Automatic imitation is reduced in narcissists but only in egocentric perspective-takers

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Abstract

Narcissism is a prevalent personality trait associated with malevolent qualities such as low concern for others and high self-focus. Congruently, reduced automatic imitation in narcissists was reported in one study (24 participants), but it was not replicated in another (57 participants). In this study, 100 participants completed the previously used narcissism and automatic imitation measures but here along with a visual perspective-taking task allowing to dissociate 4 profiles of perspective-takers. While we confirmed a non-replication at whole-sample level, we did find a reliable negative association between narcissism and automatic imitation among egocentric perspective-takers, that is, characterized as highly self-centered when tasked to adopt someone else's point of view. Our findings shed a new light on whether narcissistic individuals are less sensitive to others, highlight the importance of considering performance-based individual differences within the narcissistic personality, and revisit the recent claim that automatic imitation poorly relates to social functioning by presenting a theoretical framework that questions the sensitivity of the automatic imitation task.

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Introduction

Narcissism is characterized by inflated self-views, disregard for others' concerns, self-focus, and a strong need for external self-affirmation (American Psychiatric Association, 2000; Emmons, 1987; Morf & Rhodewalt, 2001). These features can be expressed to various degrees, ranging from mildly expressed features in the normal population to excessively expressed features in some clinical populations. However, even at the sub-clinical level narcissism is associated with a wide range of interpersonal difficulties. For example, highly narcissistic individuals are less faithful and committed in their relationships (Campbell, Foster, & Finkel, 2002; Finkel, Campbell, Buffardi, Kumashiro, & Rusbult, 2009), react more aggressively to rejection or criticism (Bushman & Baumeister, 1998), are disliked by their peers (Back et al., 2013), and are more likely to commit crimes (Barry, Frick, Adler, & Grafeman, 2007; Hepper, Hart, Meek, Cisek, & Sedikides, 2014). Reduced empathy and reduced perspective taking have both been proposed to lie at the heart of the interpersonal difficulties associated with narcissism (Hepper et al., 2014; Morf & Rhodewalt, 2001; P. J. Watson, Grisham, Trotter, & Biderman, 1984; P. J. Watson & Morris, 1991). This view is strongly supported by the consistent finding of a negative association between narcissism and self-reported measures of empathy and perspective taking (Delič, Novak, Kovačič, & Avsec, 2011; Given-Wilson, McIlwain, & Warburton, 2011; Hepper et al., 2014; Jonason & Krause, 2013; Munro, Bore, & Powis, 2005; Ritter et al., 2011; Vonk, Zeigler-hill, Mayhew, & Mercer, 2013; P. J. Watson & Biderman, 1994; P. J. Watson, Biderman, & Sawrie, 1994; P. J. Watson et al., 1984; P. J. Watson, Little, Sawrie, & Biderman, 1992; P. J. Watson & Morris, 1991) and performance-based measures of empathy (Mota et al., 2019; Vonk et al., 2013; Zajenkowski, Maciantowicz, Szymaniak, & Urban, 2018). Yet, empathy and perspective taking are complex multifaceted constructs encompassing distinct mechanisms ranging from basic sensory-motor coupling to high-level social reasoning (e.g., Bukowski, 2014; Decety, 2004;

Lamm, Bukowski, & Silani, 2016; Preston & de Waal, 2002) and thus which specific social-cognitive mechanism are altered in narcissists remains an open question.

One recent line of investigation examined whether reduced empathy in narcissism stems from reduced mimicry, or automatic (or rather spontaneous) imitation, which taps directly in perception-action coupling, the core mechanism of empathy according to Preston and de Waal (2002). Perception-action coupling applied to the social world states that (1) the social cues, such as gestures, voices tones, and facial expressions, activate specific corresponding autonomic, motoric, and affective responses and (2) this coupling occurs depending on the extent we pay attention to the social cues and we inhibit the activated responses. The first investigation of automatic imitation in relation to narcissism (Hogeveen & Obhi, 2013) used a stimulus-response matching paradigm assessing the extent individuals are interfered by their tendencies to imitate another person's irrelevant finger movements (Brass, Bekkering, & Prinz, 2001). Specifically, the authors found that narcissism predicted increased top-down modulation by the statistical relevance of the other person's finger movements (i.e. probability that the see movements are uninformative about the participant's instructed movements), which translates in imitation interference that are less automatic in narcissists. The same authors then conducted a similar study and reported within a 24-participants sample a reduced automatic imitation interference in relation to higher narcissism (Obhi, Hogeveen, Giacomini, & Jordan, 2013). Two studies attempted to replicate this latter finding without success despite using more adequate sample sizes (Butler, Ward, & Ramsey, 2015, with $N = 57$; Darda, Butler, & Ramsey, 2019, with $N = 203$ then 201). Hence, accumulated evidence supports the view that the reduced automatic imitation in narcissists finding might be a spurious result; a view that is consistent with a larger set of results indicating that automatic imitation is not significantly associated with socially-relevant personality characteristics (e.g., empathic and

