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Grandiose (communal and agentic) narcissism and predicted (dis) obedience in the Milgram paradigm[☆]

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ABSTRACT

People believe that they would disobey immoral authority in the Milgram experiment. We asked whether high (vs. low) communal and agentic narcissists would manifest a more pronounced better-than-average effect (BTAE) in their predicted disobedience. Participants (N = 348) estimated the moment at which they and the average peer would quit the Milgram experiment. High communal narcissists claimed that they would disobey the immoral authority and quit the experiment earlier (positively predicting the BTAE), whereas high agentic narcissists claimed that they, as well as an average other, would obey longer (negatively predicting the BTAE). Differences in the impression management component of socially desirable responding played a role in these links.

1. Introduction

In the classic Milgram experiment, despite the learner's (a confederate's) obvious suffering, over 60% of participants ("teachers") continued to obey the authority's persistent instructions pressing the last (30th) button of an electric shock generator and knowingly inflicting considerable pain upon the learner for providing mistaken answers to a list of word-pairs (Milgram, 1974; see also Doliński et al., 2017). Yet, experts in human behavior and laypersons alike underestimated the teachers' degree of obedience. For example, Yale University psychiatrists predicted that teachers' most common reaction would involve refusal to follow the immoral authority's directives to shock the learner; they also predicted that the majority of teachers (approximately 68%) would not go beyond the 10th button (150 V), 4% would reach the 20th button (300 V), and only one in a million would press the 30th button (450 V) (Milgram, 1974). Further, regardless of gender, race, education, or occupation, respondents presented with a detailed experimental protocol estimated that only a small percentage (the highest declared value being 3%) would obey the authority's instructions to the bitter end (Milgram, 1974). More recent research established a widespread pattern: Respondents self-predicted inordinate disobedience, claiming that they would withdraw from the Milgram experiment earlier than their average peer (Grzyb & Dolinski, 2017). This claim is an instance of the better-than-average effect (BTAE; Zell et al., 2020). Familiarity with

the Milgram paradigm did not weaken the BTAE (Grzyb & Dolinski, 2017).

We investigated individual differences in the BTAE. We focused on grandiose narcissism, and specifically on two forms of it: communal and agentic (Gebauer & Sedikides, 2018a). These forms are associated differentially with comparative self-perceptions in the morality domain, and, as such, they are especially relevant to disobedience claims in the Milgram paradigm.

1.1. The BTAE and narcissism

The BTAE is "the tendency for people to perceive their abilities, attributes, and personality traits as superior compared with their average peer" (Zell et al., 2020, p. 118). The BTAE, an indicator of self-enhancement (having unrealistically positive self-views; Dufner et al., 2019; Sedikides & Alicke, 2012), is particularly strong in personally-important domains (Alicke, 1985; Sedikides & Alicke, 2019). As an indicator of self-enhancement, the BTAE should be pronounced among dispositionally high self-enhancers, grandiose narcissists—and generally it is (Grijalva & Zhang, 2016; Sedikides & Campbell, 2017).

This pronouncement, though, may depend on the form of narcissism in question (Sedikides, 2021). We evoke the distinction between communal and agentic narcissism (Gebauer et al., 2012; Gebauer & Sedikides, 2018a). Communal narcissists exhibit the BTAE

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predominantly in the communal domain (e.g., morality, prosociality, warmth—Nehrlich et al., 2019), as this domain is more personally-important to them (Gebauer et al., 2013). Agentic narcissists, by contrast, exhibit the BTAE predominantly in the agentic domain (e.g., intelligence, competence, leadership), as this domain is more personally-important to them (Campbell et al., 2002; Zajenkowski et al., 2019).

The Milgram paradigm falls in the communal (i.e., morality) domain. It seems therefore likely that high (vs. low) communal narcissists would self-enhance in their predicted disobedience, exhibiting the BTAE (i.e., earlier experimental withdrawal than the average peer). We did not anticipate for high (vs. low) agentic narcissists to do so.

