

**Ostracism and its Effects on Needs and Behavioral Responses: The Moderating Role of
Personality**

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Abstract

Ostracism, which means being ignored or excluded, is painful and threatens fundamental psychological needs. Research findings diverge on how people react behaviorally to ostracism. The temporal need threat model of ostracism provides a theoretical framework regarding how an individual reacts psychologically and behaviorally to ostracism. In this study, I investigated how personality may influence reactions to ostracism, focusing on the personality traits of conscientiousness and agreeableness. I hypothesized that particularly people high in those traits would perceive a threat to their psychological needs after being ostracized and consequently distinctively choose prosocial behavior as a strategy to restore threatened needs. We ostracized or included adults from the U.S. ($N = 449$) in a social media-like online environment. Ostracized participants reported a significantly lower need satisfaction than included participants. Higher scores on conscientiousness and agreeableness were associated with higher need satisfaction in the ostracized as well as included group. Participants had the opportunity to engage in pro- or antisocial behavior towards an ostensible other person in a puzzle task. Most participants behaved prosocially, irrespective of their personality traits and whether they were ostracized or not. Nevertheless, the need satisfaction of ostracized individuals increased significantly, albeit still remaining below the satisfaction levels of included participants. Our findings suggested that ostracism in the context of social interaction via the internet has detrimental psychological effects. These effects can eventually be mitigated. The role of personality in these processes requires further investigation.

Keywords: ostracism, needs, conscientiousness, agreeableness

Ostracism and its Effects on Needs and Behavioral Responses: The Moderating Role of Personality

Think back, if you will, to a situation in which you were meeting someone, perhaps a person you know well or somebody in the context of a new group of people. You reach out to greet the person opposite with a handshake or maybe with a more informal high-five. Your arm is now extended as you anticipate meeting the other person's hand in a mutual acknowledgment of each other's presence. But the moment of touching hands does not occur. It appears that the other person did not notice you, and you see your hand hovering there in the empty air. Can you recall such a situation? Although this might have been just a slight mishap, and without ill intent by the other person, one may feel uncomfortable in a scenario like this, perhaps even ignored or excluded. If this, ignoring or exclusion, happens deliberately, this is referred to as ostracism, which threatens fundamental psychological needs and lowers mood (Gerber & Wheeler, 2009; Hartgerink et al., 2015; Williams, 2009). Ostracism is a recurrent incident as people are likely to experience it about once a day (Nezlek et al., 2012). Moreover, the "social" pain people feel when being ostracized elicits activity in brain regions like the anterior cingulate cortex and the right ventral prefrontal cortex, which are also involved in the processing of physical pain and the regulation of distress responses to it (Eisenberger et al., 2003). Here, I deal with the question of how people react behaviorally and psychologically to ostracism and how personality moderates this relationship.

Behavioral Responses to Ostracism

Regarding behavioral responses to ostracism, research has indicated diverging findings. On the one hand, social exclusion or ostracism can increase antisocial behavior, as demonstrated by study participants who, after being ostracized, deny someone else getting a job and blast them with unpleasant sounds (Twenge et al., 2001), or allocate large amounts of

unpleasant hot sauce to someone who dislikes hot food (Warburton et al., 2006). On the other hand, researchers have demonstrated that ostracism can also lead to prosocial behavior, as indicated by participants conforming to the opinion of others in a perception task (Williams et al., 2000), awarding more money to ostensible other participants based on rated creativity (Weerdmeester & Lange, 2019), or working harder for their group (Williams & Sommer, 1997). Ren et al. (2016) found that individuals, particularly introverted ones, may also decide on another response option to ostracism, namely seeking solitude, or rather, moving away from the sources of ostracism and social interaction, hypothetically as a coping mechanism in dealing with the social pain. Fischer et al. (2020) saw moralizing as a suitable alternative to other behavioral responses to ostracism. The researchers argued moralizing could strengthen all basic needs threatened by ostracism while being socially acceptable and therefore have a higher expected utility, which their findings partially supported. The focus of interest in this study lies on pro- and antisocial behavioral responses to ostracism. Antisocial behavior will be defined here as analogous to aggression, that is, behavior intended to harm another person, while prosocial behavior is defined as behavior that is intended to help another person (Hewstone et al., 2015).

Theoretical Framework

Pro- and antisocial actions after an experience of ostracism are generally interpreted as an attempt to restore or fortify threatened psychological needs (Wesselmann et al., 2015). For example, the temporal need-threat model of ostracism by Williams (2009) argues that the threatened needs explain the link between ostracism and pro- and antisocial behavior. More specifically, the model postulates that after an incidence of ostracism, the victim goes through a reflexive stage, which is characterized by pain, anger, and sadness. Besides, four basic psychological needs are diminished: the inclusionary needs for belonging and self-esteem and the power/provocation needs for control and meaningful existence. A reflective stage follows

during which the victim, also called the target of ostracism, tries to grasp the ostracism incident and cope with its distressing consequences. The latter is handled by the target in ways of antisocial behavior, prosocial behavior, or withdrawal.

Concerning the reflective stage of the temporal need-threat model, several factors are thought to impact an individual's response to being ostracized. These factors include context, and individual differences (Ren et al., 2016; Williams, 2009), such as personality, a factor that will be of specific interest here. The type of threatened need is also thought to influence reactions to ostracism (Gerber & Wheeler, 2009; Wesselmann et al., 2015) and will be considered here. Inclusionary needs (belonging and self-esteem) should be strengthened by prosocial behavior, which favors re-inclusion. Power/provocation needs (control and meaningful existence) are more likely enhanced via antisocial behavior, which prompts acknowledgment. Whether these behavioral responses are elicited depends on how strongly the individual perceives their needs to be threatened. For instance, Warburton et al. (2006) demonstrated that after being ostracized, individuals who had the opportunity to regain their sense of control did not behave more antisocially than those who had experienced inclusion. Persons who were excluded and did not have the chance to satisfy their need for control, on the other hand, were significantly more antisocial. The needs to belong and to control are backed up by stronger empirical evidence than the needs for self-esteem and meaningful existence (Gerber & Wheeler, 2009). Moreover, if participants are confronted with the choice between anti-and prosocial responses to ostracism, they tend to prefer antisocial (control-related) options (Gerber and Wheeler, 2009).