perspective taking dispositions or social-cognitive traits proper to autism or schizophrenia) and weakly modulated by top-down social contexts (Cracco et al., 2018; Darda et al., 2019).

This study aimed to replicate the reduced automatic imitation in narcissists finding while testing two alternative views to explain the previous non-replications. The first possible explanation is that there are distinct profiles of narcissism and that the finding of Obhi et al. (2013) applies to one specific profile. The second explanation is that the automatic imitation interference results from several confounded elements that might be differently associated with narcissism. More specifically, and in line with the interpretations of Hogeveen and Obhi (2013) and the mechanistic description of perception-action coupling (Preston & de Waal, 2002), we posit that the size of the automatic imitation interference stems from both the inhibitory capacities to suppress the interferences and the extent of self-focus in the sense that high self-focus means less attention to the other person. Critically, knowing that narcissism has been associated with both low self-control (Foster & Iv, 2008; but see also Jonason & Tost, 2010; Miller et al., 2009; Vaughn et al., 2007) and high self-focus (e.g., Buss & Chiodo, 1991; for a review, see Morf & Rhodewalt, 2001), it could be therefore predicted that automatic imitation interferences are both positively (increased) and negatively (reduced) associated with narcissism and thus that two associations cancel each other out.

In order to test these two alternative views, in addition to the completion of the Narcissistic Personality Inventory (Raskin & Terry, 1988) and automatic imitation task (Brass et al., 2001), we introduced an independent classification of the participants based on their tendencies to be poor at suppressing interferences and to be self-focused in a similar social task setting, which the level-1 visual perspective-taking paradigm (Samson, Apperly, Braithwaite, Andrews, Bodley Scott, et al., 2010). The latter paradigm offers the possibility to isolate the extent of self-focus from the interference suppression capacities and to exploit an already established classification based on

this paradigm (Bukowski & Samson, 2017). Introducing this classification thus allowed to distinguish self-focused narcissists from low self-control narcissists as both a way to examine distinct profiles of narcissists and a way to address the issue that the automatic imitation interference confounds two elements.

We predicted that narcissists classified as self-focused would have the lowest automatic imitation interference whereas the narcissists classified for their low interference suppression would show the highest automatic imitation interference.

This study was conducted at the University of Louvain, at the Psychological Sciences Research Institute, and fully complied with local ethical regulations and the Declaration of Helsinki (2013, latest revision). The raw and processed data can be found online on <https://osf.io/5erzh/>. None of the methods, procedures, and analyses were pre-registered. We report all measures, manipulations and exclusions.

Method

Participants

One-hundred healthy adults (31 females, mean age: 22.52, age range: 19-26) participated in the study in return of 10 euros. A power analysis ($\alpha = .05$, power = .95, $\eta_p^2 = .26$ for narcissism x congruency interaction) was conducted based the sole study (Obhi et al. ,2013) linking narcissism to reduced automatic imitation at time of completion of the study and recommended a minimal sample size of 24 participants. Because the reported effect came from a small-sample study and that this study aimed to re-examine the reported association in an individual differences approach (i.e., across distinct profiles), 100 participants was considered as the recommended sample size. Demographic information of 4 participants was not recorded due to a technical failure. The study was approved by the ethics committee of the Psychological

Sciences Research Institute of the Université catholique de Louvain (Projet2012-27, November 2012).

