufner, Dufner, and Back (2015) translate the Dirty Dozen. A translation for HEXACO is provided by Lee and Ashton (2009). A list of the questions and their translations are

¹⁹Technically it is possible that two subjects face exactly the same ordering, however this is unlikely as the probability of that occurring in Part 1 is $p = \frac{1}{50!}$ and in Part 3 $p = \frac{1}{16!}$.

provided in Appendices E.1 and E.2.

Some questions were changed or removed. In Part 1, a question was changed slightly to avoid excessive repetition, from *‘I am compassionate and soft-hearted’* to *‘I am compassionate’*, as another question is *‘I have a soft heart’*. Two less relevant questions from Honesty-Humility were removed in order to maintain an equal number of questions between each trait in Part 3. The removed questions are *‘I’d be tempted to use counterfeit money, if I were sure I could get away with it.’* and *‘If I knew that I could never get caught, I would be willing to steal a million dollars.’*

Some of the pre-existing translations were changed based on feedback from native German speakers. The question *‘I have a soft heart’* was changed from *‘Ich habe ein weiches Herz’* to *‘Ich bin gutherzig’*. The question *‘I have a good word for everyone’* was changed from *‘Ich habe ein gutes Wort für jeden’* to *‘Ich rede gut über andere’*. These two changes were implemented as the original translations were considered ambiguous and a little too literal. The question *‘I make people feel at ease’* was changed from *‘Ich mache andere Leute ungezwungen’* to *‘Ich kann andere beruhigen’*. Ungezwungen can be interpreted as being unhinged rather than calm, and may also be grammatically incorrect. The question *‘Ich habe getäuscht oder gelogen, um meinen Willen durchzusetzen’* was changed to *‘Ich neige dazu, zu täuschen oder zu lügen, um meinen Willen durchzusetzen’*, and similarly the question *‘Ich habe Schmeicheleien genutzt, um meinen Willen durchzusetzen’* to *‘Ich neige dazu, Schmeicheleien zu benutzen, um meinen Willen durchzusetzen’*. The other questions in the Dirty Dozen all have *‘Ich neige dazu’* (I have the tendency to), and I was concerned that the question about lying could be interpreted as whether they have been deceitful in the current experiment, rather than a tendency in general.

E.1 Part 1 Questions and Translations

English Questions	German Questions
<i>Agreeableness Positively Keyed</i>	
I am interested in people.	Ich interessiere mich für Leute.
I sympathize with other's feelings.	Ich kann die Gefühle anderer nachempfinden.
I have a soft heart.	Ich bin gutherzig.
I take time out for others.	Ich nehme mir Zeit für andere.
I feel other's emotions	Ich kann die Gefühle anderer nachfühlen.
I make people feel at ease.	Ich mache andere Leute ungezwungen.
I inquire about other's well-being.	Ich erkundige mich nach dem Wohlbefinden anderer.
I know how to comfort others.	Ich weiß wie ich andere trösten kann.
I love children.	Ich liebe Kinder.
I am on good terms with nearly everyone.	Ich komme mit fast jedem gut aus.
I have a good word for everyone.	Ich rede gut über andere.
I show my gratitude.	Ich zeige meine Dankbarkeit.
I think of others first.	Ich denke zuerst an andere.
I love to help others.	Ich liebe es anderen zu helfen.
I am compassionate.	Ich bin einfühlsam.
I assume the best about people.	Ich schenke anderen leicht Vertrauen, glaube an das Gute im Menschen.
I am respectful and treat others with respect.	Ich begegne anderen mit Respekt.
<i>Agreeableness Negatively Keyed</i>	
I insult people.	Ich beleidige Leute.
I am not interested in other people's problems.	Ich interessiere mich nicht für die Probleme anderer Leute.
I feel little concern for others.	Anderer Menschen kümmern mich wenig.
I am not really interested in others.	Ich interessiere mich nicht wirklich für andere.
I am hard to get to know.	Mich kennenzulernen ist schwer.
I am indifferent to the feelings of others.	Ich bin den Gefühlen anderer gegenüber gleichgültig.
I am sometimes rude to others.	Ich bin manchmal unhöflich und schroff.
I can be cold and uncaring.	Anderer sind mir eher gleichgültig, egal.
I tend to find fault with others.	Ich neige dazu, andere zu kritisieren.
<i>Extraversion Positively Keyed</i>	
I am dominant and act as a leader.	Ich neige dazu, die Führung zu übernehmen.
I am full of energy.	Ich bin voller Energie und Tatendrang.
I am outgoing and sociable.	Ich gehe aus mir heraus, bin gesellig.
<i>Extraversion Negatively Keyed</i>	
I tend to be quiet.	Ich bin eher ruhig.
I prefer to have others take charge.	In einer Gruppe überlasse ich lieber anderen die Entscheidung.
I am less active than other people.	Ich bin weniger aktiv und unternehmungslustig als andere.