Personality and Behavioral Responses to Ostracism

As mentioned above, in this paper, personality is of primary interest as a factor explaining whether people act pro- or antisocial after need threats posed by ostracism, with the temporal need-threat model as a general theoretical framework. Since personality defines

relatively enduring internal traits and mechanisms that influence how the environment is interacted with and adapted to (Larsen et al., 2017), it has the potential to inform us about the general tendency of how an individual will react to ostracism. The five-factor model of personality (Costa & McCrae, 1992) will be used for this purpose. It comprises the five underlying personality dimensions of agreeableness, conscientiousness, openness to experience, extraversion, and neuroticism. Two of these personality traits will be of particular interest here: conscientiousness, which encompasses being organized, reliable, planful, responsible, thorough, and efficient, and agreeableness, which includes being kind, trusting, generous, sympathetic, and forgiving (McCrae & John, 1992).

Yaakobi (2021) hypothesized that persons high in agreeableness should be more distressed by ostracism (than when included and compared to disagreeable individuals) because social interactions are of value to them. Similarly, he expected persons high in conscientiousness (vs. low conscientiousness or inclusion) to experience increased distress resulting from ostracism because they may consider it more deviant. Indeed, participants higher in conscientiousness and agreeableness showed lower need satisfaction and mood immediately after being ostracized and still after a delay of 15 minutes, those time periods meaning to represent the reflexive and reflective stages of the temporal need-threat model of ostracism (Williams, 2009).¹ Rudert et al. (2020) conducted a series of studies giving indications that low scores on conscientiousness and agreeableness in particular can increase the risk that an individual will be ostracized.² The findings suggested that persons low in those personality traits report more ostracism experiences and provoke increased ostracism intentions and acts by others. Moreover, a modeled face, designed to look like the stereotype of an ‘ostracizable’ person, was rated by participants to appear less conscientious and

¹ Neuroticism was also hypothesized to moderate the effect of ostracism on distress but it ultimately didn't, as neurotic individuals reported heightened distress both when ostracized and when included.

² Both in the findings and the theoretical reasoning of the researchers, the other three personality traits are more ambiguous in their relation to the proclivity of experiencing ostracism.

agreeable than a facial model of the ‘antiostracism’ stereotype. According to the researchers’ argumentation, if someone lacks conscientiousness, this person jeopardizes group performance and is more likely to be ostracized. Disagreeable persons may be ostracized because they disrupt cohesion and harmony within the group and violate group norms.

Current Study

The findings that people *low* in conscientiousness and agreeableness are most likely to be ostracized (Rudert et al., 2020), but people *high* in conscientiousness and agreeableness are psychologically most affected by ostracism (Yaakobi, 2021) give rise to the question of how people with those traits will then subsequently deal behaviorally with an ostracism incident. Although, Yaakobi (2021) provides evidence for the moderating role of personality regarding *psychological* reactions to ostracism (need satisfaction and mood), to my knowledge there is no research, or at least a lack thereof, on personality as a moderator of the ensuing *behavioral* responses to ostracism. The question that I want to address with this study deals with the influence of personality on whether an individual chooses antisocial or prosocial behavior in response to ostracism. In doing so, I want to focus on the personality traits of conscientiousness and agreeableness since they have received particular attention and provided the clearest indications in previous research. (Rudert et al., 2020; Yaakobi, 2021). Since these personality traits seem to predict nicely whether someone is likely to experience ostracism (Rudert et al., 2020) and how the person reacts psychologically or emotionally afterward (Yaakobi, 2021), the picture can be completed by providing information on how the ensuing behavioral reaction looks like and whether this improves need satisfaction.

In a large proportion of work in the research area of ostracism the focus is only on one type of behavioral need restoration strategy such that in some studies participants are only able to respond to ostracism in an antisocial way (see e.g., Warburton et al., 2006) and in other studies only in a prosocial way (see e.g., Weerdmeester & Lange, 2019). Although there

are examples of studies, which give their participants the opportunity to react to ostracism in more than one behavioral direction (see e.g., Fischer et al., 2020; Ren et al., 2016; Saleem et al., 2015), there is a call for more such research allowing participants to decide for differing behavioral reactions (Wesselmann et al., 2015), which we will take into account in our online experiment.

Hypotheses

In line with Yaakobi's (2021) work, I hypothesize that individuals high in agreeableness and conscientiousness perceive lower need satisfaction after being ostracized than individuals who are either low in those traits or who were included. Agreeable persons value social interaction and are forgiving and generous (McCrae & John, 1992) and thus may want to strengthen inclusionary needs. Therefore, I hypothesize that they act in a more prosocial manner after being ostracized than disagreeable individuals, who should behave more antisocial to fortify power/provocation needs. Conscientious people have ascribed the characteristics of behaving ethically and not being self-indulgent (McCrae & John, 1992). Therefore, my hypothesis here is that after an experience of ostracism higher conscientiousness leads to prosocial behavior, while lower conscientiousness leads to antisocial behavior. Finally, a hypothesis to investigate will be whether need restoration behavior in the form of pro- or antisocial acts leads to improved need satisfaction compared to the state directly after an ostracism incident.

Methods

Participants

We established the appropriate sample size of 401 participants 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 U.S. citizens were randomly sampled via the Prolific participant pool and compensated 1.95

pounds for participation. An additional twenty six participants were excluded, for reasons of straight lining ($n = 24$), double IP addresses ($n = 1$), and failed participant allocation to one of the conditions ($n = 1$).³ The final sample ($N = 449$) 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 occurring educational level was college graduate. The most selected annual income category was 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 by the Ethical Committee of Psychology from the Faculty of Behavioural and Social Sciences at the University of Groningen.

Procedure and Design

Relevant dependent variables were needs and need restoration behavior. Independent variables of interest were conscientiousness, agreeableness, and experimental condition/group. The survey flow (from the point after Ostracism Online) can be found in Appendix A.

Social Exclusion Manipulation

We adopted the Ostracism Online – social media-resembling paradigm by Wolf et al. (2014). We altered the avatars and one profile description, which we used in this task. Participants first had to create a personal profile, consisting of a name, a text about themselves, and a chosen avatar. Next, they were directed to the online environment where the participants looked at other profiles and had the opportunity to give them likes in the form of a thumbs up. The other profiles consisted of 10 ostensible other participants. The level of ostracism was manipulated by the number of likes a participant’s personal profile received. Participants were randomly assigned to one of two conditions. The excluded/ostracized participants received one like whereas the participants in the included/control condition received nine likes.