Apparatus

The experiment was run on a Dell Pentium 4 (2.8 GHz) computer with a 17-inch monitor (1024x768, 85 Hz, Dell M782p). The visual perspective-taking (VPT) task and the automatic imitation task were programmed on E-Prime software (version 2.0, Psychology Software Tools) and all the questionnaires were presented via online forms implemented with Google Drive. Participants sat at a distance of approximately 40 cm from the screen.

Stimuli and procedure

After completing the consent forms, participants completed the Positive and Negative Affects Scale (PANAS; D. Watson, Clark, & Tellegen, 1988) to assess their initial mood state. Then, they read the instructions related to a visual perspective-taking (VPT) task designed by Samson and colleagues (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010) and completed the task. Performance on the VPT task is described in a separate study unrelated to automatic imitation. Following completion of the VPT task, participants received the instructions for a stimulus-response matching task referred to as the automatic imitation task (Brass et al., 2001) then completed the task. Before being debriefed, participants completed the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988).

The automatic imitation task (Brass et al., 2001) is a behavioral measure of automatic imitation performance measured through mental chronometry across 240 trials. Each trial was a sequence of (1) an image of a static hand resting on a table (800, 1600, or 2400 ms), (2) three successive images (34, 34, and 500 ms) depicting together either a lift movement of middle or index finger and a number cue “1” or “2” located between the two fingers, and (3) a blue screen presented (3000, 2250, or 1500 ms when resting hand lasted respectively 800, 1600, or 2400 ms).

Participants were instructed to lift their index finger when the “1” cue was presented and their middle finger when the “2” cue was presented. For half of trials, the participant had to lift a finger identical to the one being simultaneously lifted on screen, which formed the congruent condition, and for the other half, the participant had to lift a finger different than the one being lifted on screen, which formed the incongruent condition. It has been consistently demonstrated that participants are faster and less accurate in incongruent than congruent trials and the performance gap, named the automatic imitation interference, is used as an index of imitative tendencies (Cracco et al., 2018).

The VPT task¹ (Samson et al., 2010) is a behavioral measure of perspective-taking performance measured through mental chronometry across 128 trials where the participant judge what is seen in scene displayed on screen from her/his own perspective or from another person’s viewpoint depicted in the center of displayed scene. What could be seen from the participant and other person’s viewpoints was sometimes identical (e.g., they both could see two red discs hanging on the left wall) or different (e.g., the participant could see 3 red discs hanging on the walls but the other person could see only two red discs hanging on the left wall and not the third red disc hanging behind her/him on the right wall). Further details of the task are described in the Supplementary materials. The orthogonal crossing of the congruency between perspectives (i.e., identical vs. different number of red discs) and the perspective to adopt (i.e., judging from the self-perspective or the other person’s perspective) allowed to isolate the extent participants managed to suppress the interference caused by the irrelevant differing perspective and the extent participants are more performant at judging from their own perspective than the other person’s perspective. Details on how these performance dimensions resulted into a classification can be found in Bukowski and Samson (2017).

¹ The stimuli are made freely available on Figshare (Samson & Apperly, 2015).

Narcissism was assessed with the NPI questionnaire in its classic form with 40 items (Raskin & Terry, 1988) adapted in French (Brin, 2011) where the rating format has been changed to the extent of agreement on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree”; this format change has also been adopted for the Dutch adaptation by Barelds and Dijkstra (2010) who showed a high equivalence with its dichotomous rating format ($r = .97, p < .001$). NPI scores were normally distributed (Shapiro-Wilk: $p = 0.988$) and show an excellent internal consistency (40 items; $\alpha = .91$). However, aiming to replicate Obhi et al. (2013) and Buttler, Ward, and Ramsey (2015), we calculated the NPI-16 score from the NPI-40. Results with the NPI-40 are qualitatively identical and provided in Supplementary materials.

Data analysis

The NPI data of one participant and the automatic imitation data of 2 participants were lost due to technical failures and were thus not included in the analyses, leaving 97 participants for the whole sample analyses. Trials of the automatic imitation task on which participants responded beyond 2.5 standard deviations above or below the mean reaction time for each condition (1.08 % of all data) were excluded from statistical analyses.