1.2. Narcissism and need for social approval

The two forms of grandiose narcissism differ on the kind of social approval they desire and the ways of obtaining it. Communal narcissists are prone both to distorting their misbehavior to reflect favorably on themselves (egoistic bias or self-deception) and to managing the impressions they convey (moralistic bias or impression management; Barry et al., 2017; Gebauer & Sedikides, 2018b; for more on these biases, see Paulhus & John, 1998). Communal narcissists' boasting on prosociality (Fatfouta & Schröder-Abé, 2018; Nehrlich et al., 2019), and their reacting with moral indignation to perceived unfairness (Yang et al., 2018), suggest that the desire to win social approval and liking might be a driving force behind their self-enhancing behavior.

In contrast, high (vs. low) agentic narcissists are more interested in asserting their dominance and eliciting admiration than liking (Leder et al., 2020). Indeed, high agentics are prone to distorting their misbehavior rather than managing their impressions. They disregard social approval won through prosocial means (Lannin et al., 2014), are proud of their agentic qualities (Giacomin, 2019), and self-enhance on these qualities while being aware and accepting of their low communion (Campbell et al., 2002; Jones & Brunell, 2014). They might even intentionally create an uncommunal self-image, insofar as they consider communion a mark of low status (Czarna et al., 2014; Drat-Ruszczak et al., 2014).

1.3. Overview

We addressed the relation between communal/agentic narcissism and the BTAE in the moral domain. We hypothesized that high (vs. low) communal narcissists would manifest the BTAE: They would claim that they would be more likely to disobey the authority (i.e., terminate the experiment earlier than the average peer). We did not expect high (vs. low) agentic narcissists to exhibit the BTAE, given that self-enhancing in the communal domain is not part of their behavioral repertoire (Campbell et al., 2002).

High (vs. low) communal narcissists do not typically express negative views of others; rather, they report that they trust others and believe others are reliable, honest, and benevolent (Kwiatkowska et al., 2019; Rentzsch & Gebauer, 2019). Accordingly, we hypothesized that they would predict an earlier withdrawal moment for themselves than the average peer. However, as high (vs. low) agentic narcissists are callous and hold unfavorable views of others (Jones & Brunell, 2014), we hypothesized that they would predict a later withdrawal both for themselves and the average peer.

Further, we examined the relevance of need for social approval (self-deception or impression management) for the links between each narcissism form and the BTAE. Specifically, we hypothesized that need for social approval would account for the positive association between communal narcissism and the BTAE, as communal narcissists' overestimation of their resistance against an immoral authority would be due to their desire for approbation rather than genuinely high moral standards. Further, need for social approval would account for the negative association between communal narcissism and estimated own

withdrawal, suggesting that they would proclaim their early withdrawal because they wished to create favorable impressions of self. In contrast, we hypothesized that agentic narcissism would be negatively associated with need for social approval. Need for social approval would account for agentic narcissists' low BTAE, because agentic narcissists do not pursue and actually openly disregard social approval earned through prosocial means. Similarly, it would account for the positive association between agentic narcissism and estimated own withdrawal.

Our research was approved by the Ethics Committee of Institute od Applied Psychology, Jagiellonian University. All participants were Polish. Materials, data, and codes are available at https://osf.io/ezmpu/.

2. Method

2.1. Participants and design

Although an N of 250 is sufficient for detecting average effect sizes in personality psychology (Schönbrodt & Perugini, 2013), we estimated the sample size required to test the hypothesized total effects of each narcissism form and indirect effects of need for approval at $\alpha = 0.05$ with power 0.80 using the pwr2ppl package (Aberson, 2021). We assumed that (1) communal narcissism has a moderate association with need for approval (Barry et al., 2017) and communal BTAE (Gebauer et al., 2012); (2) need for approval has a moderate association with the BTAE (Bensch et al., 2019); and (3) agentic narcissism has a weak-to-moderate association with need for approval (Barry et al., 2017; Vohs et al., 2005) and a moderate (negative) association with communal BTAE (Gebauer et al., 2012). A sample of 180 participants should suffice to detect a total effect of communal narcissism and an indirect effect of need for approval on the BTAE, whereas a sample of 340 should suffice to detect a total effect of agentic narcissism and an indirect effect of need for approval on the BTAE.

