

Need Satisfaction and Anti-Social Behavior after Ostracism

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Abstract

The present study experimentally investigated the effect of cyber-ostracism on need satisfaction and compensational behavior. Based on the temporal need-threat model we examined threats to the four fundamental needs (i.e., belonging, self-esteem, meaningful existence, and control). We manipulated ostracism with the Ostracism Online task, in which participants ($N = 437$) were either excluded or over-included by the amount of received likes on their personal profiles. Next, we measured pro-social or anti-social responses to ostracism with a newly developed compensational puzzle task, in which participants allocated either easy or hard puzzles to an ostensible participant. Finally, we assessed whether the personality traits agreeableness or conscientiousness function as a moderator for (changes in) need satisfaction. The results showed that ostracized participants reported significantly lower need satisfaction for all needs. Overall, both included and excluded participants distributed more easy puzzles and therefore acted more pro-social. After the puzzle task, ostracized participants reported a significant increase in their need satisfaction. However, need satisfaction was still significantly lower for ostracized participants. Excluded (vs. included) participants high in agreeableness reported a significant increase in need satisfaction after the compensational behavior, although this behavior itself did not differ. We found no clear link between threatened power needs and anti-social behavior on the one hand and threatened inclusionary needs and pro-social behavior on the other, indicating little to no supporting evidence for the temporal need-threat model.

Keywords: cyber-ostracism, Ostracism Online, need satisfaction, compensational behavior, pro-social behavior, antisocial behavior, temporal need-threat model, personality traits

Need Satisfaction and Anti-Social Behavior after Ostracism

Ostracism – being ignored and excluded – is a painful experience that most people have endured, sometimes even daily (Williams & Wesselman, 2011). The term ostracism itself stems from the ancient Greek civilization. During the fifth century B.C., citizens of Athens would cast their vote to exile those individuals with dictatorial ambitions from the democratic state. This ancient old practice was called *ostrakismos*, because the votes were written on so-called *ostraca*, shards of pottery (Williams, 2001; Zadro, 2011). Nowadays, the term ostracism is still being used for any act of ignoring and excluding of an individual or group by an individual or group (Williams, 2001).

In this paper, we have assessed reactions to ostracism on need satisfaction and compensatory behavior. Different theories argued whether this compensatory behavior is either pro-social or anti-social and whether a link with specific threatened needs exists. We have put these theories to the test, hereby specifically focusing on cyber-ostracism. Additionally, we have explored personality traits as a possible moderator between the divergent theoretical lanes. Cyber-ostracism occurs when recognition and communication via the internet are expected but do not occur (Schneider et al., 2017; Williams & Wesselman, 2011). Studying cyber-ostracism is relevant since it poses a threat to need satisfaction (Schneider et al., 2017), which is linked to low well-being (Wang et al., 2020) and a worsened mood (Galbava et al., 2021).

Theoretical Framework

Temporal Need-Threat Model

Ostracism is linked to need satisfaction by the temporal need-threat model of Williams (2009). This model of ostracism argued that being ostracized, be it online or offline (Schneider et al., 2017), can lead to the threatening of one or more of an individual's four fundamental human needs: belonging, self-esteem, control, and meaningful existence (Williams &

Wesselman, 2011; Zadro, 2011). Williams (2009) differentiated belonging and self-esteem as inclusionary needs, and control and meaningful existence as power needs. According to the temporal need threat model, reactions to ostracism occur in three progressive stages (Williams, 2009). The reflexive stage comprises an immediate response without intentional thinking. The following reflective stage is characterized by deliberative thought and implementation of coping behaviors (Donate et al., 2017; Williams, 2009). In the resignation stage, the ostracized individual is exhausted from using coping strategies (Williams, 2009). Especially the reflexive reaction to ostracism is associated with a depletion of the four fundamental needs (Donate et al., 2017).

Compensatory Behavior and Possible Explanations

After a fundamental need is threatened, targets become behaviorally, cognitively, or emotionally motivated to restore those threatened needs (Zadro, 2011). According to the goal system theory, the underlying common goal of people's behavior is need restoration, but there are different means to achieve that goal (Kruglanski et al., 2002). Research thus showed that targets that experience need threats are motivated to refortify those threatened needs and use compensatory behavior to do so.

Amongst researchers, there has been considerable debate as to whether being ostracized leads to either pro-social or anti-social aggressive behavior (Zadro, 2011). These are respectively defined by the intent to either benefit or harm another individual (Batson & Powell, 2003; Williams & Govan, 2005). On the one hand, research showed that ostracized targets can behave in pro-social ways that increase their inclusionary status. Ostracized individuals were, for example, more likely to work harder on a collective task than included individuals or showed more interest in new groups (Wesselman & Williams, 2011). William's temporal need-threat model stated that pro-social responses to ostracism aim to restore inclusionary needs (Williams, 2009). Another explanation for pro-social reactions lies in the

fundamental need to belong. Baumeister and Leary (1995) stated that individuals avoid rejection to fulfill their need to belong. Rejection avoidance can either be done by avoiding the situation in which rejection is likely, or by repairing one's behavior to get reincluded by the ostracizing group (Williams & Govan, 2005).

On the other hand, researchers suggested that socially excluded individuals are more likely to retaliate and resort to anti-social behavior. The need-threat model claims that any anti-social response focuses on refortifying the power needs (Williams & Wesselman, 2011). For example, participants without control deliberately allocated significantly more hot sauce to a stranger when it was stated very clearly that they did not prefer spicy food (Warburton et al., 2006).

To conclude, two contradictory directions are identified regarding compensatory behavior in response to being socially excluded (Ren et al., 2018). According to this literature, the choice of either anti-social or pro-social compensatory behavior depends on the threatened need the target prioritizes to refortify (Zadro, 2011).

Cyber-Ostracism

Focusing on cyber-ostracism, research suggested that cyber-ostracism negatively affects belonging, self-esteem, and meaningful existence (Schneider et al., 2017). Some researchers argued that cyber-ostracism threatens all four fundamental needs (Galbava et al., 2021), and poses the largest threat to the inclusionary need to belong (Wang et al., 2020; Williams & Wesselman, 2011). The clear practice of cyber-ostracism can be seen on social networking sites, such as Facebook (Jung et al., 2017). The ultimate goal of the usage of social networking sites is to obtain a sense of belonging (Jung et al., 2017). This can be achieved, for example, by expressing sympathy or favorability through Facebook's like-function (Jung et al., 2017). Manipulating the amount of perceived received likes, therefore, has an impact on the sense of belonging (Jung et al., 2017).

Research showed that cyber-ostracism has several consequences. After joining an experimental virtual chat room, excluded participants felt threatened in all fundamental needs, evoked more anger, and rated the experience more as painful (Donato et al., 2017). Ostracized participants also displayed greater interest in using social media, to restore a feeling of social connectedness (Knausenberger et al., 2015). In extreme cases, cyber ostracism and bullying were even associated with more suicidal thoughts and behaviors (Hinduja & Patchin, 2010).

Behavioral reactions to cyber-ostracism can take many forms. After being ostracized online, participants could either grant or decline a fellow participant's request for extra money, which was needed to complete a group task (Galbava et al., 2021). Most participants (82%) chose to loan the money, which was explained as pro-social behavior. Nevertheless, ostracized participants chose the antisocial response significantly more often than the control group (Galbava et al., 2021). Most importantly, the results showed no link between either threatened inclusionary needs and pro-social behavior or threatened power needs and anti-social behavior (Galbava et al., 2021). These findings question the aforementioned temporal need-threat model of Williams (2009).

Personality Traits

The present study also examined whether other moderators play a role in resorting to either prosocial or anti-social behavior. Research has shown that personality scales can play a role in predicting reactions to ostracism (Anestis et al., 2022). For example, Wirth et al. (2010) showed that individuals with higher levels of Cluster A personality disorder traits (e.g., interpersonal distrust), experienced fewer adverse effects of being excluded than participants with lower levels of those traits. In the present study, we focused on the Big Five dimensions of personality, namely openness to experience, extraversion, conscientiousness, agreeableness, and neuroticism (Costa & McCrae, 1992). Individuals high in agreeableness value social interactions and are kind, forgiving, cooperative, and trusting (McCrae & John,

1992; Yaakobi, 2021). Conscientiousness is a measure of reliability (Yaakobi, 2021). Conscientious people are organized, reliable, thorough, and responsible (McCrae & John, 1992). Rudert et al. (2020) stated that individuals with low levels of conscientiousness and low levels of agreeableness elicit ostracism. It is also stated that individuals higher in agreeableness or conscientiousness experience a greater negative impact on need satisfaction after ostracism (Yaakobi, 2021). In line with these findings, one would hypothesize that conscientiousness and agreeableness play a role in behavioral responses to social exclusion. This paper thus concentrates on agreeableness and conscientiousness. Perhaps personality traits function as a moderator that explains why Galbava et al. (2021) did not find support for the temporal need-threat model (Williams, 2009).

Present Study

In the current study, we investigate cyber-ostracism through a slightly altered Ostracism-Online task (Wolf et al., 2015); more specifically we examine what happens after participants experience need threats. After cyber-ostracism occurs, a negative effect can be expected on all four fundamental needs (Galbava et al., 2021), with the largest effects on the need to belong (Galbava et al., 2021; Wang et al., 2020). Therefore, hypothesis 1a states that rated need satisfaction will be lower for ostracized participants compared to included participants, especially on the need to belong. We also question whether participants will refortify need threats by using compensational behavior. Hereby, we focus on need satisfaction *changes* after a compensational puzzle task, wherein participants can act either harmful or helpful. Hence, hypothesis 1b is that there will be changes in the need satisfaction score after the compensational behavior. We expect a larger difference score for ostracized participants since we expect their need satisfaction to be lower after the ostracism.

Regarding compensatory behavior, we examine whether the reaction to social exclusion is anti-social or pro-social by using a newly developed puzzle task after the

manipulated online social task. This puzzle task lets the participants distribute either easy or hard puzzles to another participant. The next hypothesis (2a) questions how ostracized people compensate. We expect excluded participants to act more pro-social, and allocate more easy than hard puzzles, in line with Galbava et al. (2021). When focusing only on the anti-social responses, we hypothesize (2b) that ostracized individuals assign significantly harder puzzles to others than the control group (Galbava et al., 2021).

Next, we assess whether the compensatory behavior links to specific threatened needs. According to the temporal need-threat model (Williams, 2009), belonging is an inclusionary need affected by ostracism, and we could therefore also expect pro-social behavior to restore the need to belong. If the need to belong is threatened, ostracized participants would allocate easier puzzles. However, it is notable that power needs such as meaningful existence can also be affected after ostracism (Galbava et al., 2021; Wang et al., 2020), which would result in anti-social behavior. Additionally, Galbava et al. (2021) found no significant link between threatened needs (inclusionary or power need) and the chosen compensatory behavior (pro-social or antisocial). This implies that the temporal need-threat model might be up for debate. To put this to the test, hypothesis 3 questions whether there is a link between a threatened need and the number of allocated hard puzzles, for ostracized participants.