The VPT performance data was previously included in a larger dataset where individual differences in visual perspective taking performance were examined (Bukowski & Samson, 2017) via unconstrained (i.e. automated) clustering algorithm of participants in 4 distinct profiles of perspective takers. Importantly, this study revealed that 18% of 346 included participants were classified as “egocentric” as they were particularly worse at taking another person’s perspective in comparison to adopting their own viewpoint whereas 22% were classified as “non-flexible”, here labeled “conflicted” as they were particularly poor at suppressing perspectives interferences. In the present study, we use this established classification of participants in our analyses but 8

participants were not classified (due to missing data or excessively low VPT accuracy) in the previous study and thus excluded from analyses examining perspective-taking profiles.

Result

Whole sample automatic imitation and relation to narcissism

Consistently with previous automatic imitation studies and Obhi et al. (2013), we conducted three separate ANOVAs, on RT, accuracy rates, the inverse efficiency scores (IES; i.e., a composite score calculated by dividing RT by accuracy rates), with the Congruency (congruent vs. incongruent trials) as a within-subject factor and the Group (low narcissism vs. high narcissism) as a between-subject variable. We then inspected the correlations between the NPI-16 scores and the automatic imitation interference effects (congruent vs. incongruent) calculated on RT, accuracy, and IES.

Reaction times. The ANOVA on RT revealed a significant main effect of Congruency, $F(1, 95) = 348.857, p < .001, \eta_p^2 = .786$, with slower RTs for incongruent than congruent trials, a non-significant main effect of Group, $F(1, 95) = 1.762, p = .188, \eta_p^2 = .018$, and a non-significant Congruency x Group interaction effect, $F(1, 95) = 0.577, p = .450, \eta_p^2 = .006$.

Accuracy. The ANOVA on accuracy rates revealed a significant main effect of Congruency, $F(1, 95) = 72.045, p < .001, \eta_p^2 = .431$, with lower accuracy rates for incongruent than congruent trials, a non-significant main effect of Group, $F(1, 95) = 1.449, p = .232, \eta_p^2 = .015$, and a non-significant Congruency x Group interaction effect, $F(1, 95) = 0.046, p = .831, \eta_p^2 = .001$.

Inverse efficiency scores. The ANOVA on RT revealed a significant main effect of Congruency, $F(1, 95) = 238.010, p < .001, \eta_p^2 = .715$, with higher IES for incongruent than congruent trials, a non-significant main effect of Group, $F(1, 95) = 2.913, p = .091, \eta_p^2 = .030$,

and a non-significant Congruency x Group interaction effect, $F(1, 95) = 0.003$, $p = .950$, $\eta_p^2 = .001$.

Correlations. The NPI-16 scores were not significantly correlated with the interference effects measured on the RTs, $r(96) = .002$, $p = .981$, $BF_{10} = 0.153$, the accuracy rates, $r(96) = -.049$, $p = .638$, $BF_{10} = 0.148$, and the IES, $r(96) = -.011$, $p = .912$, $BF_{10} = 0.127$. Bayes Factors indicate substantial evidence in favor of the null hypothesis according to which there is no association between narcissism and automatic imitation inference and that the null hypothesis is at least 6 times more likely than the alternative hypothesis that there is an association.

These results replicated the finding that participants experienced an interference caused by automatic imitation but do not replicate the findings of Obhi et al. (2013) according to which a reduced interference is found in the low-narcissism group and the higher narcissism is correlated with lower interference; instead our results replicate the null finding of Buttler, Ward, and Ramsey (2015).

Table 1. Associations between narcissism and automatic imitation interferences across perspective takers profiles

Interference (Congruent – Incongruent)		Interaction with NPI-16 median split			Correlation with NPI-16		
		F	p	η_p^2	r	p	BF_{10}
Conflicted (N = 24)	RT	.008	.929	.000	.095	.659	0.278
	ER	1.308	.265	.056	-.110	.610	0.286
	IES	1.583	.221	.067	-.087	.685	0.274
Flexible (N = 31)	RT	.021	.886	.001	.105	.572	0.260
	ER	.653	.426	.022	.055	.768	0.233
	IES	.736	.398	.025	.069	.712	0.238
Egocentric (N = 29)	RT	10.305	.003	.276	-.583	.001	43.244
	ER	.027	.871	.001	-.075	.700	0.248
	IES	6.308	.018	.189	-.579	.001	39.566

