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A glimpse through the lens of ostracism – Preferences for and inferences about facial personality traits following ostracism

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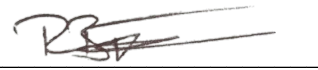
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Abstract

Previous studies found socially excluded individuals to differ from included individuals in their perception of personality traits conveyed by facial cues. Most importantly, their view of various facial personality traits became more differentiated and their preference for the assessed trait extraversion changed. The six hypotheses put forth in this study predict various differences in preference for the facial Big Five traits between socially included and excluded individuals, as well as more discriminatory perceptions of these traits by excluded individuals. In an online survey, participants (106) played cyberball and then repeatedly chose between images of faces showing extreme trait expressions and rated these images in respect to the corresponding trait. The results do not support any hypotheses, raising questions about the state of research in this area which are discussed, and ideas for further steps are highlighted.

Keywords: Personality, Big Five, Social exclusion, Ostracism, Face perception.

A glimpse through the lens of ostracism

Introduction

In 2018, the United Kingdom appointed a Minister for Loneliness in response to ongoing new evidence on loneliness and health risks (Yeginsu, 2018). Previous research had found that loneliness has similar effects on our health as excessive smoking or drinking (Holt-Lunstad et al., 2010) and increases the risk of Alzheimer's disease (Holwerda et al., 2014), cancer, and cardiovascular disease (Hawkley & Cacioppo, 2003). Thus, this topic is of great interest to our society, and it is important to better understand the causes for loneliness, the moderating variables associated with the effects, and the factors that mitigate these effects. Causes for loneliness are numerous and can be divided into five factors: personal inadequacies, developmental deficits, unfulfilling intimate relationships, relocation/significant separations, and social marginality (Rokach & Brock, 1996). An experience that can affect several of these factors is social exclusion, or more specifically, ostracism (K. D. Williams, 2006).

Experiencing ostracism

Ostracism – being excluded from and ignored by a society or group (Stevenson, 2010) – has been subject to an increasing amount of research in the last two decades (for a review, see K. D. Williams & Nida, 2011). The feeling of being excluded and ignored is familiar to everyone, whether by being excluded from a game or ignored in a group conversation. Ostracism violates the fundamental need to belong (Baumeister & Leary, 1995; K. D. Williams, 2007, 2009) and leads to a range of negative emotions like anger, depression and alienation as well as diminished self-worth and self-esteem experienced by its victim (DeWall & Bushman, 2011; K. D. Williams et al., 2000; K. D. Williams, 2007). Fortunately, most often, these experiences can be overcome

rather quickly (K. D. Williams, 2009). But what helps us in doing so? And are their strategies or abilities we use in these situations?

Within the body of ostracism research lays a topic that investigates the influence of ostracism on an affected individuals' perception of the world and other people. This is important because a changed perception also influences a person's actions. By studying these changes, we can, on the one hand, make better predictions about ostracized individuals and, on the other hand, better help them with adapted interventions.

The aim of the present study is to look for differences between socially included (ostracized) and excluded individuals with respect to preferences for and inferences about facially communicated personality traits. To this end, an online study was conducted with two groups, one of which was exposed to feelings of social inclusion and the other to social exclusion. Both groups completed two tasks, the first assessed their preferences for the Big Five personality traits conveyed by the face and the second recorded their rating scores of traits they assigned to each image. The theory providing the basis for this study is summarized in the following sections.

Perceptual variation

A study in 2011 found socially excluded individuals to have an increased categorical perception of social information compared to socially included individuals (Sacco et al., 2011). Participants who had previously experienced social exclusion were better able to discriminate between subtle angry and happy faces, but performed worse when discriminating between two happy faces, suggesting an increased but more homogeneous perception of categories as a result of social exclusion.

The assumption of perceptual differences between socially included and excluded individuals is further supported by the Resource and Perception Model (Harber et al., 2008, 2011) which links psychosocial resources to motivated perception. Psychosocial resources are intrapersonal characteristics and interpersonal conditions that promote coping and efforts to maintain, protect, and build resources (Hobfoll, 1989, 2002). Among the important resources are social support, self-affirmation, a sense of control or efficacy, and emotional openness. When these resources are lacking, individuals experience more stress and cope less well with adversity, whereas those with abundant resources show marked resilience (Billings & Moos, 1981; Taylor et al., 2008). Furthermore, research on basic perception found that motives and emotions affect the perception of object sizes (Bruner & Goodman, 1947) and others' facial expressions (Feshbach, 1963). In particular, the presence of a threat has altering effects on perception, as several studies have found this effect for spiders (Riskind et al., 1995), disturbing images (Mathews & Mackintosh, 2004), heights (Stefanucci & Storbeck, 2009) and steepness (Stefanucci et al., 2008).