Finally, this study assesses whether personality traits function as a moderator when it comes to ostracism and need satisfaction. Following Yaakobi et al. (2021), we expect that ostracized individuals high in conscientiousness or agreeableness will have lower need satisfaction, compared to included participants (hypothesis 4a).

Additionally, personality traits might moderate the divergent theoretical lanes of Galbava et al. (2021) and Williams (2009). Following the need-threat model (Williams, 2009), if agreeable and conscientious ostracized people experience greater need threats, those people should especially show strong need changes after the compensational behavior. This

would not occur if Galbava et al. (2021) are correct. Therefore, an additional analysis explores whether ostracized people high in conscientiousness or agreeableness will have a greater change in need satisfaction, compared to included individuals (hypothesis 4b). If we find significant results, we will further assess if this effect also significantly links to specific compensatory behavior.

Methods

Participants

We established the appropriate sample size of 401 for this study through a power analysis using an effect size of $f = .15$, a power of $\beta = .85$, and an alpha error probability of $\alpha = .05$ in the program G. Power 3.1 (Faul et al., 2007). A total of 475 US citizens were randomly sampled via the Prolific participant pool and compensated 1.95 pounds for participation. Twenty-six participants were excluded, for reasons of straight-lining ($n = 24$), double IP addresses ($n = 1$) or a Qualtrics software error ($n = 1$). An additional 12 participants were excluded since they assigned less than nine puzzles in the puzzle task to another ostensible participant. The final sample ($N = 437$; $n_{\text{excluded}} = 212$ and $n_{\text{included}} = 225$) consisted of 198 women and 237 men (11 participants identified as “other”) with the most selected age category being between 35 and 44 years. The most selected educational level was college graduate. The most chosen income category was approximately between \$35,000 and \$50,000. All of the included participants provided informed consent. Data collection took place between the second and seventh of June 2022. The study received approval from the Ethical Committee of Psychology from the Faculty of Behavioural and Social Sciences at the University of Groningen.

Procedure and Design

The following sections describe the relevant variables for the present study. The full survey flow can be found in Appendix A.

Social Exclusion Manipulation

We adopted the Ostracism Online social media-resembling paradigm (Wolf et al., 2014). We altered the avatars and one profile description. Participants first created a personal profile, consisting of a name, a text about themselves, and a chosen avatar. Next, they looked at 10 ostensible other profiles and had the opportunity to give them likes through a thumbs-up button. The level of ostracism was manipulated by the number of likes a participant's profile received. Participants were randomly assigned to one of two conditions. The excluded participants received one like (under average) whereas the participants in the control condition received nine likes (over average).

Following the social interaction task, participants were directed back to the survey. First, participants were asked whether they had encountered problems or technical difficulties during the Ostracism Online task, such as not being able to like other profiles, then they were asked to indicate to what degree they felt (1) ignored or (2) excluded (1 = *not at all* to 5 = *extremely*).

Need Assessment

Next, participants filled out the Need-Threat Scale (van Beest & Williams, 2006). The need-satisfaction scales include belonging (e.g. "I feel I belong"), self-esteem (e.g. "I feel good about myself"), control (e.g. "I feel I can alter events in my life"), and meaningful existence (e.g. "I feel important"). These were assessed with three out of five items, each randomly assigned. As this resulted in two missing items, we used random forest imputation (Stekhoven & Buhlmann, 2012). We reformulated the items to be in the present tense instead of the past tense (e.g. "I feel rejected" instead of "I felt rejected"; see Appendix A). Answers were provided on a 7-point Likert scale (1 = *not at all*; 7 = *extremely*). The reliability scores of the scales were good (see Table B1, Appendix B).

Assessing Pro and Anti-Social Behavior

After engaging with the Need Threat scales, participants were invited to a task in which they allocated puzzles to unknown others. We used a new behavioral online task to assess pro- and anti-social behavior. The idea behind this task was based on the validated Tangram Help/Hurt Task (Saleem et al., 2015; modified by Leander and Chartrand (2017)). We introduced the second part of our study with the following text; “We are currently running another study at our laboratory on the effects of monetary rewards on cognitive performance. Participants in this on-campus study receive pay, depending on their performance: \$1.00 for a correctly answered puzzle. You get to decide which puzzles the other participants will have to solve.” Participants decided nine times to allocate a very easy or a very hard puzzle. Choices of puzzle selection were defined as prosocial responses and antisocial responses, depending on what puzzles the participants picked.

After the recording of their behavioral responses, the Need-Threat Scale was measured again. For the analyses, we calculated the difference score, namely the score on the Need-Threat Scale after the Ostracism Online task deducted from the score after the puzzle task. A higher difference score indicated a higher increase in need satisfaction after the puzzle task.

Personality Measure

Finally, personality and demographics were assessed. Personality traits were a moderating variable, which we measured with the Ten-Item Personality Inventory (TIPI) (Gosling et al., 2003). The TIPI assessed the Big Five personality dimensions (Gosling et al., 2003). This inventory consisted of ten items, with two descriptors for each personality dimension. The sentence stem given for all items was “I see myself as”, which was followed by two descriptors for each personality dimension (e.g. "Critical, quarrelsome" and "Sympathetic, warm" for Agreeableness) ranging from 1 = *disagree strongly* to 7 = *agree strongly*. The present study focuses on agreeableness and conscientiousness, for which the

two items per scale were moderately correlated (see Table B2, Appendix B, for full details), indicating satisfactory reliability. At the end of the survey, participants were thanked and debriefed.

Results

Manipulation Checks

We conducted a manipulation check using an independent samples *t*-test. As expected, participants in the ostracized experimental condition felt significantly more ignored ($M = 2.7$, $SD = 1.4$) than the included control group ($M = 1.1$, $SD = 0.4$), $t(445) = 17.13$, $p < .001$, $d = 1.62$. Moreover, the ostracized participants felt significantly more excluded ($M = 2.6$, $SD = 1.4$) than the control group ($M = 1.1$, $SD = 0.3$), $t(445) = 16.16$, $p < .001$, $d = 1.53$.

Manipulation checks thus indicated that the manipulation worked.

Analyses

Hypothesis 1

The first hypothesis stated that ostracized participants have a lower need satisfaction after the Ostracism Online Task than included participants. An independent samples *t*-test showed violations of both Normality (Shapiro-Wilk's test) and equality of variances (Levene's-test; see Tables C1 and C2, Appendix C, for full details). We, therefore, implemented the non-parametric Mann-Whitney U test. Summarized in Table 1 and confirming our first hypotheses, excluded participants showed lower need satisfaction than included participants on all needs, with the largest effect size for belonging.

Table 1*Independent samples t-test*

	Exclusion	Inclusion	<i>W</i>	<i>p</i>	Rank-Biserial Correlation
Belonging	<i>M</i> =4.27, <i>SD</i> =1.43	<i>M</i> =5.79, <i>SD</i> = 1.01	9169	<.001	-.62
Esteem	<i>M</i> =4.28, <i>SD</i> = 1.52	<i>M</i> =5.19, <i>SD</i> = 1.31	15603	<.001	-.35
Existence	<i>M</i> =4.74, <i>SD</i> = 1.46	<i>M</i> =5.71, <i>SD</i> = 1.04	14258.5	<.001	-.40
Control	<i>M</i> =4.43, <i>SD</i> = 1.28	<i>M</i> =5.01, <i>SD</i> = 0.98	17817.5	<.001	-.25
Total	<i>M</i> =4.44, <i>SD</i> = 1.31	<i>M</i> =5.44, <i>SD</i> = 0.97	13029	<.001	-.45

Note. Mann-Whitney U test. Effect size is given by the Rank-Biserial correlation.

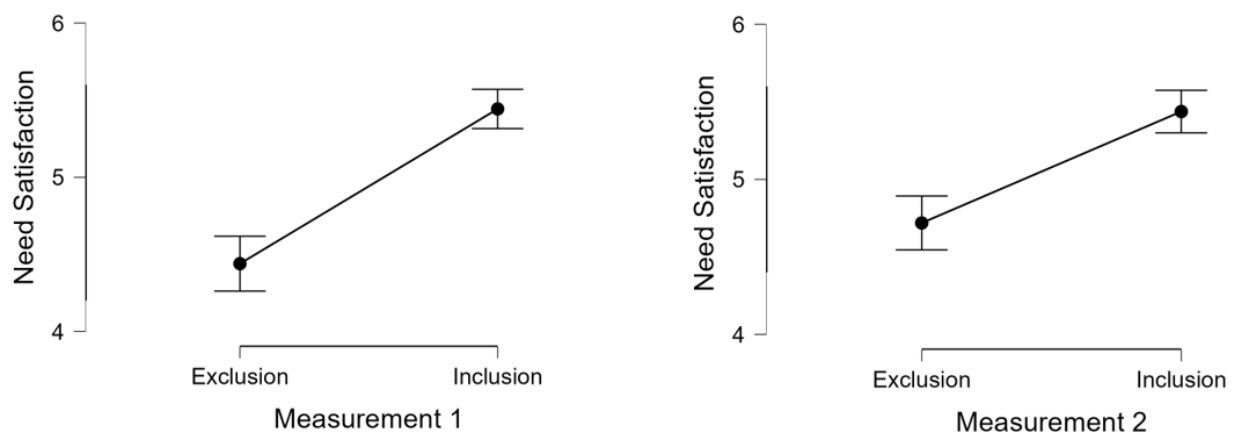
Next, we examined the need *changes* by comparing the difference scores. An independent samples *t*-test assessed whether there was a difference between conditions on the need satisfaction measurements. Both normality (Shapiro Wilk's test) and equality of variance were violated (Levene's test; see Tables C3 and C4, Appendix C for details). Therefore, we implemented a Mann-Whitney U test again (see Table 2), which showed a significant increase in total need satisfaction score after the puzzle task for excluded participants. Their difference score was also significantly higher for all fundamental needs, except control, compared to included participants. This significant increase in need satisfaction after the puzzle task for ostracized people supported hypothesis 1b.

Table 2*Independent samples t-test on difference scores*

	Exclusion	Inclusion	<i>W</i>	<i>p</i>	Rank-Biserial Correlation
Belonging	$M = .38, SD = .83$	$M = -.07, SD = .55$	32672	<.001	.37
Esteem	$M = .28, SD = .61$	$M = -.01, SD = .45$	30603	<.001	.22
Existence	$M = .28, SD = .66$	$M = .01, SD = .46$	29056.5	<.001	.28
Control	$M = .22, SD = .59$	$M = .11, SD = .45$	25242	.292	.06
Total	$M = .28, SD = .53$	$M = -.01, SD = .33$	31720	<.001	.33

Note. Mann-Whitney U test. Effect size is given by the Rank-Biserial correlation.