We collected data from community members, rather than students or graduates of social sciences (due to possible familiarity with Milgram's experiment), via the platform Pollster (https://pollster.pl/) for PLN 1.5 (\$0.40). We over-recruited in this first study on the topic and in anticipation of attrition, deciding to stop data collection at N=500. On a priori basis, we automatically excluded data from 248 participants due to incorrect answers to at least three (of the four) attention checks. Further, we excluded 163 participants because of unrealistically short completion times (i.e., less than the video's 5 min 55 s duration). The excluded participants did not differ significantly from those retained in any demographic or personality variables. The final sample comprised 348 participants (175 men, 173 women) aged 17–87 years (M=40.25, SD=15.46). We used a within-subjects design.

2.2. Procedure

Participants completed measures of demographic variables, communal narcissism, agentic narcissism, and socially desirable responding (assessing need for approval). Next, they watched a video detailing Milgram's experiment (Grzyb & Dolinski, 2017). Finally, they completed the BTAE measure (two questions as in Grzyb & Doliński) and indicated any prior knowledge of the experiment.

2.2.1. Personality measures

We assessed *communal narcissism* with the 16-item Communal Narcissism Inventory (CNI; Gebauer et al., 2012; Polish version: Zemojtel-Piotrowska et al., 2016; e.g., "I am the most caring person in my social surrounding"; 1 = strongly disagree, 7 = strongly agree; $\alpha = 0.93$). We assessed agentic narcissism with the 13-item Narcissistic

Personality Inventory (NPI-13; Gentile et al., 2013; Polish version: Zemojtel-Piotrowska et al., 2018; e.g., "I find it easy to manipulate people"; 1 = strongly disagree, 7 strongly agree; $\alpha = 0.88$). We assessed socially desirable responding with the 16-item Balanced Inventory of Desirable Responding Short Form (BIDR-16; Hart et al., 2015; Polish version: Żemojtel-Piotrowska et al., 2021; 1 = not true, 7 = very true, $\alpha =$ 0.70). The scale consists of two 8-item subscales: self-deceptive enhancement ($\alpha = 0.53$, e.g., "I have sometimes doubted my ability as a lover") and impression management ($\alpha = 0.64$, e.g. "I have taken advantage of someone"-reverse-scored). Low reliabilities for these subscales are common (Kwak et al., 2019; Margolis et al., 2019; Żemojtel-Piotrowska et al., 2021).² Finally, we assessed familiarity with Milgram's experiment with the question: "Are you familiar with the studies by Milgram, in which participants were encouraged to administer an electric shock to a 'learner' (did you read or see a film about it)?" (yes, no).

2.2.2. Better-than-average-effect

Participants watched a 6-minute video (created by Grzyb & Dolinski, 2017) describing the procedure of Milgram's experiment. The video was a narrated slide presentation that contained photos and details of the experiment, including description of the tasks entrusted to the teacher/learner and the experimenter's actions. Participants received no information about the results of the experiment. Next, they answered the four attention checks.³

Finally, participants completed the BTAE measure (as in Grzyb & Dolinski, 2017). The first question was: "What do you think—at which moment did the average person (an average participant from studies conducted around the world) cease participation in the experiment by refusing to press the next switch? Indicate the last switch the average person pressed." Participants indicated so via a scale that contained 30 switches, with each switch described as in the original Milgram experiment (Fig. 1). The second question was: "Imagine that you are participating in that experiment. Indicate the last switch you would press." Participants indicated so via the same scale. To calculate the BTAE we subtracted the estimated moment of the average peer's withdrawal from the estimated moment of participant's withdrawal, and multiplied by -1 so that the higher the score, the more positively the self was viewed in comparison to the average peer.

3. Results

We present descriptives and intercorrelations in Table 1. Only 58 participants (17%) reported familiarity with Milgram's experiment. Replicating Grzyb and Dolinski (2017), participants demonstrated the BTAE: They estimated their own withdrawal moment (M=6.42, SD=5.91) as earlier than the average peer's withdrawal moment (M=13.52, SD=7.60), t(347)=17.16, p<.001, d=0.92. The results were similar among those who were unfamiliar (own withdrawal M=6.20, SD=5.70 vs. average peer withdrawal M=12.21, SD=6.92; t(289)=14.62, p<.001, d=0.86) and familiar (own withdrawal M=7.50, SD=6.82 vs. average person's withdrawal M=20.07, SD=7.52; t(57)=10.84, p<.001, d=1.42) with Milgram's experiment.