The basic assumption of the Resource and Perception Model is that if a threat causes a distorted perception and psychosocial resources buffer the threat, then the perceptual distortions caused by the threat should be moderated by resources. And because social exclusion reduces some of these psychosocial resources, such as feelings of belonging, self-esteem, control, and existential meaning (K. D. Williams, 2007, 2009), the victims' perception should be altered according to the model.

Emerging from these psychosocial resources is, among other things, a universal need to belong, which is satisfied through frequent, non-aversive social interactions (Baumeister & Leary, 1995). When ostracism is experienced, the satisfaction of this need is reduced (K. D.

Williams, 2009). The theory of the Social Monitoring System states that socially excluded people are particularly sensitive to social cues when their need to belong is thwarted (Gardner et al., 2000). This serves the attempt to eliminate the psychological threat caused by social exclusion, achieved through social interaction to satisfy the thwarted need to belong (Gardner et al., 2005). And indeed, it was found that social exclusion has a beneficial impact on the ability to identify facial expressions (Pickett et al., 2004), encode social cues (Kawamoto et al., 2014), concentrate on them (DeWall et al., 2009; Golubickis et al., 2018) and judge the authenticity of smiles (Bernstein et al., 2008).

But to restore the satisfaction of the need to belong, an important requirement is an interaction partner who is approachable and open for social interaction. One aspect that could make a good interaction partner are his personality traits, which, among other things, indicate his social preferences and openness towards new experiences.

Facially communicated personality traits[1]

In a 2020 study, a cascade of artificial neural networks was trained to predict self-reported Big Five scores based on photos alone. In the end, the network was able to predict Big Five scores with significant accuracy (Kachur et al., 2020). Thus, there appear to be indicators in the

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[1] Facial cues conveying personality traits are neither universally valid nor predictive. They are merely clues to guide us, but not reliable indicators of our personality. When words referring to facially communicated personality traits are used in the following, they are to be interpreted in the above manner, i.e., they are to be understood as subjectively perceived indicators of these traits, not as objective indicators. All evaluative expressions regarding the topic, e.g., correct vs. wrong inference, are also to be understood in this context.

human face that are at least partially indicative of personality. The question is whether people can perceive these indicators as well.

This is exactly what has been found in previous research, as shown in a study in which participants who were given a description of a person with a low or high trait expression of agreeableness or conscientiousness showed a higher intention to ostracize the described person with a lower trait expression (Rudert et al., 2021). This perception is not only unconscious, but can also be actively accessed, as shown in a study in which subjects could relatively accurately infer personality traits of the person they were looking at when only facial cues were available (Ambady et al., 2000). Furthermore, a study at the University of Basel concluded that participants in two validation studies reliably perceived both Big Two and Big Five traits from facial images and were able to differentiate between the traits (Walker & Vetter, 2016).

Individuals also show preferences for certain facial personality traits. When examining general preferences for such traits, subjects showed a preference for higher scores in extraversion and agreeableness and lower scores in neuroticism and conscientiousness (Sacco & Brown, 2018). No general preference emerged for openness; rather, the participant's openness partially predicted his preference for openness conveyed by other faces.

The combination of social exclusion and preferences for facial personality traits has not yet been a subject of research. However, one study measured subjects' need to belong without prior manipulation and found that a lower need to belong was associated with a preference for extraverted faces (Brown & Sacco, 2017).

Furthermore, social exclusion increased categorical perception of social information (Sacco et al., 2011). Accordingly, personality traits inferred through facial cues may also be judged more extremely by socially excluded individuals.

Taken together, these results suggest that personality may be an important social cue when need to belong is low. However, it remains unclear whether individuals with a lower need to belong share additional preferences for faces that are indicative of certain personality traits compared to individuals with a high need to belong. Moreover, it is unclear whether they generally perceive these traits as more extreme than individuals with a high need to belong.

The Basel Face Database

To study differences in facial personality traits, pairs of faces, each with high and low trait expression, are required. The Basel Face Database (Walker et al., 2018) provides exactly such photographs, in which the individuals depicted are perceived as having either high or low expression of each Big Five personality trait. This resource allows to test the preferences of ostracized individuals for the Big Five personality traits and their accuracy in inferring these traits from prototypical photographs.