3 The failed participant allocation was due to a software error on the Qualtrics website.

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. Afterwards, as a manipulation check, 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 included 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 & Bühlmann, 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”). Answers were provided on a 7-point Likert scale (1 = not at all; 7= extremely). Reliability scores of the need scales were good (see Table 1 for reliability scores and descriptive statistics).

Table 1

Cronbach’s α and Descriptives for all Need Scales

Need Scales	Cronbach’s α	<i>M</i>	<i>SD</i>
Belonging P1	0.93	5.06	1.46
Belonging P2	0.93	5.21	1.33
Existence P1	0.91	5.24	1.35
Existence P2	0.91	5.37	1.28
Esteem P1	0.97	4.75	1.48
Esteem P2	0.97	4.87	1.44
Control P1	0.86	4.73	1.16
Control P2	0.87	4.89	1.17
Overall Needs P1	0.97	4.96	1.25
Overall Needs P2	0.97	5.09	1.22

Note. P1 stands for needs measurement before need restoration/at point one and P2 stands for needs measurement after need restoration/at point two.

Assessing Pro- and Antisocial Behavior

After engaging with the need-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 antisocial behavior. The idea behind this task is 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.” The participants were presented with nine pairs of puzzles, in which one puzzle was always very easy to solve and the other one very difficult to solve. 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.

Personality and Other Measures

Finally, participants completed a number of scales measuring prosocial intentions, sense of power, social dominance orientation, and personality (see Appendix A). Furthermore, 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. 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. "Dependable, self-disciplined" and "Disorganized, careless" for Conscientiousness and “Critical, quarrelsome” and “Sympathetic, warm” for agreeableness) ranging from 1: “disagree strongly” to 7: “agree strongly”. The conscientiousness sub-scale consisted of two

items and the correlation for those was $r = .74$. The scale had a mean of $M = 5.6$ and a standard deviation of $SD = 1.3$. Agreeableness was also assessed with two items and the correlation for those was $r = .62$. The scale had a mean of $M = 5.4$ and a standard deviation of $SD = 1.4$. 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 ($M = 1.1$, $SD = 0.3$), $t(445) = 16.16$, $p < .001$, $d = 1.53$. Therefore, manipulation checks indicated that our implementation of ostracism worked.

General Analysis and Hypotheses

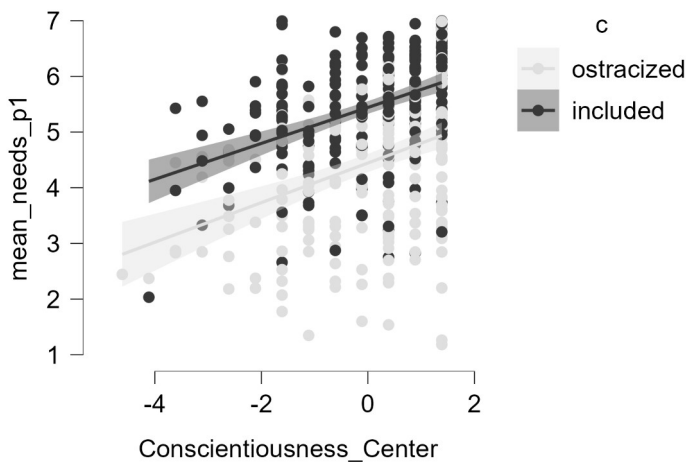
Regarding whether ostracism would result in a decrease in need satisfaction, we found that, in general, need satisfaction was significantly lower among ostracized participants than among included participants before the need restoration/at point one (P1) ($M = 4.4$, $SD = 1.3$, $M = 5.4$, $SD = 1.0$), $t(445) = -9.17$, $p < .001$, $d = -0.87$ as well as after the need restoration/at point two (P2) ($M = 4.7$, $SD = 1.3$, $M = 5.4$, $SD = 1.0$), $t(445) = -6.51$, $p < .001$, $d = -0.62$.

To investigate whether individuals with higher conscientiousness perceived lower need satisfaction after being ostracized than people with lower conscientiousness, a linear regression was conducted to predict need satisfaction at P1 based on conscientiousness and experimental condition. Conscientiousness was a centered mean composite variable. A Durbin-Watson test confirmed independence of residual errors ($d = 1.96$). Residual plots showed homoscedasticity and normality of the residuals (see Appendix B). The overall model was significant, $F(3, 443) = 58.99$, $p < .001$, with an adjusted R^2 of .28. Participants' predicted

need satisfaction at P1 was equal to $4.94 + 0.34 (\text{CONSCIENTIOUSNESS}) - 0.50 (\text{CONDITION}) + 0.02 (\text{CONSCIENTIOUSNESS} * \text{CONDITION})$, where condition was coded as 0 = ostracized, 1 = included. Thus, for each one unit of increase in conscientiousness, need satisfaction increased by 0.34 points, illustrated in Figure 1. This contradicts my hypothesis that people with higher conscientiousness show lower need satisfaction. Both conscientiousness and condition were significant predictors of need satisfaction ($p < .001$). However, the interaction term of conscientiousness*condition was non-significant ($p = .67$). Therefore, we found no evidence that the effect of conscientiousness on need satisfaction at P1 was influenced by whether participants were included or excluded. This is also not in line with my hypothesis.

Figure 1

Scatter Plot of Need Satisfaction at P1 against Conscientiousness per Experimental Group