Table A3: Part 1 Questions 1-32

English Questions	German Questions
<i>Conscientiousness Positively Keyed</i>	
I am reliable and can always be counted on.	Ich bin verlässlich, auf mich kann man zählen.
I keep things neat and tidy.	Ich mag es sauber und aufgeräumt.
I am persistent and work until a task is finished.	Ich bleibe an einer Aufgabe dran, bis sie erledigt ist.
<i>Conscientiousness Negatively Keyed</i>	
I tend to be disorganized.	Ich bin eher unordentlich.
I have difficulty getting started on tasks.	Ich neige dazu, Aufgaben vor mir herzuschieben.
I can be somewhat careless.	Ich bin manchmal ziemlich nachlässig.
<i>Negative Emotionality Positively Keyed</i>	
I worry a lot.	Ich mache mir oft Sorgen.
I tend to feel depressed and blue.	Ich bin oft deprimiert, niedergeschlagen.
I am temperamental and get emotional easily.	Ich reagiere schnell gereizt oder genervt.
<i>Negative Emotionality Negatively Keyed</i>	
I am emotionally stable and not easily upset.	Ich bin ausgeglichen, nicht leicht aus der Ruhe zu bringen.
I am relaxed and handle stress well.	Ich bleibe auch in stressigen Situationen gelassen.
I feel secure and comfortable with myself.	Ich bin selbstsicher, mit mir zufrieden.
<i>Open-mindedness Positively Keyed</i>	
I am fascinated by art, music, or literature.	Ich kann mich für Kunst, Musik und Literatur begeistern.
I am original and come up with new ideas.	Ich bin originell, entwickle neue Ideen.
I am complex and a deep thinker.	Es macht mir Spaß, gründlich über komplexe Dinge nachzudenken und sie zu verstehen.
<i>Open-mindedness Negatively Keyed</i>	
I have little interest in abstract ideas.	Mich interessieren abstrakte Überlegungen wenig.
I have few artistic interests.	Ich bin nicht sonderlich kunstinteressiert.
I have little creativity.	Ich bin nicht besonders einfallsreich.

Table A4: Part 2 Questions 33-50

E.2 Part 3 Questions and Translations

English Questions

German Questions

Narcissism Positively Keyed

I tend to want others to admire me.
 I tend to want others to pay attention to me.
 I tend to expect special favors from others.

Ich neige dazu, von anderen bewundert werden zu wollen.
 Ich neige dazu, von anderen beachtet werden zu wollen.
 Ich neige dazu, besondere Gefälligkeiten von anderen zu erwarten.

I tend to seek prestige or status.

Ich neige dazu, nach Ansehen oder Status zu streben.

Psychopathy Positively Keyed

I tend to lack remorse.
 I tend to be callous or insensitive.
 I tend to not be too concerned with morality or the morality of my actions.
 I tend to be cynical.

Ich neige dazu, keine Gewissensbisse zu haben.
 Ich neige dazu, gefühllos oder unsensibel zu sein.
 Ich neige dazu, mich nicht um die Moral meiner Handlungen zu kümmern.
 Ich neige dazu, zynisch zu sein.

Machiavellianism Positively Keyed

I have used deceit or lied to get my way.

Ich neige dazu, zu täuschen oder zu lügen, um meinen Willen durchzusetzen.

I tend to manipulate others to get my way.

Ich neige dazu, andere zu manipulieren, um meinen Willen durchzusetzen.

I have used flattery to get my way.

Ich neige dazu, Schmeicheleien zu benutzen, um meinen Willen durchzusetzen.

I tend to exploit others towards my own end.

Ich neige dazu, andere für meine Zwecke auszunutzen.

Honesty-Humility Positively Keyed

I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.

Ich würde keine Schmeicheleien benutzen, um eine Gehaltserhöhung zu bekommen oder befördert zu werden, auch wenn ich wüsste, dass es erfolgreich wäre.

I wouldn't pretend to like someone just to get that person to do favors for me.

Ich würde nicht vortäuschen, jemanden zu mögen, nur um diese Person dazu zu bringen, mir Gefälligkeiten zu erweisen.

I would never accept a bribe, even if it were very large.

Ich würde niemals Bestechungsgeld annehmen, auch wenn es sehr viel wäre.

Honesty-Humility Negatively Keyed

If I want something from someone, I will laugh at that person's worst jokes.

Wenn ich von jemandem etwas will, lache ich auch noch über dessen schlechteste Witze.

Table A5: Part 3 Questions