In previous research, a preference for extraverted faces has been found to be related to a low need to belong (Brown & Sacco, 2017). This study aims at replicating this finding as well as extending it by examining whether excluded (as opposed to included) individuals hold preferences for agreeableness, conscientiousness, neuroticism, and openness. Hence, this study will include photographs with all Big Five personality traits and analyze the preferences of socially excluded individuals for these traits as well as their inference from manipulated photographs.

Hypotheses

As we have seen, the literature provides strong support for the assumed relation between social exclusion and changes in perception, as well as the inference of facial personality traits

and a corresponding influence of social exclusion thereon. Based on this research, six hypotheses are put forth. The first five address preferences of socially excluded individuals for Big Five personality traits conveyed by faces, and the sixths relates to their inference. For each of the Big Five traits a prediction is made about the preference differences between included and excluded participants. The first three predictions are based on the findings of Sacco & Brown (2018), who found a general preference for more extraverted, more agreeable, and less neurotic faces. I expect socially excluded individuals to show these preferences as well, but since they perceive social information as more categorical (Sacco et al., 2011), they should express preexisting preferences as more pronounced.

For openness no clear preference was found, therefore a prediction is made here: For the socially excluded, I expect a preference for more open faces, as this could convey a signal of responsiveness and, theoretically, people with high levels of openness should be more open to new interactions. They are also more resilient to stress (P. G. Williams et al., 2009), which could signal calmness to excluded individuals.

For conscientiousness, a similar prediction is made in that socially excluded individuals will have a stronger preference for more conscientious faces since they may convey more stability and less risk taking.

The resulting hypotheses are as follows:

H1A: On average, socially excluded (vs. included) individuals prefer faces manipulated to display high (vs. low) extraversion by choosing these extremes more often when choosing a potential interaction partner.

H1B: On average, socially excluded (vs. included) individuals prefer faces manipulated to display high (vs. low) agreeableness by choosing these extremes more often when choosing a potential interaction partner.

H1C: On average, socially excluded (vs. included) individuals prefer faces manipulated to display high (vs. low) openness by choosing these extremes more often when choosing a potential interaction partner.

H1D: On average, socially excluded (vs. included) individuals prefer faces manipulated to display high (vs. low) conscientiousness by choosing these extremes more often when choosing a potential interaction partner. [2]

H1E: On average, socially excluded (vs. included) individuals prefer faces manipulated to display low (vs. high) neuroticism by choosing these extremes more often when choosing a potential interaction partner.

Further, I expect socially excluded individuals to make more extreme ratings when judging images of individuals with respect to a perceived personality trait. Because the trait expressions on the presented faces are meant to be either high or low, excluded participants may make their ratings more based on categorical perceptions of social information. This argument is further supported by findings that individuals with a thwarted need to belong have a more categorical perception of social information (Sacco et al., 2011). A greater need to belong was also associated with more precision in identifying facial expressions (Pickett et al., 2004), encoding social cues (Kawamoto et al., 2014), concentrating on them (DeWall et al., 2009;

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[2] This hypothesis was accidently misstated in the preregistration, where a preference for low rather than high conscientiousness scores following ostracism was predicted.

Golubickis et al., 2018) and judging the authenticity of smiles (Bernstein et al., 2008). On this

basis, the sixth hypothesis is stated as follows:

     H2: Socially excluded (vs. included) individuals make more extreme personality ratings of

the manipulated pictures.

     To ensure complete transparency, all measurement instruments for recording the required

variables are listed and explained in the following Methods section.

Methods

Participants

     The required sample size was calculated using G*Power (Faul et al., 2007) and a medium

effect size ($d = 0.5$). A t-test with independent means, given $\alpha = 0.05$, power $1\text{-}\beta = 0.8$, yielded a

sample size of 102 participants in total. To ensure that the final sample size would have enough

participants, the sample size was slightly increased (~10%, $N = 114$, 57 in each condition).

     Participants were recruited on the website prolific. For their participation they received

1.25£ each. This payment was based on a pre-estimated study completion time of 10 minutes.

Design and Procedure

     To compare the effects of social exclusion on preferences for personality traits and their

inference from photographs, participants were randomly assigned to one of two conditions:

inclusion and exclusion. Both groups were asked for their consent and introduced to the study.

Then, they played Cyberball, an online ball-tossing game where participants are either included

or excluded (K. D. Williams & Jarvis, 2006). Participants in the inclusion condition got to

interact with the other players by receiving an equal share of ball tosses (around 30%), while the

exclusion group experienced social exclusion by the other players (they received the ball only twice in the beginning). Right after, they reported their need satisfaction of the four basic needs: belonging, self-esteem, control, and meaningful existence (K. D. Williams, 2009). Need satisfaction was measured using a short Need Threat Scale (Rudert & Greifeneder, 2016), which serves to verify whether the exclusion manipulation was successful.