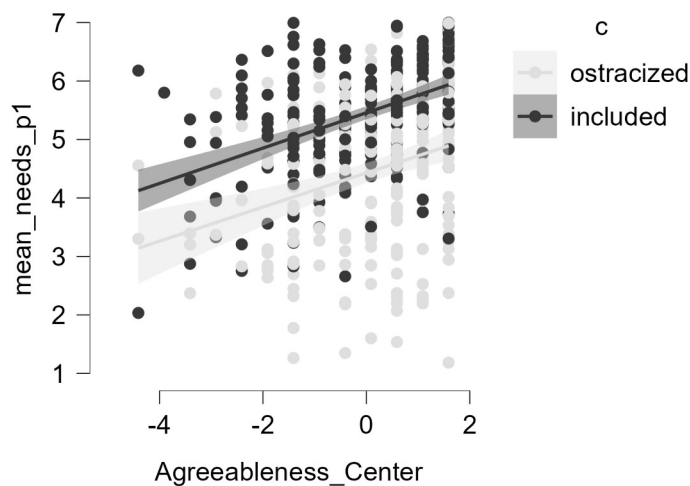


To examine whether individuals with higher agreeableness perceived lower need satisfaction after being ostracized than people with lower agreeableness, a linear regression was conducted to predict need satisfaction at P1 based on agreeableness and experimental condition. Agreeableness was a centered mean composite variable. Independence of residual errors was confirmed by a Durbin-Watson test ($d = 1.91$). Residual plots showed homoscedasticity and normality of the residuals (see Appendix C). The overall model was

significant, $F(3, 443) = 53.32, p < .001$, with an adjusted R^2 of .26. Participants' predicted need satisfaction was equal to $4.94 + 0.30 (\text{AGREEABLENESS}) - 0.51 (\text{CONDITION}) - 0.01 (\text{AGREEABLENESS} * \text{CONDITION})$, where condition was coded as 0 = ostracized, 1 = included. Thus, for each one unit of increase of agreeableness, need satisfaction increased by 0.30 points, illustrated in Figure 2. This contradicts my hypothesis that increased agreeableness would correspond with decreased need satisfaction. Both agreeableness and condition were significant predictors of need satisfaction ($p < .001$). However, the interaction term of agreeableness*condition was non-significant ($p = .89$). Therefore, we found no evidence that the effect of agreeableness on need satisfaction at P1 was influenced by whether participants were included or excluded. This is also not in line with my hypothesis.

Figure 2

Scatter Plot of Need Satisfaction at P1 against Agreeableness per Experimental Group



To address the hypothesis that agreeable and conscientious participants would act in a more prosocial manner after being ostracized than participants low in those traits, a linear regression was not appropriate because residual plots indicated violations of the assumptions of homoscedasticity and normality of the residuals (see Appendix D). However, independence of residual errors was confirmed by a Durbin-Watson test ($d = 1.91$). Therefore, a logistic regression was conducted. The binary dependent variable regarded the participants' prosocial

response and was coded with 0 = non-prosocial response or less than six easy puzzles chosen, 1 = prosocial response or at least six easy puzzles chosen. Conscientiousness, agreeableness (both centered), and experimental condition served as the predictor variables. The model was not statistically significant, $\chi^2(441, N = 447) = 6.05, p = 0.30$. The model explained between 1.3 % (Cox & Snell R^2) and 1.9% (Nagelkerke R^2) of the variance in the dependent variable and correctly classified 65.5% of cases. As shown in Table 2, none of the predictor variables significantly contributed to the model.⁴

Table 2***Logistic Regression Predicting the Likelihood of a Prosocial Response***

	Estimate	Standard Error	Odds Ratio	z	Wald Test			95% Confidence interval	
					Wald Statistic	df	p	Lower bound	Upper bound
(Intercept)	0.655	0.101	1.925	6.508	42.359	1	< .001	0.458	0.852
c (1)	-0.059	0.101	0.943	-0.582	0.338	1	0.561	-0.256	0.139
Agreeableness_Center	0.068	0.081	1.071	0.847	0.717	1	0.397	-0.090	0.226
Conscientiousness_Center	-0.166	0.086	0.847	-1.929	3.722	1	0.054	-0.335	0.003
c (1) *									
Agreeableness_Center	0.124	0.081	1.132	1.539	2.367	1	0.124	-0.034	0.282
c (1) *									
Conscientiousness_Center	-0.007	0.086	0.993	-0.084	0.007	1	0.933	-0.176	0.162

Note. ProResponse level 'Pro' coded as class 1.

⁴ The agreeableness odds ratio of 1.07 suggests that for every one unit increase in agreeableness, participants were 1.07 times more likely to respond prosocially. The conscientiousness odds ratio of 0.85 suggests that for every one unit increase in conscientiousness, participants were 0.85 times less likely to respond prosocially.

The following proportions further illustrate that conscientious and agreeable individuals did not act more prosocial than other participants and that all groups in the sample acted quite similar in the puzzle task. A prosocial response was represented by choosing at least six easy puzzles in the puzzle task. Choosing at least six difficult puzzles was indicative of an antisocial response. Considering all participants, 65.8% had a prosocial response, while 18.8% had an antisocial response. Regarding participants lower in agreeableness, 66.1% responded prosocially and 19.0% responded antisocially. Concerning participants higher in agreeableness, 65.6% had a prosocial response and 18.7% had an antisocial response. Regarding participants lower in conscientiousness, 68.5% responded prosocially and 15.2% responded antisocially. Concerning participants higher in conscientiousness, 63.9% had a prosocial response and 21.3% had an antisocial response.

To address the hypothesis that need satisfaction should increase after ostracized participants engaged in the puzzle task (need restoration behavior), an analysis of variance (ANOVA) with the need change score of P2 minus P1 as a dependent variable was computed. The assumption of Normality was checked with a Q-Q plot and no gross deviations were noted (see Appendix E). However, Levene's test was significant ($p < .001$), indicating that the assumption of homogeneity of variance was violated. Therefore, a Welch correction was used. There was a significant difference in the need change score between the ostracized and the included group $F(1, 358.62) = 44.52, p < .001, \eta^2 = 0.09$. Games-Howell post hoc testing revealed a significant difference in the need change score ($MD = 0.3$), $t(358.62) = 6.67, p < .001$, between condition groups, with ostracized participants having a greater and positive need change from P1 to P2 ($M = 0.3, SD = 0.5$) compared to included participants, who had virtually no change in need satisfaction ($M = -0.0, SD = 0.3$). However, the need change score did not correlate significantly with prosocial behavior ($r = .04, p = .394$), nor with antisocial behavior ($r = -.09, p = .072$). This suggests that while ostracized participants showed

increased need satisfaction over time, there was no evidence that the need restoration behavior contributed to this effect.