3.1. Withdrawal from Milgram's experiment

Next, we ran hierarchical regression analyses involving three indices: the BTAE, own withdrawal moment, and average peer withdrawal moment. We entered both narcissism forms and control variables (sex, age, familiarity with Milgram's experiment) in step 1, and impression management and self-deception in step 2. We standardized continuous independent variables and centered dichotomous ones.

3.1.1. Better-than average effect

In step 1, regression analysis involving the BTAE showed that communal narcissism predicted it positively, whereas agentic narcissism predicted it negatively. Familiarity with Milgram's experiment predicted it positively. Age and sex were not significant predictors. In step 2, impression management significantly predicted positively the BTAE, whereas communal narcissism and agentic narcissism did not predict it (Table 2).

3.1.2. Estimated own withdrawal

Communal narcissism predicted negatively participant's estimated own withdrawal moment, whereas agentic narcissism predicted it positively. Age and familiarity did not predict it. Men predicted later withdrawal than women. In step 2, impression management predicted negatively withdrawal, and self-deception predicted it positively (Table 3).

3.1.3. Estimated average peer withdrawal

Agentic narcissism predicted positively the average peer's with-drawal, whereas communal narcissism did not predict it. Age predicted it negatively: older participants estimated that the average peer would quit earlier. Familiarity with Milgram's experiment predicted positively the average peer's withdrawal. In step 2, neither self-deception nor impression management emerged as predictors (Table 4).

3.2. The role of need for social approval

3.2.1. Better than average effect

We tested whether self-deception and impression management had significant indirect effects on communal narcissists' BTAE. Bootstrapping results (5000 bootstrap samples) indicated that only impression management accounted for the effect of communal narcissism ($b=0.33,\,95\%$ CI [0.06, 0.71]). The direct effect of communal narcissism was not significant ($b=0.77,\,95\%$ CI [-0.15, 1.69]). Next, we next turned to agentic narcissism. Impression management (but not self-deception) also accounted for its effect ($b=-0.45,\,95\%$ CI [-0.88, -0.09]). The direct effect of agentic narcissism was not significant ($b=-0.61,\,95\%$ CI [-1.54, 0.33]).

3.2.2. Estimated own withdrawal

Only impression management had a significant indirect effect in the association of communal narcissism with estimated own withdrawal (b=-0.42, 95% CI [-0.72, -0.18]). The direct effect of communal narcissism was not significant (b=-0.32, 95% CI [-1.01, 0.37]). Impression management also had a significant indirect effect in the association of agentic narcissism with estimated own withdrawal (b=0.55, 95% CI [0.27, 0.90]). The direct effect of agentic narcissism remained significant and positive (b=1.53, 95% CI [0.83, 2.23]).

3.2.3. Estimated average peer withdrawal

We did not test for indirect effects of need for social approval in the association of agentic narcissism with the estimated average peer withdrawal, because neither self-deception nor impression management emerged as significant predictors.

 $^{^{1}}$ We conducted separate regression analyses involving each NPI-13 subscale as predictor. We report these analyses in Supplementary Material, Tables S1–S3.

² Participants also completed the Single Item Self-Esteem Scale (Robins et al., 2001). Our results were unconfounded by self-esteem. See Supplementary Material Tables S4–S6 (regression analyses with self-esteem as a predictor) and Tables S7–S9 (regression analyses with self-esteem as a control).

³ Participants who failed at least three checks were redirected to debriefing (and their data excluded from analyses).

	SI	ight	sho	ck	Mod	lerat	e sh	ock	Str	ong	sho	ck		stro hock			ense lock			extre			Dan	ger: sho		ere		XX	X	
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fig. 1. The scale of 30 switches representing electric shock levels in the Milgram experiment.

Table 1 Zero-order correlations.