Thereafter, participants were presented with 40 different pairs of photographs, each pair displaying the same person. Importantly, the pairs of photographs were manipulated so that they display the same person once enhanced and once reduced on the personality trait of interest. Participants were asked to choose the image of the person that they would prefer to interact with. Participants made 40 decisions in total (40 pairs for five personality traits, resulting in eight pairs per trait).

Before the second task, an attention check was included with the instruction to select from two consent choices (I agree – I do not agree) the negating one.

Afterwards, they were presented with 20 individual photographs, each showing a face with either enhanced or reduced characteristics of one of the big five traits. They were asked to rate the depicted individuals on the photograph with respect to the manipulated personality trait using a 7-point Likert scale. To consider that participants may not know the exact Big Five terms, two synonyms that are common in everyday language were chosen to describe each trait instead (e.g., not at all sociable, chatty – extremely sociable, chatty). The exact terms were provided in an online article that covered this very topic (Lima, 2020; accessed June 13, 2021). A list of all expressions is attached in the appendix. Participants made these ratings for 20 faces. The photos presented in both tasks were shown in a randomized order. The preference task was

chosen to come first because it does not mention personality traits, which could otherwise influence the answers in the second task.

Finally, participants answered a short questionnaire with 10 items to record their own trait expressions of the Big Five (Rammstedt & John, 2007). This offers the option to investigate whether their own traits had an influence on their preferences for facial personality traits in an exploratory manner, since this association has already been found in a previous study (Sacco & Brown, 2018).

Statistical Analysis

To compare preferences for a high or low trait expression among included and excluded individuals, the mean preference for both groups was calculated as a number between 0 and 1 (each participant choosing one of two photos representing the values 0 and 1, respectively). A mean of 0.5 would therefore mean that a participant is indifferent between low or high manipulation on the according trait. With this mean value, an independent t-test was calculated for each trait. The Holm-Bonferroni method was chosen to optionally control for family-wise error rates following the calculations of t-tests but was not put into practice. Afterwards, the moderating effect of participants' own personality traits were controlled for with a linear regression model.

To compare the personality inferences of the exclusion and the inclusion group, the items displaying a low trait expression were first inverted to be included into the analysis of the high trait expression items. Then, an independent t-test was conducted for every trait rating to determine if the difference in the average rating of both groups was significant.

Additionally, we first ran an ANOVA including one factor for the direction of trait manipulation to account for differences in the direction of trait expression.

Because the preference for certain personality traits may depend on participants' own expression of that personality trait, participants additionally answered a short questionnaire with 10 items assessing their own trait expressions of the Big Five (Rammstedt & John, 2007). The potential moderating effect of the participants' personality were controlled for with a linear regression model.

Finally, exploratory analyses are calculated if the data provide sufficient reasons to do so.

Results

The online survey was conducted on July 28 and the set number of participants was reached on the same day. Of the initial 131 participants, who attempted the online study survey that day, 17 refused consent. Furthermore, seven participants failed the attention check, and one advised against the use of his data without giving a specific reason. This resulted in a total number of 106 participants whose results were included in the analysis. Of these 106 participants, 79 (74%) were female and 26 were male, while one person reported being non-binary. The mean age was 25.4 years with a standard deviation of 7.5 years. After completion of the selection process, 50 participants were in the inclusion condition and 56 were in the exclusion condition.

To measure the effectiveness of Cyberball in inducing feelings of social exclusion in the exclusion condition, all need threat items were summed and an average score was calculated for each participant. With this new variable, a Welch two sample t-test was conducted, which confirmed the effectiveness of Cyberball. Participants in the inclusion condition ($M = 6.28$, $SD = 1.68$) showed significantly higher need threat scores than participants in the exclusion condition ($M = 2.64$, $SD = 2.02$), $t(103.44) = -10.11$, $p < .001$, $d = -1.95$, 95% CI [-4.35, -2.92].

Confirmatory Analysis

First, the mean preference was calculated for each Big Five trait and both conditions, included and excluded, as a number between zero and one, whereby zero stands for a low trait expression image and one for a high trait expression image. The resulting means as well as standard deviations are stated in Table 1 below.[3]

For the overall effect of the ostracism condition on mean preferences in the preference task, an ANOVA was computed across all traits, but found no significant effect, $F(3.21, 333.68) = 0.66$, $p = .59$, $\eta2 = .005$. Table 1 summarizes the individual analyses for each trait, in which the preferences of the inclusion group were compared with those of the exclusion group for each Big Five trait. An independent t-test was chosen for this purpose because the data were normally distributed across both conditions but none of the t-test analyses yielded a significant result.