Discussion

One goal I had with this study was to investigate the psychological reaction, in the form of need satisfaction, to ostracism. A second aim was to examine the behavioral reactions to ostracism in the form of pro-and antisocial behavior. Moreover, I inspected how the personality traits of conscientiousness and agreeableness moderate these reactions to ostracism. I hypothesized that, after an incident of ostracism, higher levels of conscientiousness and agreeableness would lead to lower need satisfaction. Not supporting that hypothesis, I found that higher scores on those personality traits were associated with higher need satisfaction in the context of ostracism as well as inclusion. I further hypothesized that conscientiousness and agreeableness would lead to more prosocial need restoration behavior. Contradicting that hypothesis I found that conscientious and agreeable participants did not act more prosocial than other participants. Finally, I hypothesized that need restoration behavior would improve need satisfaction. Indeed, there was an increase of the need satisfaction of ostracized participants. There was no evidence, however that this increase was due to the restoration behavior. Nevertheless, the ostracism manipulation worked and expected patterns of need satisfaction changes were observed.

Part of my first hypothesis was that ostracized agreeable and conscientious individuals would have lower need satisfaction than included participants. This was supported by the results. Also part of my first hypothesis was that, among ostracized participants, agreeable persons would have a lower need satisfaction than those who are less agreeable. The rationale behind this was that agreeable persons would be more affected by ostracism because social interaction may be more important to them than to disagreeable individuals. Conscientious persons may deem ostracism more deviant than others. Hence, I hypothesized that individuals

higher in conscientiousness would perceive lower need satisfaction after being ostracized than participants lower in conscientiousness. The results showed, however, that higher levels of conscientiousness and agreeableness were associated with higher need satisfaction both in the ostracized and in the included group. Furthermore, the non-significant interaction between experimental condition and agreeableness or conscientiousness respectively, provided no evidence that the influence of these personality traits on need satisfaction was influenced by whether participant were ostracized or included. Hence, the hypothesis that, after being ostracized, participants higher in conscientiousness and agreeableness would have lower need satisfaction than participants low in those traits did not hold. This contradicts the findings of Yaakobi (2021), who had similar hypotheses. However, Yaakobi had his participants complete the Big-Five Inventory with its 44 items three weeks before the experiment. In contrast, we used the TIPI, which includes only 10 items, is somewhat inferior to lengthier widely used personality measures (Gosling et al., 2003), and was completed by our participants in the course of the experiment itself. Nevertheless, there is currently a relative paucity of research linking personality to ostracism, and it will be interesting to see what pattern of findings other studies bring forth in the future.

Because ethical behavior and not being self-indulgent are characteristics of conscientious people, while forgiveness and generosity are qualities of agreeable persons, I hypothesized that people high in those personality traits would behave more prosocial after ostracism than participants low in those traits. A logistic regression indicated that neither the experimental condition nor conscientiousness nor agreeableness nor their interaction significantly predicted prosocial or non-prosocial behavior.⁵⁶ Therefore, this hypothesis was

⁵ The odds ratio for conscientiousness even suggested a slight decrease of the likelihood for prosocial behavior for every one unit increase in conscientiousness. But like the other effects, this was non-significant.

⁶ Further investigation showed that the whole sample, irrespective of groups, acted prosocial rather than antisocial. The proportions were always very similar: Whether highly conscientious/agreeable or not, whether included or ostracized, between 65 and 69 % of participants acted prosocially, while 19 to 21 % behaved antisocially.

not supported. These findings also challenge the inclusionary versus power/provocation needs account of the temporal need threat model. This idea states that certain types of threatened needs can increase the likelihood of either pro- or antisocial behavior. However, in our study, the likelihood of prosocial or antisocial behavior did not change when participants' needs were threatened. There are examples of other studies that also could not establish the link between threatened need type and pro- or antisocial behavior in the direction predicted by the temporal need-threat model (see Fischer et al., 2020).

The question remains why the vast majority of participants in this study decided to act prosocially. Perhaps, we overemphasized the opportunity to make another person win money in the introduction to the puzzle task, while not pointing out that choosing difficult puzzles would actively prevent that from happening. This may have led participants to believe that sending easy puzzles, that is acting prosocially, was the more efficacious (need restoration) behavior. Thus, in a future study either rephrasing the introduction to the puzzle task or even adding the narrative that sending difficult puzzles can make another person lose money may entice more participants into behaving 'antisocially'.

In line with the temporal need threat model, my last hypothesis was that need restoration behavior, in the form of pro- or antisocial behavior during the puzzle task, would result in improved need satisfaction of ostracized participants compared to their need satisfaction before the puzzle task. Indeed, there was a positive change in the need satisfaction of ostracized participants, while the need satisfaction of included participants did not change between the two points of measurement in our study. Interestingly, although the need satisfaction of ostracized participants did increase, it was still significantly below that of included participants after the puzzle task. This suggests that ostracism, as we implemented it, had a considerable impact on the psychological needs of the affected participants. This is in line with previous research illustrating the effects of cyberostracism (ostracism over the

internet) (see e.g., Galbavá et al., 2021; Williams et al., 2000). There was no significant correlation, however, between the need change score and prosocial or antisocial behavior. This implies that it cannot be concluded that the increase in need satisfaction of ostracized participants was due to their need restoration behavior. Perhaps need satisfaction improved just because some time had passed since the ostracism incident, which participants might have relativized after a while. Therefore, this hypothesis can be supported in part only.

Limitations

Our study took a novel approach regarding the constellation of components in ostracism research. We used a fairly ecologically valid manipulation of ostracism, representing cyberostracism in a social media type of environment, and gave our participants the opportunity to restore their threatened needs in a new puzzle task that allows for pro- as well as antisocial behavior. This is a relatively thorough approach to studying ostracism since many other studies focus either on need satisfaction or need compensation behavior, which is often only assessed in one direction (either prosocial or antisocial behavior). Nevertheless, some limitations regarding our study have to be considered. Next to the limitations discussed earlier regarding instructions for the puzzle task and the personality measure, two other limitations come to mind. Firstly, we only gave our participants the option to behave prosocially or antisocially. Research shows that people may want to resort to other behavioral responses to ostracism as well, such as seeking solitude (Ren et al., 2016), or moralizing (Fischer et al., 2020). However, implementing all these behavioral options or even more in a methodologically solid study would probably be extraordinarily complicated. A lot of research focuses on one or two behavioral options. This has the advantage of methodological clarity but comes at the cost of restricting participants in their behavioral options. Another limitation might have been that we did not include a ‘neutral’ group next to groups of ostracized and included participants. In the Ostracism Online part of our study ostracized

participants received a below average amount of likes, while our included participants received an above average number of likes. There would have been the option to include a third group with an average amount of likes like Wolf et al. (2014) did in their study. Another consideration we had was to include a neutral group without the task to like other profiles and which would receive no likes itself, but would have just an observant role in the online environment. Ultimately, we did not perceive a great benefit in including additional groups to the two we ended up using in our study. Besides, Ostracism Online has worked and been used with just two groups in previous research as well (Galbavá et al., 2021).