Automatic imitation and relation to narcissism across perspective-taker profiles

The analyses from the previous section were conducted again but separately across the distinct profiles of perspective takers identified in a previous study with the same dataset

(Bukowski & Samson, 2017). These profiles were named the “egocentric” (N=29), “conflicted” (N=24), “flexible” (N=31), and the “altercentric” (N=6), because their visual perspective-taking performance was characterized by, respectively, egocentrism in the sense of a strong performance advantage at adopting one’s own perspective over the other person’s viewpoint, strong interferences on performance caused by the incongruence (or conflict) between viewpoints, weak or normal range interferences, and a strong performance advantage at adopting the other person’s viewpoint over one’s own perspective. The altercentric profile was not analyzed because of its excessively small sample size.

The ANOVA results for the Congruency x Group (low vs. high narcissism) interaction and the correlations between the NPI-16 and the interferences on the RTs, accuracy rates, and IES are described in Table 1. Inspection of the ANOVA interactions and correlations (see Figure 1) with narcissism clearly indicates that only among the egocentric perspective takers there is reduced automatic imitation in narcissists; which replicates the findings of Obhi et al. (2013). Bayes Factors on RTs and IES indicate strong evidence in favor of the alternative hypothesis according to which there is an association between narcissism and automatic imitation interference and that the alternative hypothesis is at least 39 times more likely than the null hypothesis of no association.

Figure 1. How narcissism, measured with the 16 items version of Narcissistic Personality Inventory relates to visual perspective-taking and automatic imitation performance? Among egocentric perspective takers, narcissism is associated with reduced automatic imitation interferences.

Finally, we examined the possible differences between profiles of perspective takers in terms of interferences (RT, accuracy, IES), NPI-16 scores, age, mood, and gender distributions. The one-way ANOVA on the three interferences scores with the perspective-taker profile as a between-subject variable was conducted and revealed a non-significant effect on RTs, $F(2, 83) = 0.839$, $p = .436$, $\eta^2 = .020$, a marginally significant effect on accuracy rates, $F(2, 83) = 2.407$, $p = .097$, $\eta^2 = .056$, with an interference significantly higher in the conflicted group than in the flexible group, $p = .032$, and a non-significant effect on IES, $F(2, 83) = 2.302$, $p = .107$, $\eta^2 = .054$. The interference in the conflicted group was however marginally significantly higher than in the flexible group, $p = .056$, and the egocentric group, $p = .069$ (see Table 2). The same one-way ANOVA conducted on the NPI-16 scores revealed a significant effect on the NPI-16 scores, $F(1, 84) = 5.652$, $p = .005$, $\eta^2 = .121$, with the conflicted group having a larger score, $M = 8.327$, $SD = 2.187$, than the flexible group, $p = .031$, $M = 7.048$, $SD = 2.363$, and the egocentric group, $p = .001$, $M = 6.362$, $SD = 1.897$. The same one-way ANOVA conducted on age was not significant, $F(1, 84) = 0.145$, $p = .865$, and the one conducted on mood via the PANAS results, was not significant either, $F(1, 82) = 2.054$, $p = .135$. At last, a Pearson's chi-square analysis examined the relation between gender and VPT profiles revealed a non-significant rejection of the null hypothesis of independence, $\chi^2(2, N = 85) = 0.947$, $p = .623$. To recap the aforementioned results, the egocentric group was not characterized by distinct mean age, mood, or gender distribution but rather by a lower narcissism score than the other groups. Moreover, the conflicted group had the highest automatic imitation interferences and the highest narcissism score.

Table 2. Narcissism, automatic imitation interferences, age, and gender across perspective-takers profiles

	RT interference	Accuracy interference	IES interference	NPI-16
<u>Conflicted</u>	76.37±43.84	0.08±0.07	142.72±98.05	8.33±2.19
<u>Flexible</u>	74.26±36.47	0.04±0.06	104.35±58.68	7.05±2.36
<u>Egocentric</u>	64.59±27.84	0.05±0.06	105.67±61.36	6.36±1.9