It is however notable that the rated need satisfaction after the puzzle task was still significantly higher for the included participants. This can be concluded after an additional Mann-Whitney U test was performed on the second need satisfaction measurement (see Figure 1).

Figure 1*Independent samples t-test*

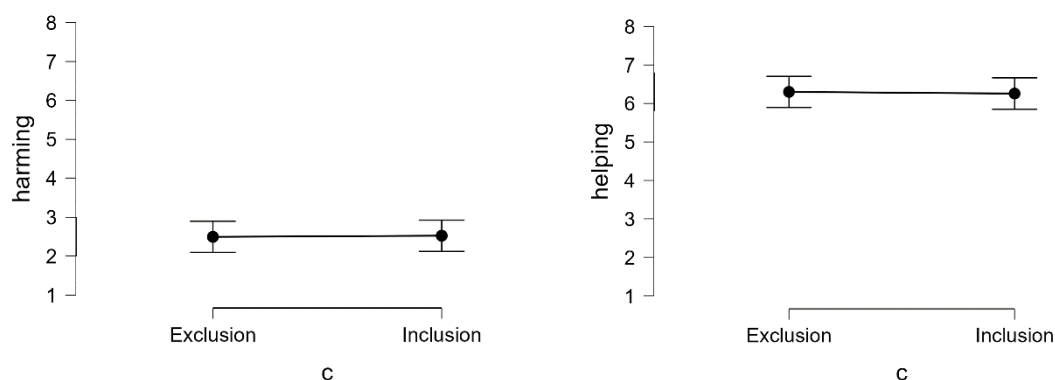
Note. Mann-Whitney U test

Hypothesis 2

We expected that ostracized participants would assign easier puzzles to another participant, so-called pro-social behavior (2a), and that ostracized participants would hand out more hard puzzles than included participants (2b). To test these hypotheses, we conducted an independent samples *t*-test. Normality was deviated (see table D1, Appendix D) and therefore the Whitney-Mann U test was used. Hypothesis 2a was supported, since ostracized participants handed out easier puzzles (see Figure 2). The distribution of allocated puzzles did not differ between excluded and included participants, since included participants distributed on average 2.54 hard puzzles ($SD = 3.06$) and excluded participants on average 2.50 ($SD = 2.96$). The *t*-test showed that this difference is non-significant ($W = 23988$, $r_{pb} = .01$, $p = .91$). Therefore, we couldn't replicate the findings of Galbava et al. (2021) for hypothesis 2b.

Figure 2

Independent samples t-test



Note. Whitney Mann U test

Hypothesis 3

We questioned whether a link exists between threatened inclusionary needs (belonging and self-esteem) or threatened power needs (existence and control) and the amount of assigned hard puzzles by ostracized participants ($n = 212$). To test this third hypothesis, we checked whether the rated need satisfaction after the Ostracism Online Task correlated

significantly with the number of hard puzzles that excluded participants distributed.

Assumption checks indicated that the variables were not normally distributed, and therefore Spearman correlation was used (see Figure E1, Appendix E, for detailed graphs).

The Spearman correlation coefficient indicated no significant correlation (for $\alpha = .05$) between the amount of distributed hard puzzles and belonging ($r(210) = -.12, p = .08$), self-esteem ($r(210) = -.08, p = .22$), and control ($r(210) = -.10, p = .13$). There was one significant negative correlation, namely between the number of distributed hard puzzles and existence ($r(210) = -.14, p = .035$, for $\alpha = .05$). Lower levels of meaningful existence correlated with more allocated hard puzzles. However, this correlational effect was quite weak. Moreover, the power decreased since the sample size decreased.¹ Concluding, all correlations between the different needs and hard puzzles showed negative tendencies, although they were relatively small. Additionally, only one significant link between a power need (meaningful existence) and harming behavior was found, albeit relatively weak.

Hypothesis 4

The main question for the final hypothesis was whether personality traits function as a moderator to predict need satisfaction after exclusion. Residuals plots showed no indication of a violation of linearity and homoscedasticity and QQ plots showed a relatively normal distribution of residuals (see Figures F1 and F2, Appendix F). The Durbin-Watson statistic was non-significant for both agreeableness ($p = 0.31$) and conscientiousness ($p = 0.72$) and therefore the assumption of independence of residuals was not violated.

We hypothesized that higher levels of agreeableness and conscientiousness would relate to lower need satisfaction. Linear regression with need satisfaction after the

¹ By remaining an effect size of $f = .15$, the power lowered to $\beta = .58$ for $n = 212$, established through a power analysis in the program G. Power 3.1 (Faul et al., 2007). This is a large decrease in power. Increasing the effect size lead to an increase in power. For $\alpha = .05$ and $f = .20$, the power was $\beta = .80$, for $n = 199$.

manipulation as the dependent variable and the centered agreeableness scale as the additional predictor showed contradictory findings. Results showed that participants higher in agreeableness reported higher levels of overall need satisfaction on the first measurement ($t(435) = 5.02, p < .001$; see Table 3), regardless of their experimental condition, since no significant interaction effect was found ($t(435) = 0.18, p = .86$).

Table 3*Coefficients Linear Regression Agreeableness*

Model		Unstandardized	SE	Standardized ^a	<i>t</i>	<i>p</i>
H ₀	(Intercept)	4.96	0.06		82.36	< .001
H ₁	(Intercept)	4.42	0.07		59.54	< .001
	AgreeablenessCentered	0.29	0.06	0.32	5.02	< .001
	c (Inclusion)	1.04	0.10		10.05	< .001
	AgreeablenessCentered * c (Inclusion)	0.01	0.08		0.18	0.855

^a Standardized coefficients can only be computed for continuous predictors.

Similar results were found for the personality trait conscientiousness. Linear regression indicates a positive main effect for conscientiousness ($t(435) = 7.87, p < .001$), stating participants with higher levels of conscientiousness reported higher levels of need satisfaction (see Table 4). However, this effect did not differ between excluded and included participants, since no significant interaction effect was found on conscientiousness and exclusion ($t(435), p < .001$).

Table 4*Coefficients Linear Regression Conscientiousness*

Model		Unstandardized	SE	Standardized ^a	<i>t</i>	<i>p</i>
H ₀	(Intercept)	4.96	0.06		82.36	< .001
H ₁	(Intercept)	4.44	0.07		60.92	< .001
	ConscientiousnessCentered	0.37	0.05	0.39	6.87	< .001
	c (Inclusion)	1.01	0.10		9.85	< .001

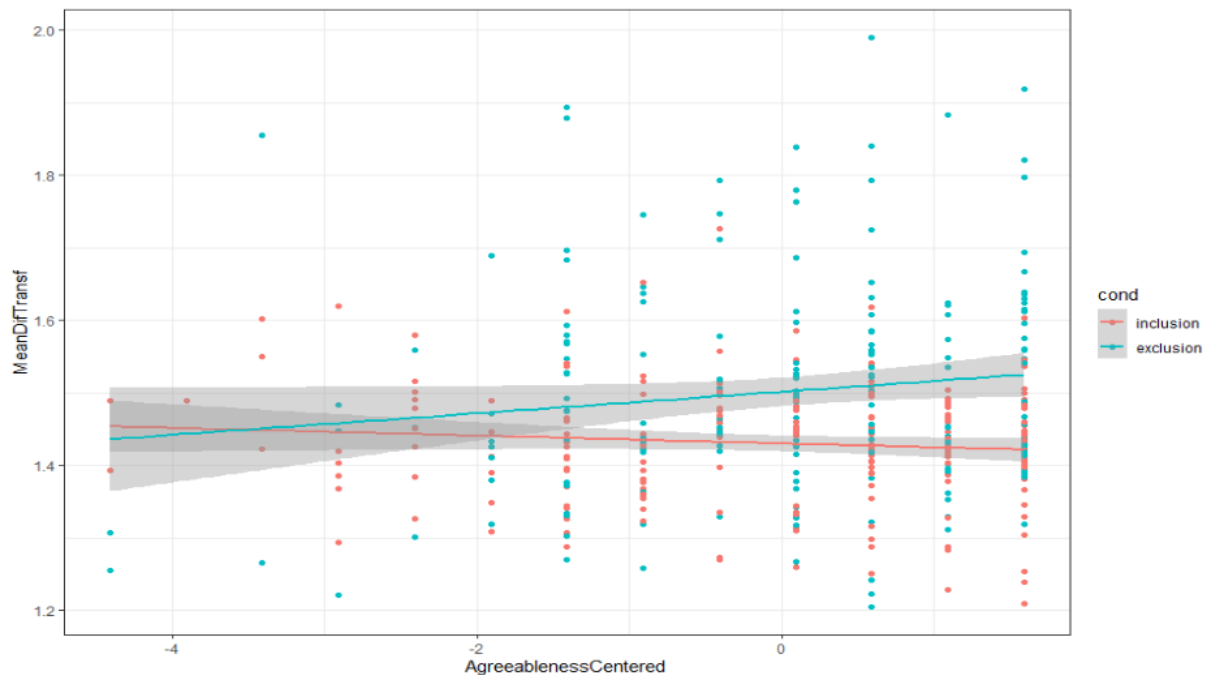
Table 4*Coefficients Linear Regression Conscientiousness*

Model	Unstandardized	SE	Standardized ^a	<i>t</i>	<i>p</i>
ConscientiousnessCentered * c (Inclusion)	-0.05	0.08		0.61	0.54

^a Standardized coefficients can only be computed for continuous predictors.***Exploratory Analysis***

For exploratory analysis, we were interested to see if participants with higher levels of agreeableness and conscientiousness would have a significant *change* in need satisfaction after the puzzle task. To test hypothesis 4b, we used linear regression with the difference score of the need satisfaction. The residual plots indicated a violation of linearity, homoscedasticity, and normal distribution of residuals (see Figures G1 and G2, Appendix G). After a square root transformation and removing outliers ($n = 22$), the plots indicated that the assumptions were met (see Figures G3-G7, Appendix G). These corrections resulted in a sample of $n = 415$, which is large enough to remain a power of $\beta = .85$ for an effect size of $f = .15$.

The main effects for conscientiousness remained the same by using the difference score (see Table G1, Appendix G for coefficients). However, for agreeableness, a significant interaction effect was found for $\alpha = .05$ ($t(413) = -2.36, p = .02$; see Table G2, Appendix G for coefficients). This indicated that excluded participants with higher levels of agreeableness have a larger increase in need satisfaction, compared to included agreeable participants (see Figure 3).