Theoretical and Practical Implications

The idea that need satisfaction diminishes after being ostracized and that, consequently, a type of need restoration behavior is evoked that is influenced by context and personal differences is encapsulated in the temporal need-threat model of ostracism (Williams, 2009). Our findings were in line with the temporal need threat model of ostracism in that ostracism did lead to decreased need satisfaction. Moreover, need satisfaction did improve for ostracized participants, although the reason for that is not entirely clear and did not seem to be linked to need restoration behavior directly. The model's account of the relationship between inclusionary and power/provocation needs and need restoration behavior was not supported. As previous research has also found inconsistencies regarding the temporal need threat model (see e.g., Hartgerink et al., 2015), there may be a need for refinement or adjustment of the model. Most participants in our sample opted for prosocial behavior after being ostracized (and when included), whereas other research has indicated a tendency of preference for antisocial behavioral responses to ostracism if given the choice between pro- and antisocial responses (Gerber & Wheeler, 2009). As discussed above, the tendency of choice for pro- or antisocial behavior in ostracism experiments may be influenced by how palatable either of these behavioral options appears to the participants in relation to

the other one. Ideally, both behavioral options should seem similarly attractive in studies like ours.

Although judging from our results, the role of personality was ambiguous in its relationship to ostracism, our results clearly indicate that cyberostracism has a detrimental effect on the psychological needs for belonging, self-esteem, control, and meaningful existence. This illustrates that ostracism cannot only be a challenge in face-to-face social interactions but also in the context of the internet, particularly concerning social media platforms. Our study, as well as most studies with respect to ostracism, examined an adult sample. However, considering that children and adolescents are increasingly involved with digital technology and the internet as well, it might be an interesting objective of future research to investigate the prevalence and effects of (cyber)ostracism on underage individuals.

Conclusions

Taken together, the results of our study show that ostracism in an online context did decrease psychological needs. A second measurement revealed that the need satisfaction of ostracized individuals had improved but was still below that of included participants. This improvement in need satisfaction could not be directly ascribed to prosocial or antisocial need restoration behavior. Most participants, whether ostracized or included, chose prosocial behavior in our puzzle task. Our results partially supported the temporal need threat model of ostracism. Regarding personality, it was not the participants higher in conscientiousness and agreeableness who had lower need satisfaction, but those who were lower in those personality traits. Moreover, participants high in agreeableness and conscientiousness did not differ from other participants in their decisions regarding pro or antisocial behavior in the puzzle task after ostracism. It seems clear that ostracism has a detrimental psychological effect whose hurtful consequences can be alleviated. The behavioral reaction to ostracism is influenced by many factors, which require further investigation, and personality is one of them.

References

- Costa, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and Individual Differences, 13*(6), 653–665. [https://doi.org/10.1016/0191-8869\(92\)90236-I](https://doi.org/10.1016/0191-8869(92)90236-I)
- Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does Rejection Hurt? An fMRI Study of Social Exclusion. *Science, 302*(5643), 290–292.
<https://doi.org/10.1126/science.1089134>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175–191. <https://doi.org/10.3758/BF03193146>
- Fischer, M., Kuppens, P., & Moors, A. (2020). When socially excluded people prefer moralizing to anti- and prosocial behavior: Support for a goal-directed account. *Motivation and Emotion. <https://doi.org/10.1007/s11031-020-09826-6>*
- Galbavá, S., Machackova, H., & Dedkova, L. (2021). Cyberostracism: Emotional and behavioral consequences in social media interactions. *Comunicar, 29*, 9–20.
<https://doi.org/10.3916/C67-2021-01>
- Gerber, J., & Wheeler, L. (2009). On being rejected: A meta-analysis of experimental research on rejection. *Perspectives on Psychological Science, 4*(5), 468–488.
<https://doi.org/10.1111/j.1745-6924.2009.01158.x>
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*(6), 504–528.
[https://doi.org/10.1016/S0092-6566\(03\)00046-1](https://doi.org/10.1016/S0092-6566(03)00046-1)
- Hartgerink, C. H. J., van Beest, I., Wicherts, J. M., & Williams, K. D. (2015). The ordinal effects of ostracism: A meta-analysis of 120 cyberball studies. *PLoS ONE, 10*(5).
<https://doi.org/10.1371/journal.pone.0127002>
- Hewstone, M., Stroebe, W., & Jonas, K. (2015). *An Introduction to Social Psychology* 6

- Larsen, R., Buss, D., Wismeijer, A., & Song, J. (2017). *Personality Psychology Domains of Knowledge about Human Nature*
- Leander, N. P., & Chartrand, T. L. (2017). On thwarted goals and displaced aggression: A compensatory competence model. *Journal of Experimental Social Psychology, 72*, 88–100. <https://doi.org/10.1016/j.jesp.2017.04.010>
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality, 60*(2), 175–215. <https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>
- Nezlek, J. B., Wesselmann, E. D., Wheeler, L., & Williams, K. D. (2012). Ostracism in everyday life. *Group Dynamics: Theory, Research, and Practice, 16*(2), 91–104. <https://doi.org/10.1037/a0028029>
- Ren, D., Wesselmann, E., & Williams, K. D. (2016). Evidence for Another Response to Ostracism: Solitude Seeking. *Social Psychological and Personality Science, 7*(3), 204–212. <https://doi.org/10.1177/1948550615616169>
- Rudert, S. C., Keller, M. D., Hales, A. H., Walker, M., & Greifeneder, R. (2020). Who gets ostracized? A personality perspective on risk and protective factors of ostracism. *Journal of Personality and Social Psychology, 118*(6), 1247–1268. <https://doi.org/10.1037/pspp0000271>
- Saleem, M., Anderson, C. A., & Barlett, C. P. (2015). Assessing Helping and Hurting Behaviors Through the Tangram Help/Hurt Task. *Personality and Social Psychology Bulletin, 41*(10), 1345–1362. <https://doi.org/10.1177/0146167215594348>
- Stekhoven, D. J. & Bühlmann, P. (2012). MissForest—non-parametric missing value imputation for mixed-type data, *Bioinformatics, 28*(1), 112–118. <https://doi.org/10.1093/bioinformatics/btr597>