Automatic imitation in high narcissism across perspective-taker profiles

Aiming to compare the narcissists (i.e., high-narcissism half of the group identified via median split) within each perspective-taking profiles and to test our predictions, we examined the possible differences in interferences (RT, accuracy, IES) across the high-narcissism halves of the perspective-takers groups via one-way ANOVAs (see results on Table 3). The ANOVA on RT interference of high-narcissism individuals was significant, $F(2, 40) = 3.636, p = .036$, with an interference significantly lower in the egocentric group than the flexible group, $p = .024$, and conflicted group, $p = .030$. The same ANOVAs was not significant for accuracy rates, $F(2, 40) = 1.085, p = .348$, and for IES, $F(2, 40) = 2.183, p = .127$, with nevertheless an IES interference significantly lower in the egocentric group than the conflicted group, $p = .044$. At last, a one-way ANOVA on the NPI-16 scores was significant, $F(2, 40) = 7.165, p = .002$, with a narcissism level significantly lower in the egocentric group than the flexible group, $p = .049$, and the conflicted group, $p = .001$, and a narcissism level in the conflicted group higher than the flexible group to a marginally significant extent, $p = .057$. In sum, as predicted, the egocentric narcissists showed the lowest automatic imitation interference whereas the conflicted narcissists showed the highest automatic imitation interference. Curiously, however, the narcissism level within the egocentric group was significantly lower than in the other groups.

Table 3. Narcissism, automatic imitation interferences, age, and gender across perspective takers profiles

		RT interference	Accuracy interference	IES interference	NPI-16
<u>Conflicted</u>	High-NPI	77.34±27.68	0.06±0.05	113.29±40.02	10.02±2.02
	Low-NPI	75.68±53.55	0.09±0.09	163.74±121.49	7.00±1.17
<u>Flexible</u>	High-NPI	73.33±34.05	0.03±0.04	95.55±39.00	8.89±1.20
	Low-NPI	75.26±40.07	0.05±0.07	113.73±74.62	5.09±1.57
<u>Egocentric</u>	High-NPI	50.70±19.42	0.05±0.05	80.33±37.69	7.81±1.25
	Low-NPI	79.47±28.33	0.06±0.07	132.83±71.01	4.81±1.02

Discussion

Narcissism has been previously associated with reduced automatic imitation (Obhi et al., 2013), a finding that was later non-replicated with larger samples (Butler et al., 2015; Darda et al., 2019). This study tested the same association with a larger sample and failed to replicate the original finding. However, a re-examination of this relationship by dividing the sample according to an established classification (Bukowski & Samson, 2017) into three profiles of perspective-takers revealed that narcissism was strongly associated with reduced automatic imitation within the egocentric perspective-takers.

In line with the recent efforts to replicate the significant effects reported by weakly powered studies, Butler et al. (2015) attempted to replicate the reduced automatic imitation in narcissism finding of Obhi et al. (2013) with a twice larger sample and found no significant association between automatic imitation and narcissism. The present study used a four times bigger sample size and again could not replicate the significant association between automatic imitation and narcissism reported by Obhi et al. (2013). At last, recent unpublished results from Darda, Butler and Ramsey (2019) showed with even larger samples ($N=203$; $N=201$) that narcissism was not significantly associated with reduced automatic imitation. Based on these results, it would seem that the reduced automatic imitation in narcissism finding is a spurious results caused by a low-powered design. This conclusion goes in line with the lack of relationships between automatic imitation and other personality characteristics associated with social behavioral and social cognitive disorders reported by Butler et al. (2013) and Darda et al. (2019) and, more generally, it fits with the conclusion of a recent meta-analysis of automatic imitation studies that challenged the view that automatic imitation is an indicator of social functioning (Cracco et al., 2018).

Interestingly, the story gets more complicated as we found that taking into account inter-individual differences in perspective taking performance allowed to replicate the reduced

automatic imitation in narcissism finding. More specifically, we found the same association as Obhi et al. (2013) within a specific subsample formed by the application of a recent classification of individuals (Bukowski & Samson, 2017) based on their performance on a visual perspective-taking task (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010). This novel classification allows to classify a person, not merely as a poor or good perspective taker, but as whether the person is self-centered or not and whether the person manages to flexibly suppress her/his own viewpoint when imagining what the other person thinks. Importantly, the subsample where the association was found is referred to as the “egocentric profile” because these individuals are characterized for being much better at adopting their own (i.e., egocentric) perspective than adopting someone else’s perspective. The reasons why the narcissism–automatic imitation association was found specifically in the egocentric group is open to interpretations; we develop hereafter two lines of potential reasons.