For the rating task, the same approach was chosen as for the preference task, testing for the overall effect of the ostracism condition on the ratings using an ANOVA. This analysis also showed no significance, $F(4, 416) = 0.81$, $p = .52$, $\eta2 = .006$. The results of each t-test for each trait can be seen in Table 2. Again, the ratings of the included group were compared to the ratings of the excluded group for every Big Five trait using t-tests for independent groups. These analyses yielded no significant results as can be seen in Table 2.

Correction of the p-values of both main analyses using the Holm-Bonferroni method was neither necessary, since the results were far from significant, nor would it have resulted in different figures.

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[3] Because a lot of statistical models were computed during the analysis, their results are listed in tables to give a better overview. For some tables, a main analysis is explained in the text to provide a comprehensive picture of the corresponding table.

Table 1

Descriptive and inferential results of the preference task analysis; Welch two sample t-test.

Trait	Preferences M (SD)		Effect size (Cohen's d)	95% CI	Independent t-test
	Inclusion	Exclusion			
Agreeableness	0.75 (0.19)	0.78 (0.19)	d = 0.14	[-0.05, 0.10]	t(103.4) = 0.72, p = .47
Conscientiousness	0.50 (0.23)	0.52 (0.20)	d = 0.10	[-0.06, 0.10]	t(97.78) = 0.49, p = .62
Extraversion	0.73 (0.24)	0.77 (0.17)	d = 0.20	[-0.04, 0.12]	t(88.41) = 0.99, p = .33
Neuroticism	0.40 (0.23)	0.35 (0.20)	d = -0.20	[-0.13, 0.04]	t(98.51) = -1.02, p = .31
Openness	0.68 (0.21)	0.69 (0.21)	d = 0.02	[-0.08, 0.09]	t(102.97) = 0.12, p = .90

Table 2

Descriptive and inferential results of the rating task analysis; Welch two sample t-test.

Trait	Ratings M (SD)		Effect size (Cohen's d)	95% CI	Independent t-test
	Inclusion	Exclusion			
Agreeableness	4.12 (0.68)	4.08 (0.65)	d = -0.05	[-0.29, 0.22]	t(101.29) = -0.27, p = .79
Conscientiousness	4.32 (0.80)	4.23 (0.64)	d = -0.13	[-0.37, 0.19]	t(93.43) = -0.65, p = .52
Extraversion	4.57 (0.81)	4.72 (0.64)	d = 0.22	[-0.13, 0.44]	t(92.54) = 1.11, p = .27
Neuroticism	4.08 (0.70)	3.94 (0.79)	d = -0.18	[-0.42, 0.15]	t(104) = -0.92, p = .36
Openness	3.77 (0.74)	3.88 (0.69)	d = 0.16	[-0.16, 0.39]	t(100.62) = 0.82, p = .42

Additionally, to the main analyses of hypotheses, a two-way ANOVA analysis was conducted for the rating task, with the direction of trait manipulation as one factor. The corresponding results are depicted in Table 3. None of them were significant, suggesting that the direction of trait manipulation had no effect on the relation between ostracism condition and ratings.

Table 3

Inferential results of the direction of trait manipulation analysis; two-way ANOVA.

Trait	Effect size ($\eta2$)	*F*-statistic	*p*-value
Agreeableness	$\eta2 = .007$	$F(1, 208) = 1.36$	$p = .24$
Conscientiousness	$\eta2 = .00009$	$F(1, 208) = 0.02$	$p = .89$
Extraversion	$\eta2 = .009$	$F(1, 208) = 1.93$	$p = .17$
Neuroticism	$\eta2 = .005$	$F(1, 208) = 1.05$	$p = .31$
Openness	$\eta2 = .002$	$F(1, 208) = 0.45$	$p = .50$

Finally, a linear model analysis was computed to control for the moderator variable in form of participants' own Big Five personality traits. To this end, the influence of participants' personality trait on the effect of condition (included vs. excluded) on their preferences was calculated for each trait of the rating task. The results of the corresponding moderator analyses are provided in Table 4. None of the linear models yielded significant numbers, therefore participants' own personality trait can be discarded as a moderator variable for the effect of exclusion on participants' preferences for facial personality traits.

Table 4

Inferential results of the moderator (participants' self-reported personality traits) analysis;

multiple linear regression model.