- Twenge, J. M., Baumeister, R. F., Tice, D. M., & Stucke, T. S. (2001). If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology*, *81*(6), 1058–1069. <https://doi.org/10.1037/0022-3514.81.6.1058>
- van Beest, I., & Williams, K. D. (2006). When inclusion costs and ostracism pays, ostracism still hurts. *Journal of Personality and Social Psychology*, *91*(5), 918–928. <https://doi.org/10.1037/0022-3514.91.5.918>
- Warburton, W. A., Williams, K. D., & Cairns, D. R. (2006). When ostracism leads to aggression: The moderating effects of control deprivation. *Journal of Experimental Social Psychology*, *42*(2), 213–220. <https://doi.org/10.1016/j.jesp.2005.03.005>
- Weerdmeester, J., & Lange, W.-G. (2019). Social Anxiety and Pro-social Behavior Following Varying Degrees of Rejection: Piloting a New Experimental Paradigm. *Frontiers in Psychology*, *10*. <https://www.frontiersin.org/article/10.3389/fpsyg.2019.01325>
- Wesselmann, E. D., Ren, D., & Williams, K. D. (2015). Motivations for responses to ostracism. *Frontiers in Psychology*, *6*. <https://www.frontiersin.org/article/10.3389/fpsyg.2015.00040>
- Williams, K. D. (2009). Chapter 6 Ostracism: A Temporal Need-Threat Model. In *Advances in Experimental Social Psychology* (Vol. 41, pp. 275–314). Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)00406-1](https://doi.org/10.1016/S0065-2601(08)00406-1)
- Williams, K. D., Cheung, C. K. T., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, *79*(5), 748–762. <https://doi.org/10.1037/0022-3514.79.5.748>
- Williams, K. D., & Sommer, K. L. (1997). Social Ostracism by Coworkers: Does Rejection Lead to Loafing or Compensation? *Personality and Social Psychology Bulletin*, *23*(7), 693–706. <https://doi.org/10.1177/0146167297237003>

Wolf, W., Levordashka, A., Ruff, J. R., Kraaijeveld, S., Lueckmann, J.-M., & Williams, K. D.

(2015). Ostracism Online: A social media ostracism paradigm. *Behavior Research Methods*, 47(2), 361–373. <https://doi.org/10.3758/s13428-014-0475-x>

Yaakobi, E. (2021). Personality as a moderator of immediate and delayed ostracism distress.

British Journal of Social Psychology. <https://doi.org/10.1111/bjso.12484>

Appendix A

Survey Flow Including Instructions and Scales From the Point After Participants had Completed Ostracism Online

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.

Table A1

Manipulation Check for Ostracism Online

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"/>

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**.

Table A2

Need-Threat Scale - Belonging

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**.⁷

Table A6

Puzzle Task Manipulation Check 1

7 What followed next was the second employment of the Need-threat scale (see Tables A2 – A5)

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"/>

Table A7

Puzzle Task Manipulation Check 2

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"/>

Table A8

Puzzle Task Manipulation Check 3

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)

(If 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)

(If Yes:) What was the problem during the puzzle sending task (your feedback is greatly appreciated)?

Table A13

Fail Scale

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"/>

Demographics

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)

Debriefing

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

Residual Plots Regarding the Linear Regression Predicting Need Satisfaction at P1
Based on Conscientiousness and Experimental Condition.

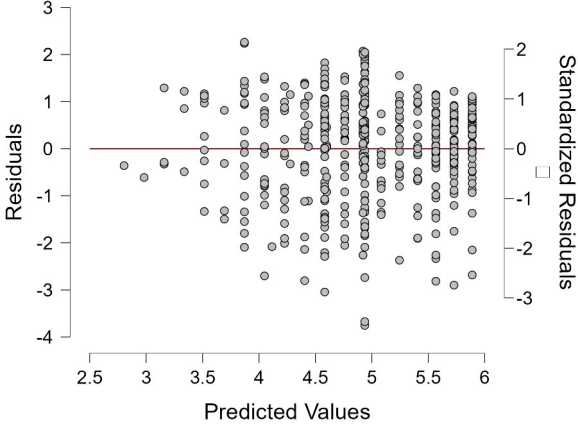


Figure B1. Residual vs. predicted plot indicating homoscedasticity.

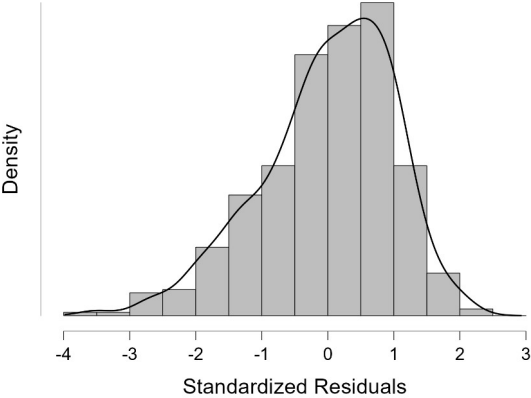


Figure B2. Standardized residuals histogram indicating normality of residuals.

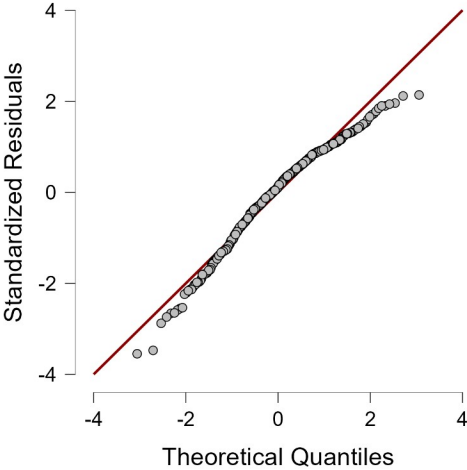


Figure B3. Q-Q plot of standardized residuals indicating normality of residuals.

Appendix C

Residual Plots Regarding the Linear Regression Predicting Need Satisfaction at P1
Based on Agreeableness and Experimental Condition.