Figure 3*Interaction plot Agreeableness x Difference Score Need Satisfaction*

To further explore which specific needs increased more in excluded agreeable participants, we performed linear regressions on the difference score for each need. Only the interaction effect for the need belonging appeared to be significant ($t(413) = -3.07, p = .002$; see Figure G8, G9 and Table G3, Appendix G). This result indicated that excluded (vs. included) participants with higher levels of agreeableness have a larger increase in belonging. Interaction effects were non-significant for meaningful existence ($t(413) = -1.21, p = .31$), self-esteem ($t(413) = -1.20, p = .23$), and control ($t(413) = -0.31, p = .76$).

Finally, we assessed whether excluded agreeable people differed in their compensatory response to ostracism. We used linear regression with the number of allocated hard puzzles as the dependent variable and the centered agreeableness scale as the additional predictor. The results were non-significant. Overall, there was no main effect on agreeableness ($t(413) = -1.01, p = .31$). Thus, agreeable participants did not act more harmful. Moreover, no significant interaction effect was found ($t(413) = 0.55, p = .58$), indicating that excluded (vs. included) participants high in agreeableness did not differ in their distribution of hard puzzles.

Discussion

This study aimed to assess whether cyber ostracism affects need satisfaction and the following compensatory behavior. Summarizing the results, our study shows that need satisfaction decreases in ostracized people for belonging, meaningful existence, self-esteem, and control. After compensational behavior, excluded participants showed a significant increase in need satisfaction compared to included participants. Nonetheless, included individuals still reported significantly higher need satisfaction than ostracized individuals.

Over the years, researchers have been conflicted as to whether need satisfaction threats lead to either pro-social or anti-social behavior. Our study provides clear findings that ostracized people act pro-social, because excluded participants allocated fewer hard puzzles to the ostensible participant. However, they did not act more pro-social than included participants, since the distribution of hard puzzles did not differ between the experimental conditions. For ostracized participants, there was a relatively small trend between lower need satisfaction and more distributed hard puzzles; only the correlation with meaningful existence was significant though. This might have implications for our understanding of the temporal need-threat model.

Finally, participants higher in agreeableness and conscientiousness showed higher levels of need satisfaction, regardless of their experimental condition. Most interestingly, ostracized individuals with high levels of agreeableness have a larger *change* in need satisfaction after the compensational task; only on the need to belong. They did not differ in their distribution of hard puzzles. We will further discuss the implications and limitations of these findings.

Theoretical and Practical Implications

Need Satisfaction Changes after Threats

Results indicate, in line with previous research and our prior expectations, that ostracized compared to included individuals experience significantly lower need satisfaction on the four fundamental needs (Schneider et al., 2017; Wang et al., 2020). After compensation, need satisfaction can significantly increase on all needs, except control. One possible explanation for the lacking increase in control could be that the Ostracism Online task already provides features to refortify control (Schneider et al., 2017). Distributing likes to others in response to their own received likes could already function as a way of regaining control. That could explain why the additional puzzle task does not contribute to the increase of the need for control, since it is already restored.

However, after the puzzle task, the need satisfaction was still significantly higher for included participants. This implies that included people are still better off than ostracized people after compensational behavior, although they do not increase in need satisfaction. A plausible explanation is that compensational behavior is not the only mediating mechanism between cyber-ostracism and need satisfaction.

Furthermore, there are some practical implications to these findings. First, the significant increase in need satisfaction after the compensation indicates that the newly developed puzzle task could function as a compensational task, to restore negatively affected needs. This new task could therefore be particularly interesting to other researchers interested in compensational behavior. Second, we showed that being excluded online can have a detrimental effect on need satisfaction, which is linked to low well-being (Wang et al., 2020). Therefore, these findings can be of interest to those engaging in social networking sites.

Pro-Social Responses to Ostracism

In line with our prior expectations, we found that participants tended to act more pro-social. Participants allocated on average easier puzzles to the ostensible participant, regardless of their experimental condition. However, contradictory to previous research (Galbava et al.,

2021), ostracized participants did not allocate more difficult puzzles.

There are numerous explanations for this pro-social response to social exclusion. One plausible explanation for our findings lies in a limitation of the present study. We slightly increased the likelihood of pro-social behavior by our suggestive choice of wording. Perhaps acting anti-social was simply not effective enough in this situation. Another possibility is that giving excluded people control over their environment or providing the opportunity to regain social connection can decrease aggressive behavior (DeWall & Twenge, 2013). Perhaps the fact that one can do something after ostracism is already sufficient to decrease aggressive behavior. Excluded participants can also become motivated to reintegrate, in manners such as conformation and cooperation (Molden & Maner, 2013). Giving easier puzzles can be a way of cooperating with the other participant and therefore acting pro-social.

Implications for the Need-Threat Model

Finding only small negative trends between need satisfaction and compensation might challenge Williams' temporal need-threat model (Williams, 2009). Lower need satisfaction levels in ostracized participants correlated with more anti-social behavior, for all needs. Notably, the trend was only significant for the correlation between harming behavior and the power need meaningful existence. According to the need-threat model, one would expect this negative trend to appear only for the power needs. For the inclusionary needs, the need-threat model predicts that low need satisfaction would lead to pro social behavior. This effect was not found in the present study. The power needs correlated with anti-social behavior (in fact, one of them significantly), but so did the threatened inclusionary needs. There seems to be no clear distinction between threatened power needs and anti-social behavior on the one hand and threatened inclusionary needs and pro-social behavior on the other. Our results are therefore partly consistent with Galbava et al. (2021), stating that the need-threat model may not be the correct predictor of anti-social behavior.

Other variables and theoretical models are possibly better at predicting anti-social behavior. Research showed, for example, that people high in self-compassion are less likely to act anti-social after social exclusion (Allen et al., 2013). Emotion regulation strategies can also play a role in resorting to adaptive or maladaptive behavior after social exclusion (Riva, 2016). For instance, cognitive reappraisal and mindfulness can reduce reactive aggression (Denson, 2015). However, the present study did not account for these possible third variables.

A possible implication of these findings could be that the need-threat model needs to be revised, but since the negative trend was non-significant for three needs and only one correlation was below an alpha of .05, this is a cautious statement. We also reduced the sample size by only assessing the excluded condition and therefore lost power. For more conclusive statements replication and additional research are recommended.

Agreeableness as Moderator

Beforehand, we expected that agreeable and conscientious participants should be more susceptible to the negative effects of ostracism, in line with Yaakobi (2021). Contrary to these expectations, people with higher levels of agreeableness and conscientiousness reported higher levels of need satisfaction, regardless of ostracism. Both conscientiousness and agreeableness associate positively with well-being (Anglim et al., 2020; Mohsen, 2022), which possibly explains why overall need satisfaction is higher for conscientious and agreeable individuals.

Increase in Need to Belong

Most interestingly, excluded (vs. included) participants with higher levels of agreeableness showed a larger increase in total need satisfaction and belongingness. This indicates that agreeableness might predict the increase in need satisfaction, but only for excluded people. Agreeable individuals value social interaction, are more altruistic, and are more likely to act cooperative (Barańczuk, 2019; Yaakobi, 2021). People high in

agreeableness also have greater adaptive emotion regulation strategies (Barańczuk, 2019). Agreeableness is associated with greater mindfulness and reappraisal and lower avoidance and suppression strategies (Barańczuk, 2019). Reappraisal, for example, is positively related to greater well-being (Gross & John, 2003). Perhaps agreeable ostracized individuals can deal with their dissatisfaction faster because of their adaptive emotional regulation abilities. Since agreeable people value social interaction, it would be plausible that they prioritize refortifying their need to belong, which might explain why their need to belong increased significantly in this study. However, the present study did not account for emotional regulation as a moderator, so this could be an interesting topic for future research. It should be noted that this effect size was relatively small, particularly after considering the corrected violated assumptions.

No Difference in Compensatory Behavior

Additionally, we found that excluded agreeable participants did not differ in their puzzle distribution from those included agreeable participants. Following the need-threat model, compensatory behavior would function as an underlying mechanism for refortifying threatened needs (Williams, 2009). More specifically, pro-social behavior would be associated with restoring the need to belong. However, agreeable excluded (vs. included) participants were no more pro-social than included agreeable participants, although they did show a significant change in their need to belong after compensation. This implies that changes in need satisfaction might not be attributed to compensatory behavior. Moreover, these results provide little to no support for the validity of this aspect of the temporal need-threat model. This might indicate that the need-threat model needs to be altered.

Notably, these effects were only exploratory. The personality measurements also consisted of only two items. Therefore, more research on personality traits as a moderator on need satisfaction changes is recommended.

Limitations and Future Directions

In the present study, there are two limitations regarding the Ostracism Online task. First, we lack data on how participants behave within the Ostracism Online task, for example, how many likes they give other profiles. According to the need-threat model, the reflexive response follows the ostracism immediately, without deliberative thought (Donato et al., 2017). Because of the lack of this data, it is hard to derive conclusions about the different stages after ostracism in this study. It would be interesting to see if over-included and ostracized participants differ in their immediate responses. Since we can now only speculate about the behavior within the online environment. This is something to investigate for further research. Second, the present study contains no control group that got an average amount of likes. The over-included group functioned as the control group. Nevertheless, it is thinkable that over-included individuals respond differently than individuals who would receive an average amount of likes. Adding a third experimental group is thus worth considering for future research. Additionally, since we manipulated ostracism, results are not only correlational but also have predictive power.

Regarding the Puzzle task, there are three limitations. First, anti-social behavior could be operationalized better. In the current set-up, participants do not take away money when they allocate hard puzzles. They simply make it harder to earn money for the other participants. Distributing hard puzzles is therefore not pro-social behavior, since there is surely no intent to benefit the ostensible other, but it could be unclear if there is actual intent to harm them. A possible solution might be adding a third neutral response option. Choosing hard puzzles would then become even more deliberate. The second limitation comprises that the puzzle options are not independent of each other. Assigning more easy puzzles is automatically intertwined with assigning less difficult puzzles. Finally, in our instructions before the Puzzle task, we were also slightly suggestive of pro-social behavior. This could be

something to investigate while further developing this task. However, the new Puzzle task is also a strength of this study, since we implemented a newly developed compensational puzzle task. We, therefore, contribute to the development of scientific research on ostracism.

Another strength is that our study measured need satisfaction both before and after the compensational task, something that not many researchers have done before. Hence, we could detect whether the need satisfaction changed after the compensatory behavior. Furthermore, the current study had a large sample and therefore an 85 percent chance ($\beta = .85$) of detecting a small effect ($f = .15$) if there were to be any. This adds a lot of power to our current statements.