Trait	Effect size (Adjusted R^2)	F-statistic	p-value
Agreeableness	$R^2 = -.02$	$F(3, 102) = 0.31$	$p = .82$
Conscientiousness	$R^2 = -.02$	$F(3, 102) = 0.22$	$p = .88$
Extraversion	$R^2 = -.01$	$F(3, 102) = 0.68$	$p = .56$
Neuroticism	$R^2 = -.02$	$F(3, 102) = 0.42$	$p = .74$
Openness	$R^2 = -.02$	$F(3, 102) = 0.25$	$p = .86$

The analysis could not support the five hypotheses that ostracized individuals have different preferences for facial personality traits than socially included individuals. The same is true for the sixth hypothesis, as no empirical evidence was found that ostracized individuals make more pronounced inferences about these facial traits compared to included ones. Thus, all hypotheses were refuted. When the direction of manipulation in the rating task was considered, no significant effect was found on all five traits, contradicting a directional effect of the trait manipulations. The same conclusion holds true for the results of the moderator analysis. Participants' own expression of personality traits had no significant effect on preferences for facial personality traits.

In the next section, an exploratory approach is taken to analyze the data for more general effects that have also been found in previous studies.

Exploratory Analysis

The main findings on which this study is based are the significant inferences people make about facial personality traits (Ambady et al., 2000; Walker & Vetter, 2016). As a final step in the analysis, this effect was examined in the present sample. To examine the rating accuracy, a one-sided one-sample t-test was calculated for the enhanced trait manipulations and the same for the images with reduced trait manipulations. The ostracism manipulation was not included in this analysis because all previous results regarding it were not significant, suggesting that the condition variable would have no effect in this analysis either.

In addition, a two-sided one-sample t-test was calculated for each trait and the direction of trait manipulation. The results are provided in Table 5 (for enhanced trait manipulations) and Table 6 (for reduced trait manipulations). For all t-tests, the actual Likert scale scores (1-7) were compared to the scale mean (4). This provides information about which of the participants' specific personality ratings significantly differed from the mean.[4]

The analysis revealed that participants were generally able to evaluate images with enhanced trait manipulations ($M = 4.36$, $SD = 0.53$) with significant accuracy, $t(105) = 6.94$, $p < .001$, $d = 0.67$, 95% CI [4.27, Inf].[5] On the other hand, overall inferences were not significantly correct for images with reduced trait manipulations ($M = 4.02$, $SD = 0.52$), $t(105) = 0.34$, $p = .63$, $d = 0.03$, 95% CI [-Inf, 4.10].

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[4] The sign in front of Cohen's d indicates whether the group mean is greater (positive sign) or lesser (negative sign) than the scale mean (4). This indicates whether a significant result points to the upper or lower extreme of the rating scale and helps determine whether the result is in the "correct" direction, considering the direction of trait manipulation.

[5] One side of the 95% CI is infinite because the t-test used is one-sided.

Table 5

Descriptive and inferential results of the trait rating accuracy analysis for enhanced trait manipulations; two-sided one-sample t-test.

Trait	Ratings M (SD)	Effect size (Cohen's d)	95% CI	Two-sided t-test
Agreeableness	4.52 (1.06)	$d = 0.49$	[4.31, 4.72]	$t(105) = 5.02, p < .001*$
Conscientiousness	4.90 (0.96)	$d = 0.94$	[4.72, 5.09]	$t(105) = 9.67, p < .001*$
Extraversion	5.05 (1.08)	$d = 0.97$	[4.84, 5.25]	$t(105) = 9.99, p < .001*$
Neuroticism	4.17 (1.21)	$d = 0.14$	[3.94, 4.41]	$t(105) = 1.49, p = .14$
Openness	3.16 (1.05)	$d = -0.80$	[2.95, 3.36]	$t(105) = -8.26, p < .001*$

* p-value < .05

With respect to the enhanced trait manipulation images, the t-tests for agreeableness, conscientiousness, and extraversion yielded significantly correct inference of the facial personality traits. For neuroticism, the rating mean was found to be not significantly different from the scale mean. Surprisingly, inferences for openness were also significant, but opposite to the trait manipulation, as indicated by the negative Cohen's *d*, meaning that participants rated images with enhanced openness significantly lower than the scale mean of 4. It appears that the enhanced openness conveyed in faces is more difficult to infer than the other Big Five traits.

The results of the t-tests for images with reduced trait manipulation yielded very similar significance values in quantity to the analysis of increased trait manipulation. However, the direction in which they deviated from the mean is surprising. For the traits extraversion and openness, the numbers reached significance in the direction of the intended trait manipulation.