The first, most intuitive, line of interpretations is based on the fact that narcissism is strongly associated with self-focus, egocentrism, or self-centeredness in clinical psychology and popular culture (Konrath, Bushman, & Grove, 2009; Morf & Rhodewalt, 2001). Congruently, self-reported perspective-taking habits and empathic concern have been consistently negatively associated with narcissism (Delić et al., 2011; Given-Wilson et al., 2011; Hepper et al., 2014; Vonk et al., 2013; P. J. Watson et al., 1994, 1992; P. J. Watson & Morris, 1991). Moreover, in the study of Bukowski and Samson (2017), the egocentric group had a significantly lower score on the Perspective taking subscale of the Interpersonal Reactivity Index (Davis, 1980). Theoretically, egocentrism should be negatively associated with automatic imitation because egocentrism captures the extent one gives a higher attentional priority to her/his own way of thinking and experiencing the world and automatic imitation results from the extent one pays attention and is sensitive to the other person’s social cues. Hence, partitioning individuals based on their

perspective-taking performance might have allowed to select a key feature of narcissism – egocentrism – and thus a subcategory of narcissists that is particularly self-centered and thus possibly showing particularly low automatic imitation. In short, it could be that only the egocentric narcissists show low automatic imitation. In support for this interpretation, the empirical examination of the automatic imitation interferences across profiles of perspective takers indicates that indeed the high-narcissism half of the egocentric group shows the lowest automatic imitation interferences for RTs and IES in comparison to the other profiles (see Table 2), and to a significant extent for the RTs. Consequently, it could be that the 24 white North-American young adults recruited in Obhi et al. (2013) were largely represented by egocentric narcissists while this possibility is increasingly less likely with larger samples. However, empirical characterization of the egocentric group revealed that the narcissism level in this group is significant lower than in the two other groups, which makes us wonder whether the egocentric narcissists are actual narcissists. Hence, we developed a second, more critical, line of interpretations.

The second of line of interpretations ponders the possibility that the strong negative association between narcissism and automatic imitation was artificially created. This rationale is based on the multidimensional approach we developed to study perspective taking (Bukowski, 2014) according to which the interference (or bias or intrusion) experienced in perspective taking is made of two separate elements: (1) the capacity to detect and suppress the interference, which has been referred to as conflict handling and self-other distinction which partially taps into cognitive control resources, and (2) the relative attentional priority (or focus) given to one's own mental experiences over the other person's mental experiences, which has been referred to as self-centeredness, egocentrism, self-focus, or self-priority. Importantly, the automatic imitation interference is, theoretically, also made of these two elements, which are however systematically confounded when examining its associations or modulations with/by other variables. We have

repeatedly demonstrated in perspective taking that its modulations and associations with/by variables such as emotions (Bukowski & Samson, 2016), sleep privation (Deliens et al., 2018), and individual differences (Bukowski & Samson, 2017) are expressed on only one of those two elements. Unfortunately, the automatic imitation paradigm does not allow to control for the relative attentional priority element because all trials require to focus on the self. Hence, it is possible that associations with imitative interferences are repeatedly non-significant because the tested factor might relate to one specific element out of two confounded elements. If so, it is plausible that in the present study grouping the participants with high self-centered attentional priority in the egocentric profile created a group that is homogenously high in self-centered attentional priority in automatic imitation. Importantly, such homogenization of attentional priority in the egocentric group leaves more variance to be explained by the interference resolution element and thus it is possible that the association with narcissism among egocentric perspective-takers stems essentially from individual differences in resolution of automatic imitation interferences. Alternatively, it is possible that narcissism was associated to automatic imitation because attentional priority to the self was high enough in range in the egocentric group whereas the interference resolution element was more constrained in range since the particularly good or poor individuals in interference resolution were allocated in the flexible and conflicted groups, respectively. Either way, the common interpretation is that selecting the egocentric participants allowed to create the statistical conditions that solve the issue attentional priority and interference resolution are confounded when measuring automatic imitation interferences, which is what enabled to capture the association with narcissism. This interpretation is however speculative and does not pinpoint the specific automatic imitation element that is associated with narcissism; yet, we are confident that automatic imitation research has a lot to gain by developing a novel paradigm that can separate the attentional priority and interference resolution elements.