Conclusion

In conclusion, engaging in online interactions can have detrimental effects on need satisfaction. Being socially excluded negatively impacts belonging, self-esteem, meaningful existence, and control. We found no indication that specific compensatory behavior is associated with need restoration. Overall, people tend to act pro-social, even after being excluded online. Being high in agreeableness might predict a refortification of the need to belong if one is ostracized. However, when it comes to need satisfaction, excluded participants are still worse off than included participants in the end. It is therefore important to keep in mind that online exclusion negatively impacts psychological needs, especially in times like the present where online interactions become more and more common.

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Appendix A

This Appendix contains the full survey flow of the study, after the Ostracism Online task when participants were redirected to Qualtrics.

Bachelor_2022_Ostracism_HvH_Second

Before starting Part 2 of the study, please answer the following questions about your experiences in the social interaction task.

Your answers are completely anonymous and will not influence your role or participation in the study in any way.

During the social interaction task, I felt...

	Not at all (1)	(2)	(3)	(4)	Extremely (5)
...ignored. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...excluded. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you feel each of the following, right now?
I feel....

[illegible][illegible]

I feel....

	1: Not at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7: Extremely (7)
...invisible. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...meaningless. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...non-existent. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...important. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...useful. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1: Not at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7: Extremely (7)
...powerful. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...I have control. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...I can alter events in my life. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...I am unable to make things happen. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...as though others decide everything. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We are currently running another study at our laboratory on the effects of monetary rewards on cognitive performance. Participants in this on-campus study receive pay, depending on their

performance: **\$1.00 for a correctly answered puzzle.** You get to decide which puzzles the other participants will have to solve.

On each of the following screens, you will see two puzzles. Select one of the puzzles to send to the campus laboratory. The next participant at the lab must try to solve the puzzles you send. Make your decision within 15 seconds. After you sent a puzzle, two new puzzles will appear on screen. **There will be 9 puzzles in total. The laboratory participant will be paid \$1.00 for each correctly solved puzzle.**

You are connecting to our servers. This might take a few moments, do not close or reload the page.

Hovering to the left or right will show two puzzles. Click on the puzzle you want to send to the other participant. Make your decision within 15 seconds:

You have made all your choices. The survey will continue in a second.

The final part of this study involves general questions about your experience with this research study, followed by questions about you in general.

Following next are some statements about how you feel **right now.**

Please use the corresponding scale to indicate how representative each statement is of your **current feelings.**

I feel...

[illegible][illegible]

[illegible][illegible]

How much do you agree or disagree with the following statements:

When I was sending the puzzles to the other participant in the second part of the study, I felt...

	Strongly disagree (- 3)	Disagree (- 2)	Somewhat disagree (-1)	Neither agree nor disagree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
... powerful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... in control.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... happy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... content.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you agree or disagree with the following statements:

To what extend do you think sending the puzzles to the other person...

	Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (- 1)	Neither agree nor disagree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
... had an impact on the other person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... made the other person feel good.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you agree or disagree with the following statements:

Do you think other people...

	Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither agree nor disagree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
... would send challenging puzzles to the other person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... should send challenging puzzles to the other person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

During the social interaction task, did you encounter any problems? (e.g. not being able to like other profiles, errors in the display, etc.).

☐ Yes (1)

☐ No (0)

Display This Question:

If During the social interaction task, did you encounter any problems? (e.g. not being able to like... = Yes

What was the problem during the social interaction task (your feedback is greatly appreciated)?

Did you experience any problems with the task where you sent puzzles to the other person?

☐ Yes (1)

☐ No (0)

Display This Question:

If Did you experience any problems with the task where you sent puzzles to the other person? = Yes

[illegible]

[illegible]

How much do you support or oppose the ideas about groups in general?

[illegible]

I see myself as:

[illegible]

Agree or disagree:

	Strongly disagree (-2)	Disagree (-1)	Neither agree nor disagree (0)	Agree (1)	Strongly agree (2)
Not a lot is done for people like me in the US.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I compare people like me against other people in the US, my group is worse off.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recent events in society have increased my struggles in daily life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is your gender?

- ☐ Male (1)
- ☐ Female (2)
- ☐ Other (3)
-

What is your age?

- ☐ 18-24 (1)
- ☐ 25-34 (2)
- ☐ 35-44 (3)
- ☐ 45-54 (4)
- ☐ 55-64 (5)
- ☐ 65+ (6)
-

What is your education?

- ☐ Some High School or Less (1)
 - ☐ High School Graduate / GED (2)
 - ☐ Some College (3)
 - ☐ College Graduate (4)
 - ☐ Graduate Degree (5)
-

What is your annual income?

- ☐ Under \$15,000 (1)
 - ☐ \$15,000 - \$25,000 (2)
 - ☐ \$25,000 - \$35,000 (3)
 - ☐ \$35,000 - \$50,000 (4)
 - ☐ \$50,000 - \$75,000 (5)
 - ☐ \$75,000 - \$100,000 (6)
 - ☐ \$100,000 - \$150,000 (7)
 - ☐ \$150,000 - \$200,000 (8)
 - ☐ \$200,000 + (9)
-

Thank you for your participation in this study. **You can click “Next” to be redirected to prolific for the completion code.**

Debriefing:

The goal of this university-based psychological study is to examine the effects of ostracism, a form of social exclusion, on psychological needs and compensatory behavior as measured by the allocation of puzzles to an ostensible other.

We apologize that deception was necessary for the experimental set-up of this study. You were told that the profiles you encountered in the social-medial online environment were those of other participants. However, these were preexisting profiles created by researchers. To make it possible for us to compare social exclusion with social inclusion, you were randomly selected to be either excluded by receiving none to few likes on your profile or included by receiving many likes. This was done by computer scripts. **Please note that no matter how you designed your profile, the number of likes on your profile was predetermined and generated not by real people but by a computer.** Moreover, to assess your reaction to this experience we asked you to send puzzles to an ostensible other. **Here we also had to use a bit of deception in that there was no other participant.** We are very sorry to have done that.

The results will be used for scientific research purposes only. Your data will be treated confidentially. You have the right to withdraw your data without any negative consequences. If you have any questions or concerns about the study or your participation, you are welcome to contact the lead investigator, M. Agostini (m.agostini@rug.nl). You are also welcome to contact our university ethics board at ecp@rug.nl.

Now that you know the purpose of this study, do you have any advice or suggestions to improve the survey experience? If you would like to share any concerns, we are also very happy to hear about them. We appreciate any feedback you can offer.

Please click “Next” to be redirected to prolific for the completion code.

Appendix B

Table B1 indicates high reliability for all Need Threat measurement scales.

Agreeableness and conscientiousness were measured with two-items scales. The assumptions of linearity and especially normality are violated (see Figures B1 and B2) and therefore the Spearman correlation was used. As Table B2 shows, the correlation effect size between the two items for conscientiousness is large and for the agreeableness-items medium to large (Cohen, 1992).

Table B1

Descriptive statistics and reliability of Need Threat Scale

		<i>M</i>	<i>SD</i>	Cronbach's α	95% CI Lower Bound	Upper bound
Need measure 1	Belonging	5.05	1.45	.93	.92	.94
	Esteem	4.75	1.48	.97	.96	.97
	Existence	5.24	1.35	.91	.89	.93
	Control	4.73	1.17	.86	.84	.88
	Total	4.96	1.25	.97	.97	.98
Need measure 2	Belonging	5.20	1.32	.93	.96	.97
	Esteem	4.88	1.44	.97	.96	.97
	Existence	5.38	1.29	.91	.90	.93
	Control	4.89	1.17	.88	.86	.89
	Total	5.09	1.22	.97	.97	.98

Figure B1

Scatter plot of the two items of the Agreeableness-scale

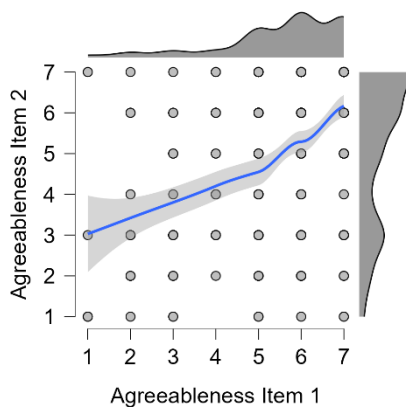
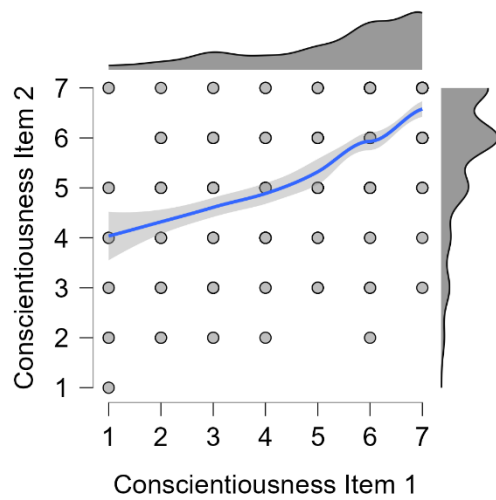


Figure B2

Scatter plot of the two items of the Conscientiousness-scale

**Table B2**

Reliability personality scales agreeableness and conscientiousness

	<i>M</i>	<i>SD</i>	Spearman's rho	<i>p</i> -value
Agreeableness	5.4	1.31	.476	<.001
Conscientiousness	5.6	1.37	.650	<.001

Appendix C

Assumption checks for hypothesis 1. Normality and equality of variance are violated, for both hypotheses 1a (Tables C1 and C2) and 1b (Tables C3 and C4).

Table C1

Test of Normality (Shapiro-Wilk)

		<i>W</i>	<i>p</i>
mean_belonging_p1	Exclusion	0.98	0.004
	Inclusion	0.91	< .001
mean_esteem_p1	Exclusion	0.97	< .001
	Inclusion	0.95	< .001
mean_existence_p1	Exclusion	0.96	< .001
	Inclusion	0.91	< .001
mean_control_p1	Exclusion	0.98	0.004
	Inclusion	0.99	0.017
mean_needs_p1	Exclusion	0.98	0.001
	Inclusion	0.96	< .001

Note. Hypothesis 1a. Significant results suggest a deviation from normality.

Table C2

Test of Equality of Variances (Levene's)

	<i>F</i>	<i>df</i>	<i>p</i>
mean_belonging_p1	36.48	1	< .001
mean_esteem_p1	10.31	1	0.001
mean_existence_p1	39.20	1	< .001
mean_control_p1	19.82	1	< .001
mean_needs_p1	29.94	1	< .001

Note. Hypothesis 1a.