Table 6

Descriptive and inferential results of the trait rating accuracy analysis for reduced trait

manipulations; two-sided one-sample t-test.

Trait	Ratings M (SD)	Effect size (Cohen's d)	95% CI	Two-sided t-test
Agreeableness	4.32 (1.11)	d = 0.28	[4.10, 4.53]	t(105) = 2.92, p = .004*
Conscientiousness	4.36 (1.14)	d = 0.32	[4.14, 4.58]	t(105) = 3.24, p = .002*
Extraversion	3.75 (1.03)	d = -0.24	[3.55, 3.95]	t(105) = -2.50, p = .01
Neuroticism	4.17 (1.06)	d = 0.16	[3.96, 4.37]	t(105) = 1.60, p = .11
Openness	3.50 (1.21)	d = -0.42	[3.26, 3.73]	t(105) = -4.28, p < .001*

* p-value < .05

The t-tests for Agreeableness and Conscientiousness also yielded significant results, but the means deviated in the wrong direction, opposite to the intended direction of trait manipulation. Basically, this means that participants were actually very bad in their inferences of these two traits and performed worse than they would have by pure chance. Only for openness were the ratings significantly in the direction of trait manipulation.

Overall, participants were better able to infer increased trait manipulations than reduced ones. However, when considering the individual traits and their direction of manipulation, inferences appear to be quite randomly distributed. These results are contrary to all previous expectations and raise questions that will be discussed in the next section.

Discussion

Despite previous research findings providing promising support for the hypotheses tested in this study, none of them reached significance. There was no difference in the preference for facial personality traits between socially excluded and included subjects when choosing repeatedly between two facial images displaying two extremes of a trait. When they rated the facial personality traits on a Likert-scale, their estimations did not differ significantly from included individuals. Further, the direction of trait manipulation had no influence on the effect of the ostracism condition and a moderator analysis for participants' own personality traits showed no significant results, contradicting the assumption that people prefer faces that convey personality traits similar to their own.

This raises the question of why there were no significant results. The simplest reason would be that the effects described in the hypotheses do not exist. However, this would imply that previous research in both areas – preference for and inference about facial personality traits – has arrived at significant results by chance. With regard to preference for facial personality traits, this concerns Brown & Sacco's (2017) extraversion study, which found a significant relationship between a thwarted need to belong and a preference for extraverted faces. No such relationship was observed in the present study; more specifically, said relationship was far from significant ($p = .41$). There is little reason to believe that this was due to bad luck, and in nineteen other cases the results would reach significance. For this assumption the numbers at hand are far too unequivocal.

One way to explain these contradictory results is to assume that the effects are present but too small to be empirically significant, and that both the present study and that of Brown & Sacco represent the two extremes of the overall distribution of results that can be expected from

repeated testing. However, because the results of the two studies are very far apart, this probability is exceptionally low.

Another explanation for the discrepant results could be the limitations of the present study. First, although the sample size required for a medium effect size had been calculated in advance, it was just short of the calculated limit, with only 106 participants, and was therefore rather small. Second, the study was conducted online, which offers no possibility to standardize the experimental conditions, apart from the fact that the tasks were all completed on screen. For one thing, we cannot be sure how attentively participants answered the questions or whether they just clicked through the study half-heartedly – even though there was an attention test, albeit one that only filters out the most inattentive subjects. For another, the environment in which they completed the tasks – at home or elsewhere – could have had an impact on their answers, as could any disturbances to which they were exposed. And the screens they viewed the study on could have differed in size and resolution. All these differences lead to a variety of possible experimental conditions, which is an important limitation of the present study design.

Further discrepancies exist between the present study and the findings of Ambady et al. (2000) and Walker & Vetter (2016). Both studies have shown that individuals are able to correctly infer facial personality traits. These results are only partially supported by the present study, in which participants' personality ratings were significantly correct only for the overall analysis of enhanced trait manipulations, as well as for enhanced trait manipulations of agreeableness, conscientiousness, and extraversion and for reduced trait manipulations of extraversion and openness. Surprising results, significantly opposite to the intended manipulation direction, were found for ratings of images manipulated to convey high openness and for images that conveyed low agreeableness and conscientiousness. In all these cases, the

subjects' estimates were not only far from the actual trait manipulation values, but their inferences were even significantly in the wrong direction, assuming low values for images with enhanced openness manipulations and high values for images with reduced agreeableness and reduced conscientiousness manipulations. The best performance was for the trait extraversion, where scores were significantly correct regardless of the direction of trait manipulation.