	1	2	3	4	5	6	7	8	9	10
1. CNI	_									
2. NPI	0.46***	_								
3. Familiarity	-0.17**	-0.05	-							
4. Age	-0.18**	-0.25***	-0.16**	_						
5. BIDR_SDE	0.22***	0.09	0.10	0.26***	_					
6. BIDR_IM	0.08	-0.30***	0.11*	0.26***	0.41***	_				
7. BTA	0.05	-0.03	-0.32***	-0.16**	-0.05	0.12*	_			
8. Own withdrawal	0.02	0.31***	-0.08	-0.11*	0.02	-0.35***	-0.40***	_		
9. Average other withdrawal	0.07	0.22***	-0.39***	-0.25***	-0.03	-0.15*	0.70***	0.37***	_	
Self-esteem	0.37***	0.42***	0.17**	0.09	0.35***	0.05	-0.12*	0.07	-0.07	_
M	3.82	3.19	1.83	40.25	3.94	4.31	7.10	6.42	13.52	5.47
SD	1.06	1.03	0.37	15.46	0.73	0.91	7.72	5.91	7.60	2.30

Note. CNI = communal narcissism; NPI = agentic narcissism; BIDR_SDE = Self-Deceptive Enhancement subscale of BIDR; BIDR_IM = Impression Management subscale of BIDR; BTA = moral better-than-average index. We report point-biserial correlations for familiarity.

Table 2 Hierarchical regression of the better-than-average index (adjusted $R^2 = 0.14$).

	В	SE	<i>b</i> *	t	p
Step 1					
Intercept	7.10	0.39		18.36	0.000
ZCNI	1.10	0.45	0.14	2.43	0.016
ZNPI	-1.05	0.45	-0.14	-2.34	0.020
Familiarity_c	6.80	1.08	0.33	6.28	0.000
ZAge	-0.81	0.41	-0.10	-1.95	0.052
Sex_c	-0.95	0.79	-0.06	-1.20	0.231
Step 2					
Intercept	7.10	0.38		18.54	0.000
ZCNI	0.87	0.47	0.11	1.83	0.068
ZNPI	-0.51	0.48	-0.07	-1.07	0.286
Familiarity_c	6.83	1.07	0.33	6.36	0.000
ZAge	-0.97	0.43	-0.13	-2.27	0.024
Sex_c	-0.62	0.80	-0.04	-0.78	0.436
BIDR_SDE	-0.50	0.45	-0.07	-1.12	0.264
BIDR_IM	1.37	0.46	0.18	2.95	0.003

Note. ZCNI = Z-scored communal narcissism; ZNPI = Z-scored agentic narcissism; Familiarity c = centered familiarity with Milgram experiments; ZAge = Zscored age; Sex c = sex centered; BIDR SDE = Self-Deceptive Enhancement subscale of BIDR; BIDR_IM = Impression Management subscale of BIDR.

4. Discussion

We examined the links between communal and agentic narcissism on the one hand, and the BTAE in a moral domain on the other, alongside the relevance of need for social approval. Do narcissists estimate differentially their own and the average peer's (dis)obedience in Milgram's experiment? To begin, we replicated Grzyb and Dolinski (2017): We obtained a large BTAE, both among participants who were unfamiliar and familiar with Milgram's experiment. Participants estimated the moment of their own withdrawal from the experiment as occurring earlier than the moment of the average peer's withdrawal. People believe firmly that they would oppose the authority's directives to harm another person earlier than would others, an instance of moral superiority illusion (Alicke & Sedikides, 2009; Green et al., 2019). Familiarity

Table 3 Hierarchical regression of estimated own withdrawal (adjusted $R^2 = 0.18$).

	В	SE	b*	t	p
Step 1					
Intercept	6.42	0.30		21.71	0.000
ZCNI	-0.74	0.35	-0.13	-2.12	0.035
ZNPI	2.09	0.34	0.35	6.06	0.000
Familiarity_c	0.62	0.83	0.04	0.75	0.453
ZAge	-0.39	0.32	-0.07	-1.23	0.219
Sex_c	1.85	0.61	0.16	3.04	0.003
Step 2					
Intercept	6.42	0.29		22.43	0.000
ZCNI	-0.46	0.35	-0.08	-1.30	0.196
ZNPI	1.40	0.36	0.24	3.90	0.000
Familiarity_c	0.59	0.80	0.04	0.73	0.465
ZAge	-0.20	0.32	-0.03	-0.61	0.544
Sex_c	1.41	0.60	0.12	2.38	0.018
BIDR_SDE	0.71	0.34	0.12	2.12	0.035
BIDR_IM	-1.73	0.35	-0.29	-5.01	0.000

Note. ZCNI = Z-scored communal narcissism; ZNPI = Z-scored agentic narcissism; Familiarity c = centered familiarity with Milgram experiments; ZAge = Zscored age; Sex c = sex centered; BIDR SDE = Self-Deceptive Enhancement subscale of BIDR; BIDR_IM = Impression Management subscale of BIDR.

with the experiment only appeared to strengthen the BTAE.