Table C3*Test of Normality (Shapiro-Wilk)*

		<i>W</i>	<i>p</i>
MeanDifBelonging	Exclusion	0.98	0.003
	Inclusion	0.86	< .001
MeanDifExistence	Exclusion	0.91	< .001
	Inclusion	0.91	< .001
MeanDifEsteem	Exclusion	0.92	< .001
	Inclusion	0.96	< .001
MeanDifControl	Exclusion	0.95	< .001
	Inclusion	0.98	0.006
MeanDifTotal	Exclusion	0.92	< .001
	Inclusion	0.89	< .001

Note. Hypothesis 1b. Significant results suggest a deviation from normality.

Table C4*Test of Equality of Variances (Levene's)*

	<i>F</i>	<i>df</i>	<i>p</i>
MeanDifBelonging	33.56	1	< .001
MeanDifExistence	19.08	1	< .001
MeanDifEsteem	13.91	1	< .001
MeanDifControl	8.95	1	0.003
MeanDifTotal	26.72	1	< .001

Note. Hypothesis 1b.

Appendix D

Assumption check for hypothesis 2, indicating a violation of the normality assumption.

Table D1

Test of Normality (Shapiro-Wilk)

		<i>W</i>	<i>p</i>
harming	Exclusion	0.79	< .001
	Inclusion	0.78	< .001

Note. Hypothesis 2. Significant results suggest a deviation from normality.

Appendix E

Assumption checks for hypothesis 3. For a correlation, both variables need to be normally distributed and linear related, and Figure E1 shows that these assumptions were not met. Therefore hypothesis 3 was tested using Spearman's rho (see Results).

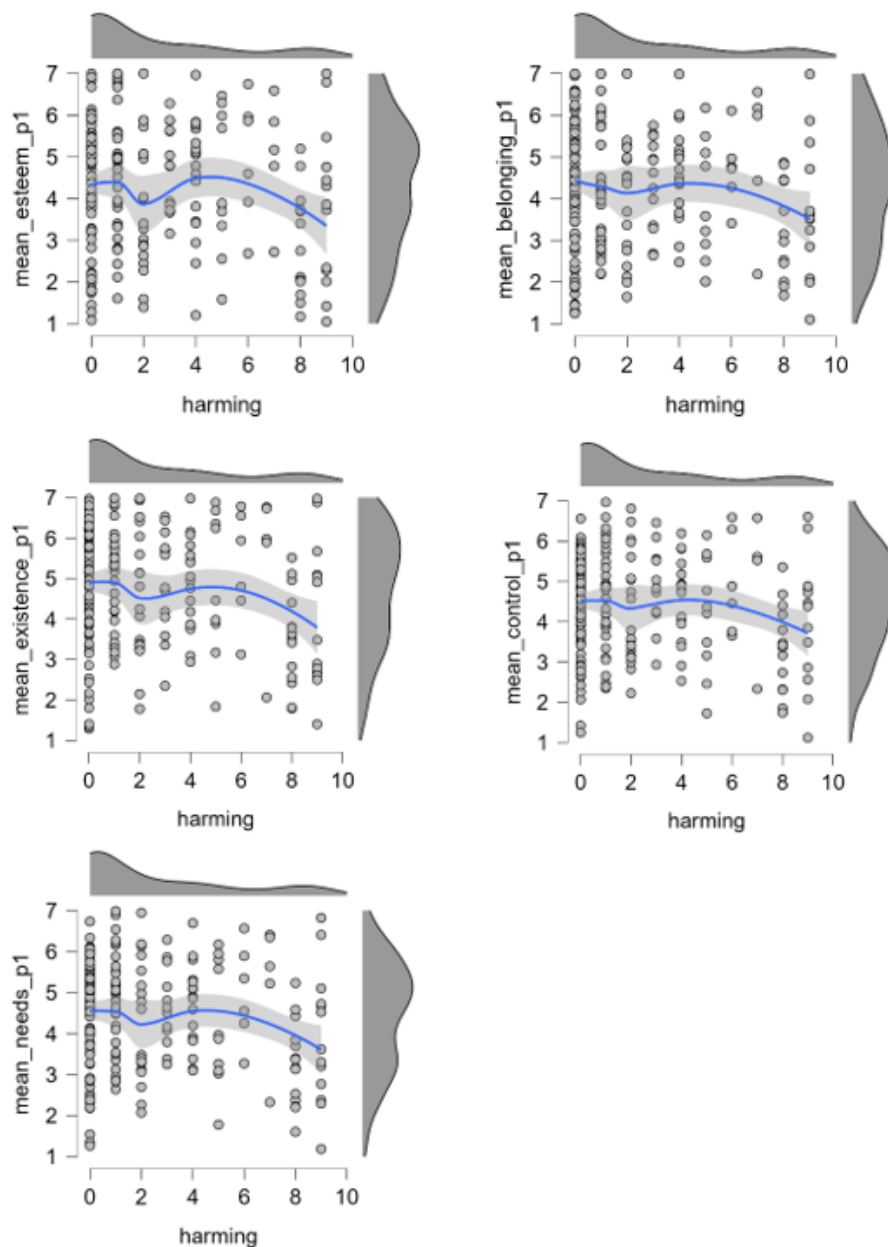
Table E1

Shapiro-Wilk Test for Multivariate Normality

<i>Shapiro-Wilk</i>	<i>p</i>
0.69	< .001

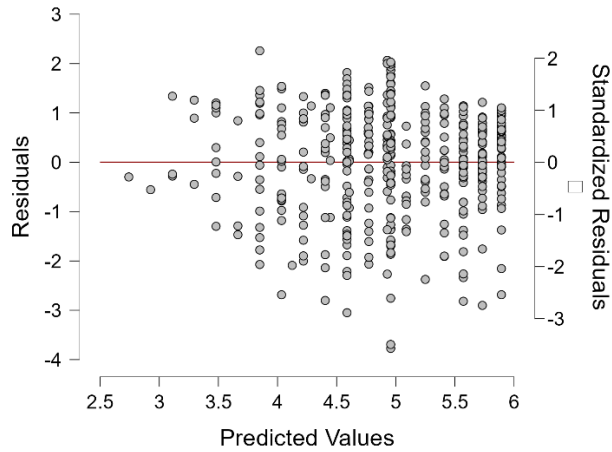
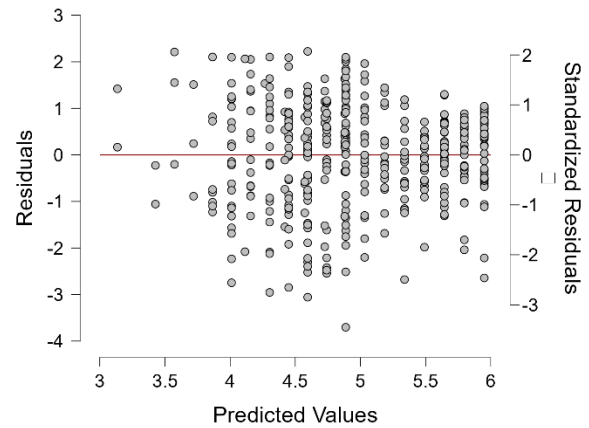
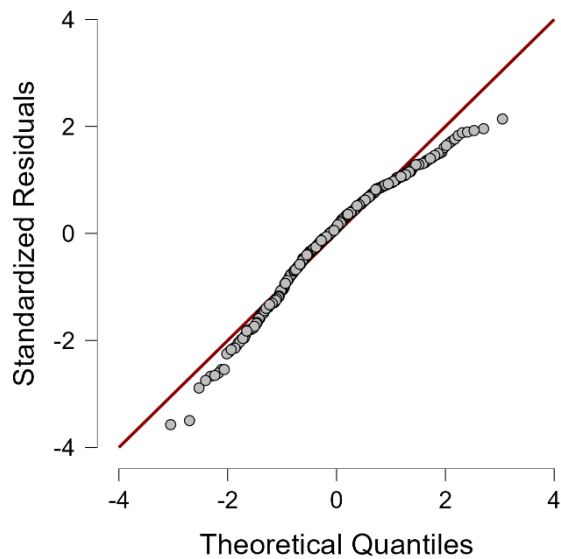
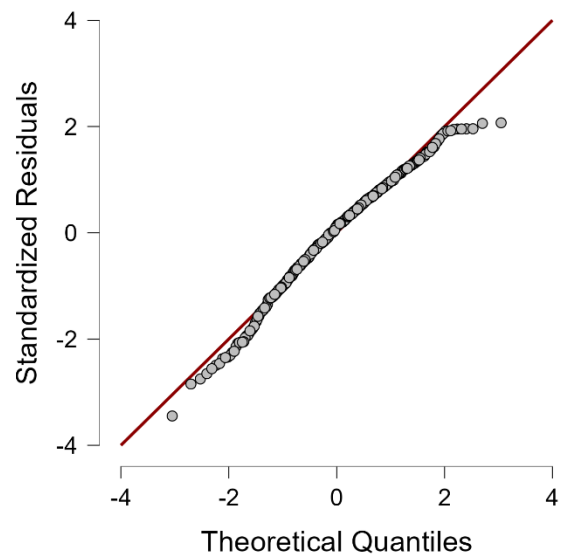
Figure E1

Scatter Plots



Appendix F

Figures F1 and F2 show no indication of violated assumptions for hypothesis 4a.

Figure F1*Conscientiousness**Agreeableness***Figure F2***Q-Q Plot Conscientiousness**Q-Q Plot Agreeableness*

Appendix G

Hypothesis 4b is tested with a linear regression on the DV ‘difference score mean needs’ and both conscientiousness and agreeableness. Figures G1 and G2 indicate violations of both linearity and normal distribution of residuals. Thus, we transformed the data of the DV into positive values by adding 2 and performed a square root transformation on those data (see Figures G3 and G4). However, no big improvements in the assumptions were shown. Therefore also outliers of the transformed ‘Mean Difference’ variable were determined (Figure G5) and removed, resulting in the graphs shown in G6 and G7. Tables G1 and G2 show the linear regression coefficients for hypothesis 4b.