In conclusion, there is a large discrepancy between previous studies and the present one. Based on the present results alone, the statement from previous research that individuals can reliably and correctly infer personality traits conveyed by faces would have to be rejected. For neuroticism, no significant inference was found, and for three other traits' directions, the inferences were towards the incorrect extreme. Overall, the trait ratings appear to be rather random, but the fact that most inferences across both trait manipulation directions point to the high end of the scale suggests that assessing faces with enhanced trait manipulations may be easier or more familiar to us than with reduced trait manipulations.

This difference could be due to the conspicuousness of individuals with high traits, as they are often more noticeable and prominent (e.g., high extraversion).

A different explanation worth considering is a general positivity bias that we humans have (Augustine et al., 2011; Dodds et al., 2015). Because we tend to describe others with positive traits (Sears, 1983), participants may have been reluctant to assign lower trait values to images. Even though lower values on all Big Five traits do not actually have a negative meaning, a positivity bias may have affected ratings nevertheless because the choice of words used to describe the Big Five traits in the questionnaire was, in retrospect, unfavorable. They were mostly evaluative in either a positive or negative direction and therefore could have signaled to participants that the trait had a positive connotation on one side of the scale and a negative

connotation on the other. However, the data do not clearly support this assumption, because the only trait described by words with negative connotations was neuroticism (anxious, pessimistic), and for pictures intended to convey both high and low neuroticism levels, a slightly higher rating was given on average. This means that participants were not hesitant to give higher ratings for negative characteristics. The opposite was true for openness, as this trait was explained by two positive words (imaginative, spontaneous), and lower ratings were selected on average for all pictures conveying openness, regardless of the direction of manipulation. This suggests a limited influence of positivity bias at best. However, the descriptive words for the Big Five traits should be as neutral as possible to minimize influence on participants' choices and represent an important weakness in the present study.

Another explanation for the ratings leaning towards the high scale end is pure chance, as a product of a small sample size coupled with bad luck on certain personality inferences. Or they could have resulted from the study's other limitations mentioned earlier. Regardless, there appears to be a need for further research on facial personality traits.

Future Research

Although the present study was unable to confirm any of the hypotheses stated, important conclusions can be drawn from the findings. In part, the results call into question the strong support that previous studies had found for participants' ability to accurately perceive personality traits conveyed by the face. This is an indication that the actual effects may be smaller than suggested in the literature. In any case, further research on facial personality traits is needed to obtain a more accurate representation of the actual correlations.

The individual t-tests for the ratings of each trait with respect to manipulation direction revealed some interesting patterns that could serve as a basis for more detailed research. This is

particularly true for the traits agreeableness and conscientiousness, for which all images had a high average trait rating, and openness, for which all images had a low average trait rating, regardless of the direction of manipulation. Overall, trait ratings tended to be in the upper half of the scale, suggesting that individuals are better at assessing enhanced trait manipulations than reduced ones. Future research could clarify whether this was just a random result or if facial personality traits are generally perceived as higher in respective scale scores and whether a general positivity bias is responsible for this or some other effect that we do not yet know.

The sample size of the present study was large enough for statistical measurement, but still quite small. However, the effects are too far from significant for a larger sample size to have a reasonable chance of producing significant effects. Thus, there is little reason to believe that the results would be significantly different in a replication study with a larger sample and a laboratory rather than an online design.

Although this study could not confirm a link between an individual's personality traits and their preference for personality traits in the faces of others, more extensive research may reveal this relation. Previous research has found a relation that the present study was unable to establish (Sacco & Brown, 2018), and other studies have found that perceived similarities positively influence adult trust, prosociality, selection of potential mates, and perceived attractiveness (Bailenson et al., 2008; Berscheid et al., 1971; Bressan & Zucchi, 2009; DeBruine, 2002; DeBruine et al., 2008; Giang et al., 2012; Jones et al., 2004; McPherson et al., 2001). This strong support for similarity preference supports the conclusion that an influence of one's personality on facial preference for certain personality traits is likely, which could be elucidated by future research.

In summary, none of the predicted effects were found. On the contrary, the results are surprisingly non-significant and partially contradictory, calling the previous literature into question. How much of the discrepancy is due to chance or weaknesses in the present study design and how much is due to bias in the publication of previous research results cannot be conclusively determined. However, the results point to a gap in the literature that remains to be filled.

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Appendix

Table 7

List of words used to describe the Big Five traits in the experiment tasks.

Trait	First expression	Second expression
Agreeableness	helpful	trusting
Conscientiousness	careful	disciplined
Extraversion	sociable	chatty
Neuroticism	anxious	pessimistic
Openness	imaginative	spontaneous