The findings, though, diverged for communal versus agentic narcissism. High (vs. low) communal narcissists estimated that they would quit the experiment earlier, whereas high (vs. low) agentic narcissists estimated that they would quit the experiment later. Additionally, although communal narcissism was unrelated to the estimated average peer withdrawal, high (vs. low) agentic narcissists estimated that the average peer would quit later. These results were consistent with hypotheses. Communal narcissists have favorable self-views, but they do not express unfavorable views of others, on the communal domain.

Differences in impression management accounted for the associations between narcissism and the BTAE, and estimated own withdrawal—fully in the case of communal narcissism and partially in the case of agentic narcissism. The direction of the indirect effects was

p < .05.

^{***} p < .0.

p < .001.

Table 4 Hierarchical regression of estimated average peer withdrawal (adjusted $R^2 = 0.20$).

	В	SE	<i>b</i> *	t	p
Step 1					
Intercept	13.52	0.36		37.16	0.000
ZCNI	0.37	0.43	0.05	0.86	0.391
ZNPI	1.03	0.42	0.14	2.45	0.015
Familiarity_c	7.42	1.02	0.37	7.28	0.000
ZAge	-1.19	0.39	-0.16	-3.08	0.002
Sex_c	0.89	0.75	0.06	1.19	0.233
Step 2					
Intercept	13.52	0.36		37.09	0.000
ZCNI	0.41	0.45	0.05	0.90	0.367
ZNPI	0.89	0.46	0.12	0.19	0.054
Familiarity_c	7.41	1.02	0.36	7.26	0.000
ZAge	-1.17	0.41	-0.15	-2.86	0.005
Sex_c	0.79	0.76	0.05	1.05	0.296
BIDR_SDE	0.21	0.43	0.03	0.49	0.626
BIDR_IM	-0.37	0.44	-0.05	-0.83	0.406

Note. ZCNI = Z-scored communal narcissism; ZNPI = Z-scored agentic narcissism; Familiarity_c = centered familiarity with Milgram experiments; ZAge = Z-scored age; Sex_c = sex_centered; BIDR_SDE = Self-Deceptive Enhancement subscale of BIDR; BIDR_IM = Impression Management subscale of BIDR.

opposite for the two narcissism forms. Specifically, communal narcissists estimated that they would quit earlier likely due to their desire to create favorable impressions of self, whereas agentic narcissists estimated that they would quit later likely due to their disinterest in creating a socially desirable image. Unlike communal narcissists, agentic narcissists disregarded social approval. These results are consistent with our hypotheses. Further, as expected, the positive association between agentic narcissism and estimated average peer withdrawal was not accounted for by impression management. Agentic were not shy of expressing a lack of concern for the well-being of others, consistent with prior findings (Czarna et al., 2014; Drat-Ruszczak et al., 2014; Lannin et al., 2014).

One limitation of our research is that we relied on self-reports. Future work could also examine informant reports, and it could also test our findings longitudinally. Another limitation pertains to the low reliability of the self-deceptive self-enhancement subscale of the BIDR. Although the pertinent indirect effects were not significant, results involving that subscale should be approached with caution. Follow-up work may use balanced inventories of agentic and communal social desirability (Blasberg et al., 2014) or control for overclaiming. Lastly, our results raise the possibility of altruism among communal narcissism, which, under some circumstances, might lead them (more than low communals) to speak up and resist authority. Further research could scrutinize this hypothesis.

In all, we found that communal narcissists, unlike agentic narcissists, self-enhance in the communal domain consistent with the agency-communion model of narcissism. We also extended the nomological network of communal and agentic narcissism by showing their differing links with need for social approval.

CRediT authorship contribution statement

Roksana R. Zdunek: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing – original draft, Project administration. Anna Z. Czarna: Conceptualization, Methodology, Formal analysis, Data curation, Writing – review & editing, Supervision, Funding acquisition. Constantine Sedikides: Conceptualization, Writing – review & editing, Supervision.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2022.111514.

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