Figure G1

Residual plots before transformation (agreeableness)

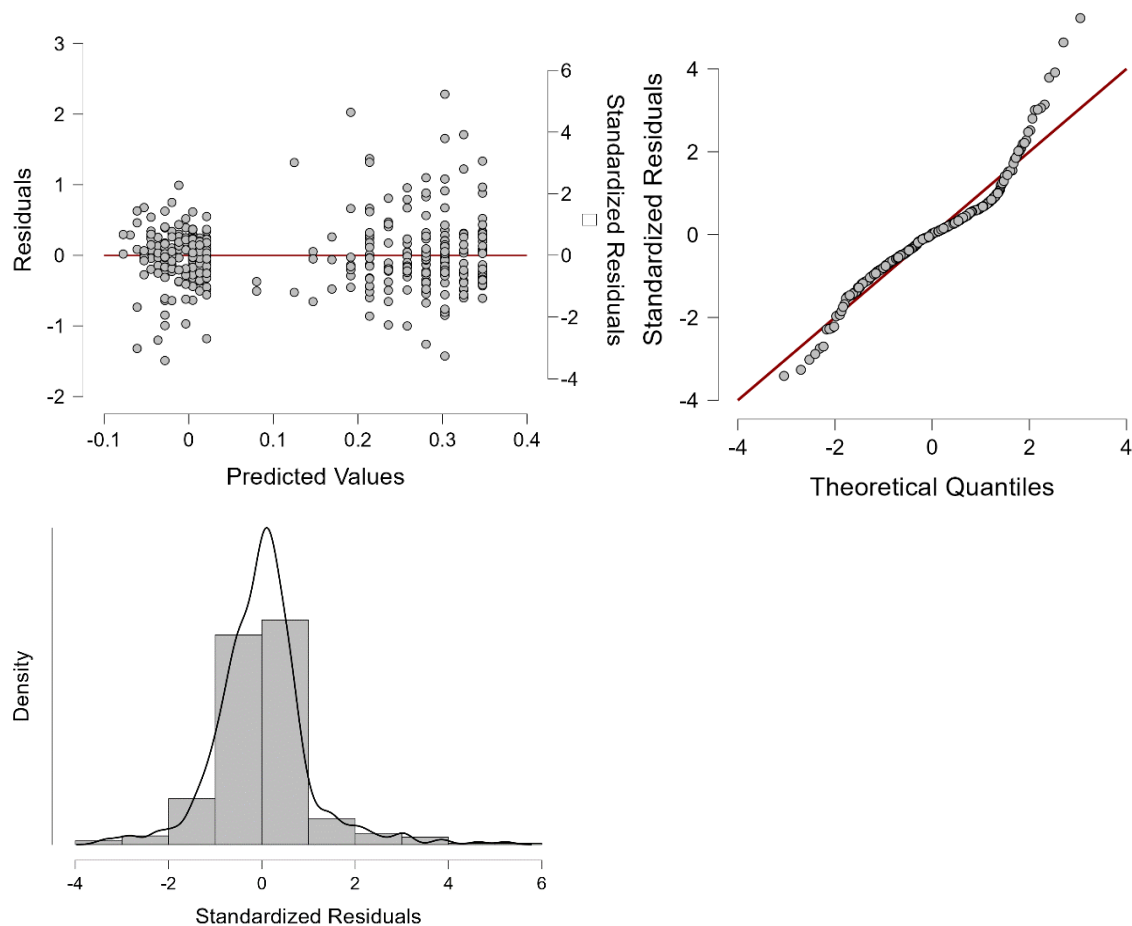


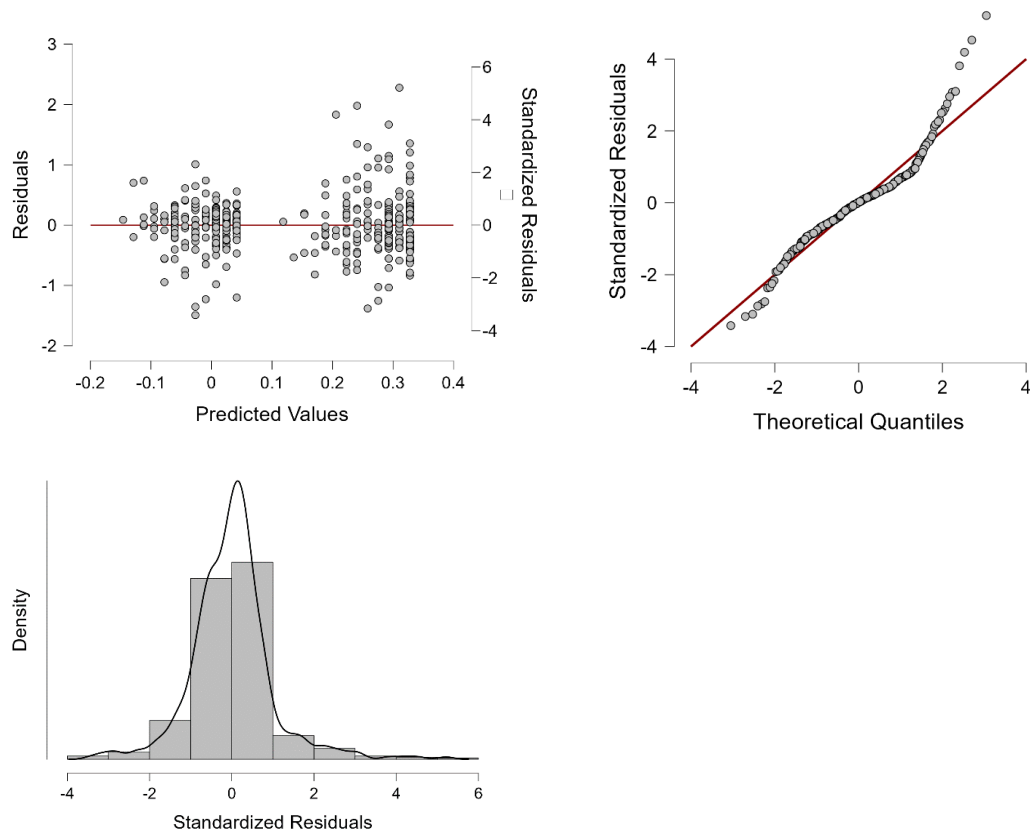
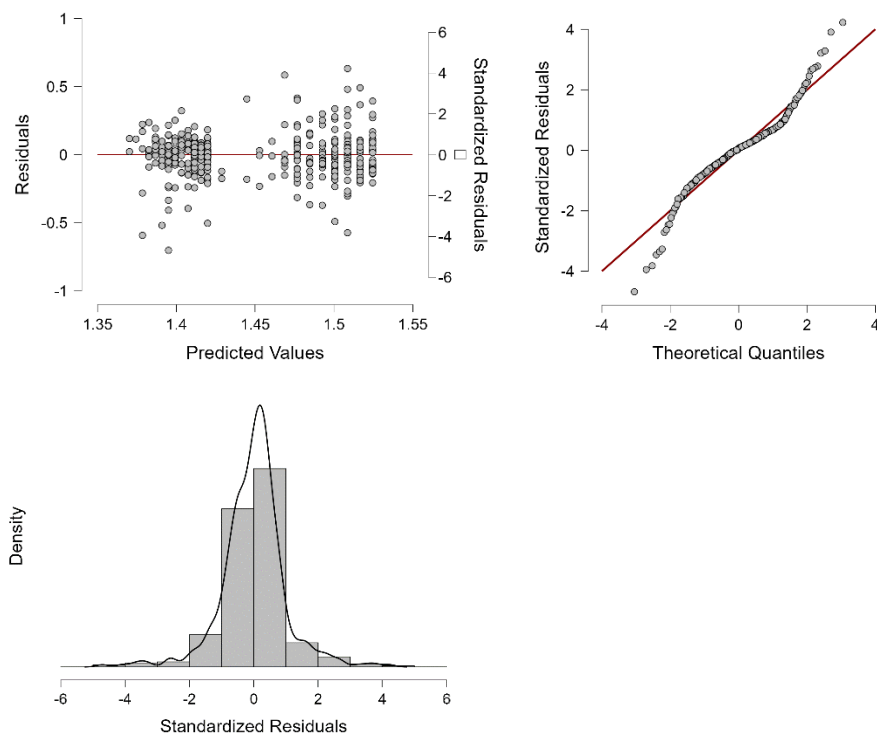
Figure G2*Residual plots before transformation (conscientiousness)***Figure G3***Residual plots after square root transformation (agreeableness)*

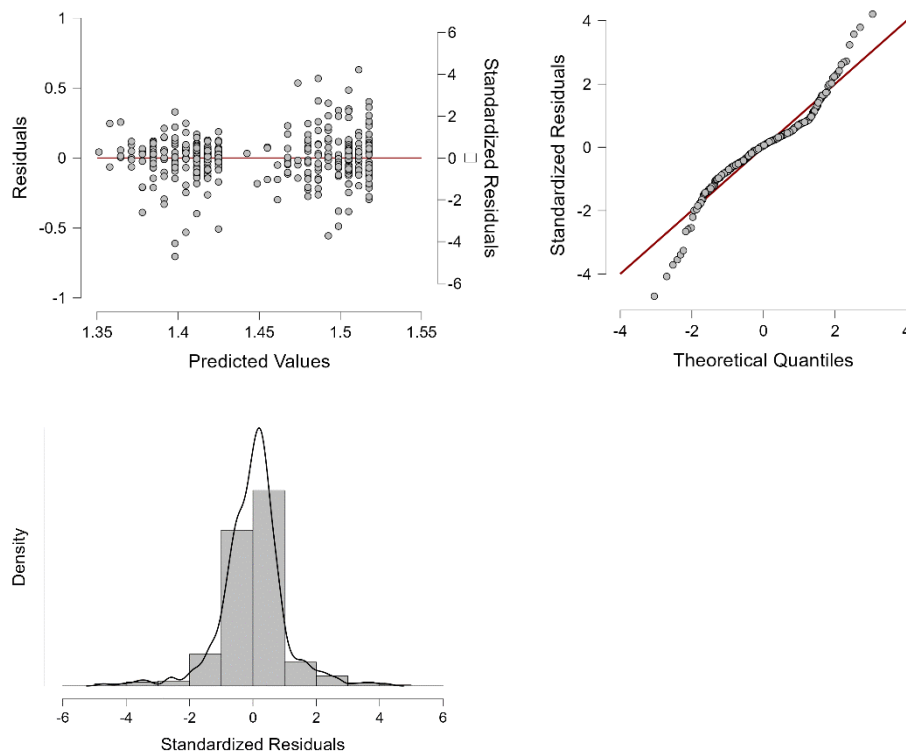
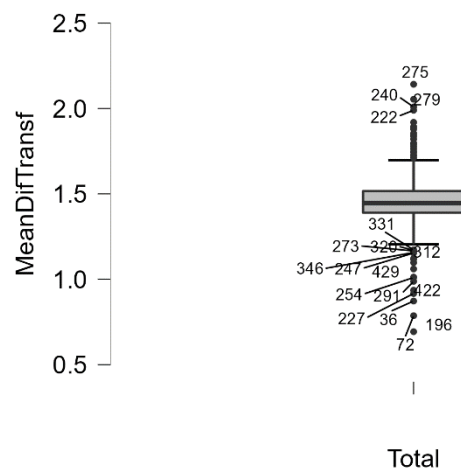
Figure G4*Residual plots after root square transformation (conscientiousness)***Figure G5***Boxplot before removing outliers*