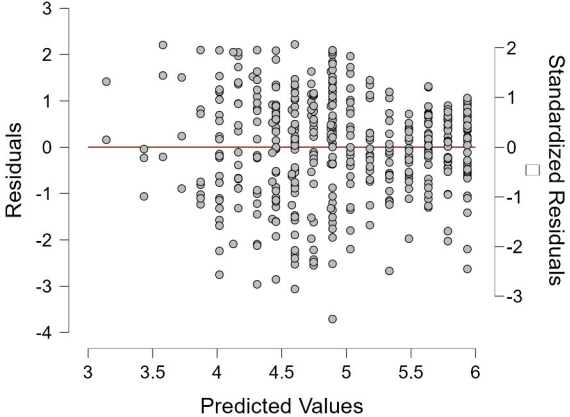


Figure C1. Residual vs. predicted plot indicating homoscedasticity.

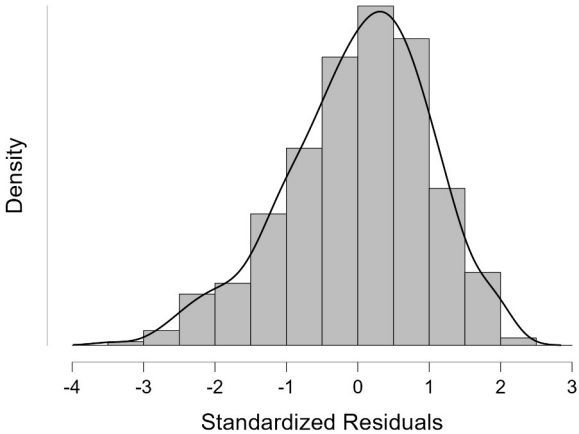


Figure C2. Standardized residuals histogram indicating normality of residuals.

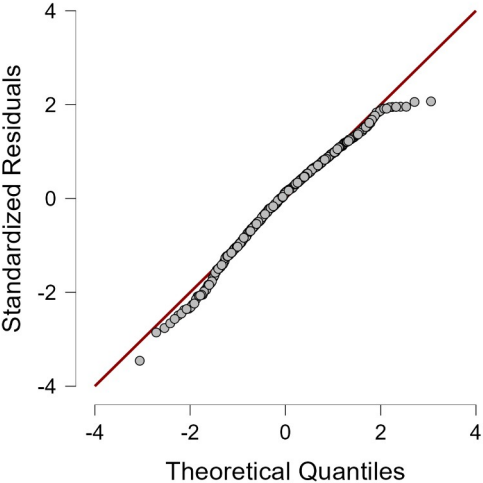


Figure C3. Q-Q plot of standardized residuals indicating normality of residuals.

Appendix D

Residual Plots Regarding the Linear Regression Predicting Prosocial Response Based on Agreeableness, Conscientiousness, and Experimental Condition.

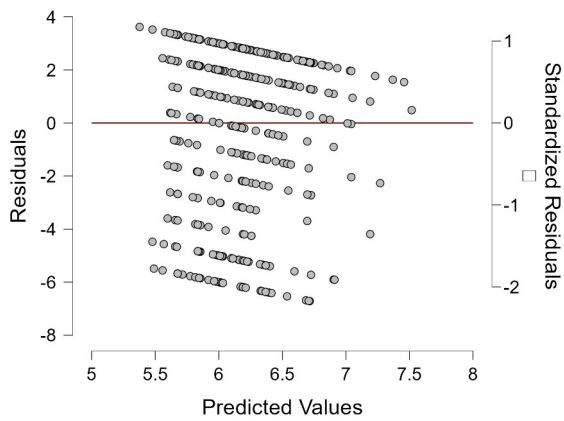


Figure D1. Residual vs. predicted plot indicating a violation of homoscedasticity.

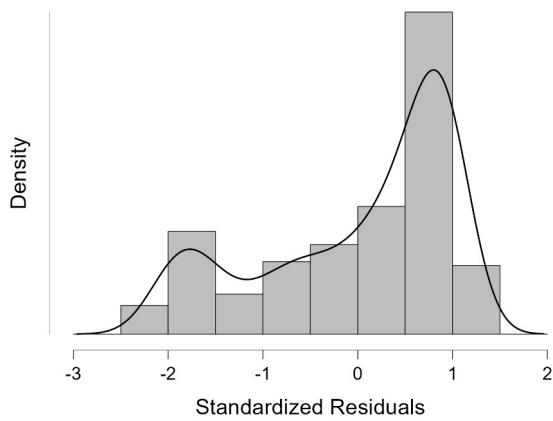


Figure D2. Standardized residuals histogram indicating violation of normality of residuals.

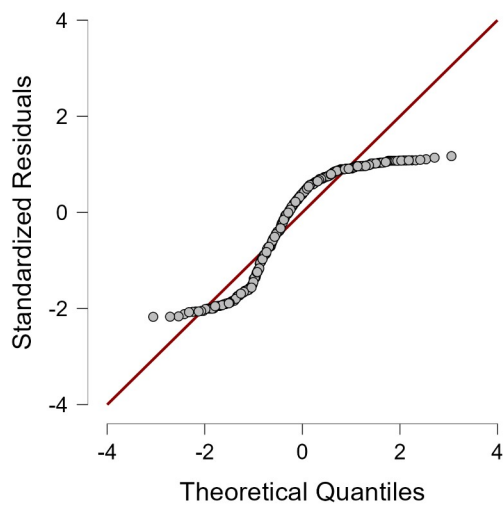
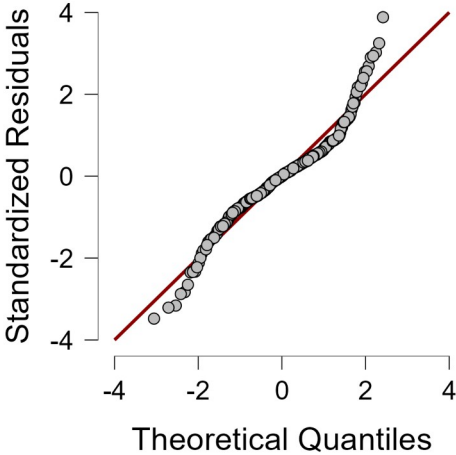


Figure D3. Q-Q Plot of standardized residuals indicating violation of normality of residuals.

Appendix E



Appendix E. Q-Q plot of standardized residuals indicating normality of residuals regarding the ANOVA assessing differences in the need chage score among experimental groups.