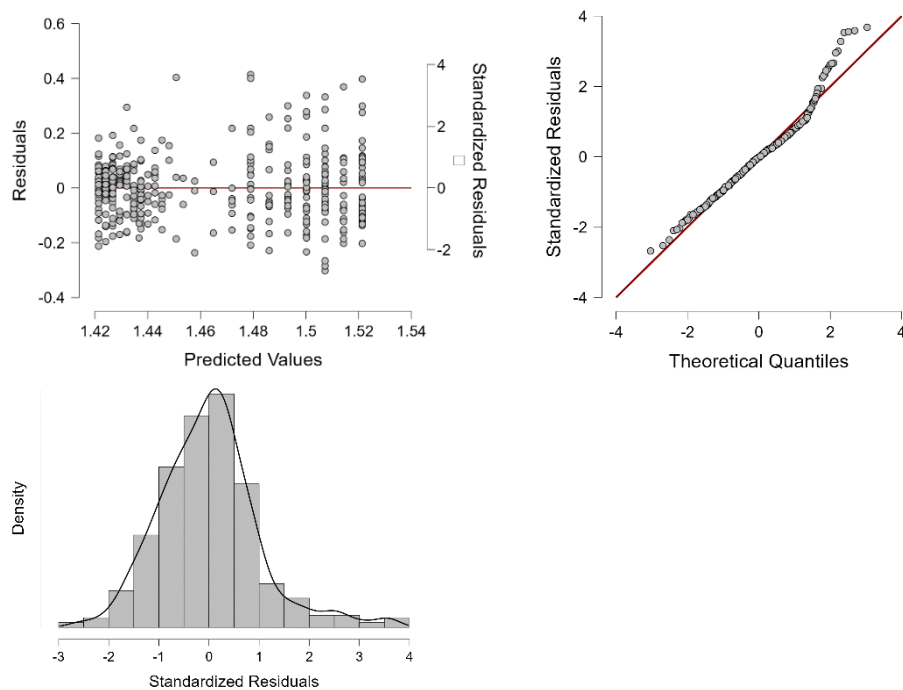
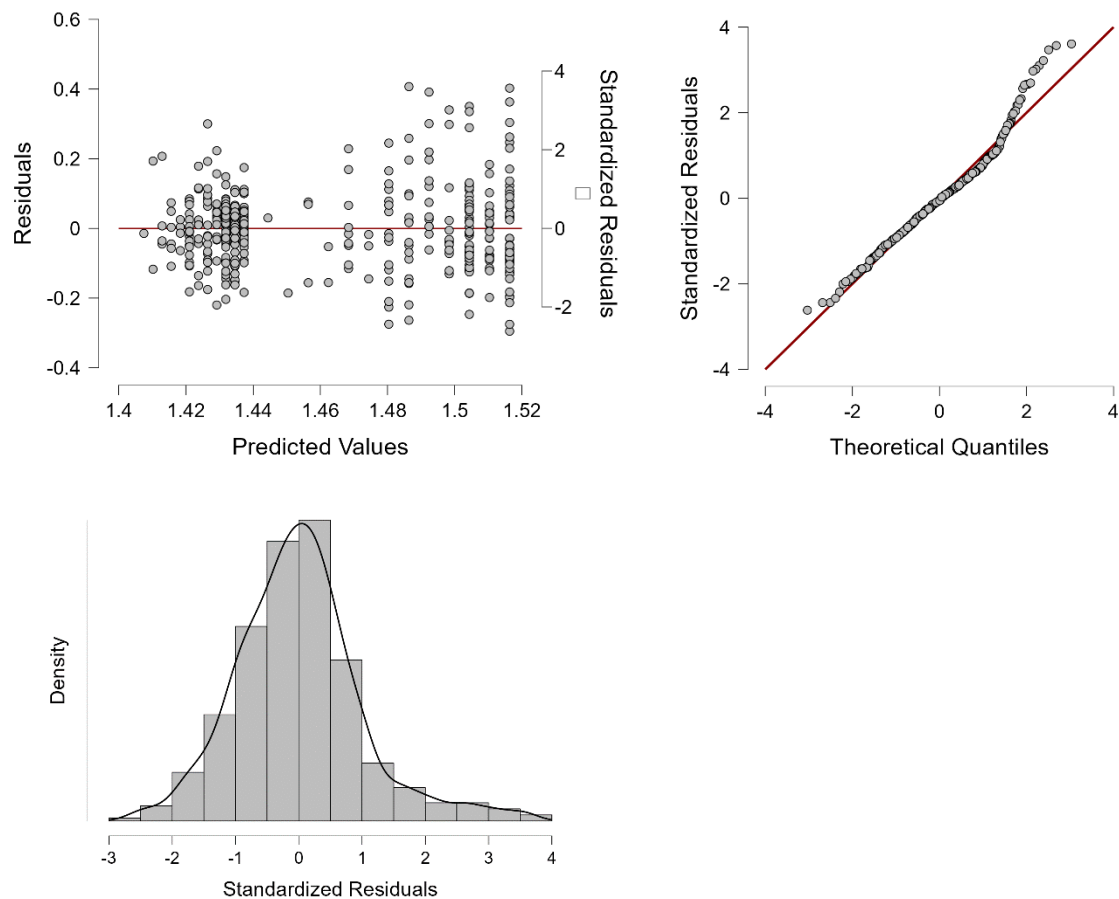
Figure G6*Residual plots after removing outliers (agreeableness)***Figure G7***Residual plots after removing outliers (conscientiousness)*

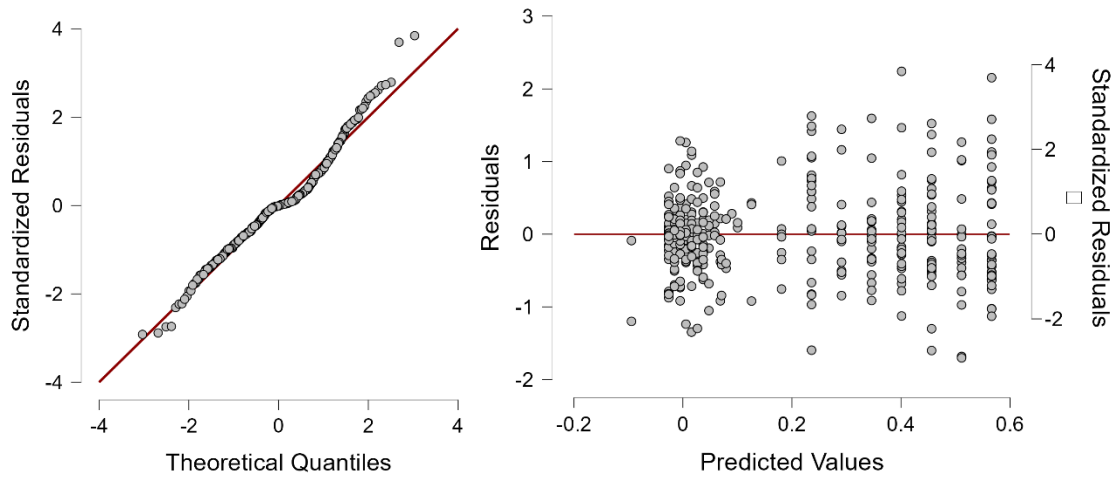
Table G1*Coefficients for hypothesis 4b*

Model		Unstandardized	SE	Standardized ^a	<i>t</i>	<i>p</i>
H ₀	(Intercept)	1.46	0.01		250.54	< .001
H ₁	(Intercept)	1.50	0.01		188.24	< .001
	ConscientiousnessCentered	0.01	0.01	0.132	2.04	0.04
	c (Inclusion)	-0.07	0.01		-6.27	< .001
	ConscientiousnessCentered * c (Inclusion)	-0.01	0.01		-0.77	0.44

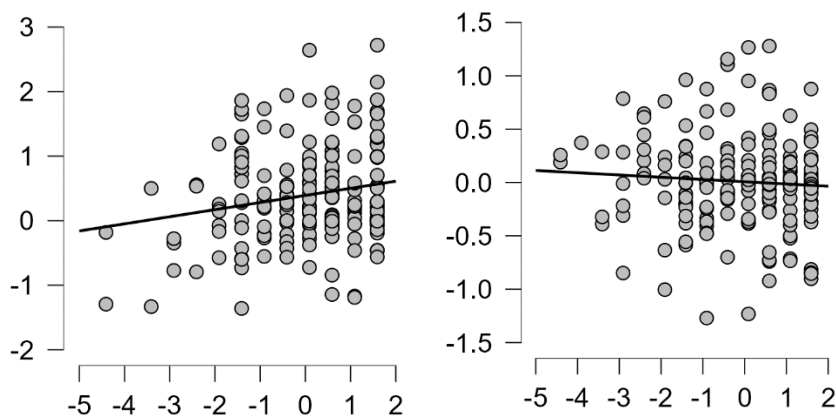
^a Standardized coefficients can only be computed for continuous predictors.**Table G2***Coefficients for hypothesis 4b*

Model		Unstandardized	SE	Standardized ^a	<i>t</i>	<i>p</i>
H ₀	(Intercept)	1.46	0.01		250.54	< .001
H ₁	(Intercept)	1.49	0.01		188.18	< .001
	AgreeablenessCentered	0.01	0.01	0.162	2.28	0.023
	c (Inclusion)	-0.07	0.01		-6.19	< .001
	AgreeablenessCentered * c (Inclusion)	-0.02	0.01		-2.36	0.019

^a Standardized coefficients can only be computed for continuous predictors.

Figure G8*Residual plots for agreeableness and difference score belonging*

Note. Assumption checks for linear regression on the difference score for belonging. Normality and linearity seem acceptable.

Figure G9*Correlation plot for Exclusion (left) and Inclusion (right)*

Note. The x-axis displays levels of agreeableness (centered) and the y-axis displays the difference score for belonging.

Table G3*Coefficients*

Model	Unstandardized	SE	Standardized ^a	t	p
H ₀ (Intercept)	0.20	0.03		6.48	< .001
H ₁ (Intercept)	0.39	0.04		9.49	< .001
AgreeablenessCentered	0.11	0.03	0.24	3.44	< .001
c (Inclusion)	-0.38	0.06		6.66	< .001
AgreeablenessCentered * c (Inclusion)	-0.13	0.04		3.07	.002

^a Standardized coefficients can only be computed for continuous predictors.

Table G4*Coefficients*

Model	Unstandardized	SE	Standardized ^a	t	p
H ₀ (Intercept)	2.51	0.15		16.94	< .001
H ₁ (Intercept)	2.50	0.21		11.76	< .001
AgreeablenessCentered	-0.17	0.17	-0.075	1.01	.31
c (Inclusion)	0.03	0.29		0.10	.92
AgreeablenessCentered * c (Inclusion)	0.12	0.22		0.55	.58

^a Standardized coefficients can only be computed for continuous predictors.