In the same line of reasoning, we should entertain the possibility that failures to find a reliable association between narcissism and automatic imitation result from the presence of two opposite links between narcissism and automatic imitation: Higher narcissism predicts lower interferences resolution capacities and thus higher interferences while at the same time higher narcissism predicts stronger self-focus priority and thus lower interferences. Although interference resolution capacities of narcissists have never been tested to our knowledge, narcissism is associated with stronger impulsivity (i.e., lack of self-control) (Foster & Iv, 2008; but see also Jonason & Tost, 2010; Miller et al., 2009; Vaughn et al., 2007). Moreover, results from the present study supports this possibility: participants of the conflicted group, who are thus characterized by a low capacity to resolve the interference in perspective taking, also showed the highest automatic imitation interferences (with marginally significant differences) and the highest level of narcissism (with significant differences) of all three groups. If these observations were to become confirmed by further empirical investigations, it would mean that the currently used measure of automatic imitation is inadequate to capture the relationships between imitative tendencies and narcissism.

Finally, these results carry several implications for the study of automatic imitation and of narcissism. First, researchers need to entertain the possibility that the previously reported lack of associations between automatic imitation and social cognitive measures or manipulations may result from the fact that the interference confounds sensitivity to others and interference resolution capacities, two elements that might be differently associated with social cognitive functioning. At a more fundamental level, we could ponder whether the imitative tendencies captured in real-life social interactions tap into interference resolution capacities as it could be argued that most people do not try to resist from imitating the other person, either because they are not aware of imitating or because they have no interest in refraining from imitating. In short, the automatic imitation

interference might not be sensitive enough to adequately capture the associations between social factors and imitative tendencies.

Secondly, the study of individual differences in narcissism might gain from examining cognitive performance. So far, most efforts have consisted in identifying distinct factors in existing self-report questionnaires (Maxwell, Donnellan, Hopwood, & Ackerman, 2011), using distinct self-report questionnaires of narcissism (Darda et al., 2019; Jauk, Weigle, Lehmann, Benedek, & Neubauer, 2017; Vonk et al., 2013), or in devising new self-report questionnaires (Back et al., 2013), which have been reviewed and described as unsuccessful (Krizan & Herlache, 2018; Miller, Lynam, Hyatt, & Campbell, 2017). In contrast, we identified only three attempts to distinguish separate profiles of narcissists in terms of performance on socio-cognitive tasks (Mota et al., 2019; Vonk et al., 2013; Zajenkowski et al., 2018) despite the fact that these objective measures are precisely well-justified to assess individuals characterized for actively seeking to create a positive image of themselves (John & Robins, 1994). The classification in profiles of perspective takers used in the present study offers a novel way to distinguish types of narcissism.

Conclusion

Aiming to replicate a potentially spurious finding according to which automatic imitation is reduced in narcissists (Obhi et al., 2013), we both replicated the original finding and the non-replication findings of later studies (Butler et al., 2015; Darda et al., 2019) by introducing a novel classification of individuals in distinct profiles of perspective takers (Bukowski & Samson, 2017). Although these findings are encouraging us to think that the imitative tendencies might after all relate to social functioning (Cracco et al., 2018), we also encourage a critical stance whereby imitative tendencies might be inadequately captured with the automatic imitation interference.

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Supplementary materials

Supplementary Table 1. Narcissism and automatic imitation across perspective takers profiles

NPI-40 x Interference		ANOVA with median split			Correlation with NPI	
		F	p	η_p^2	r	p
Conflicted (N = 24)	RT	.005	.942	.000	.108	.616
	Accuracy	.100	.755	.005	.024	.910
	IES	.157	.696	.007	.005	.981
Flexible (N = 31)	RT	.014	.906	.000	.027	.886
	Accuracy	.093	.762	.003	.062	.741
	IES	.284	.598	.010	.010	.958
Egocentric (N = 29)	RT	7.215	.012	.211	-.565	.001
	Accuracy	.027	.871	.001	-.084	.665
	IES	4.017	.055	.130	-.541	.002

Supplementary Table 2. Narcissism and automatic imitation across perspective takers profiles

Index	Profile	Effect	F	Sig.	Partial Eta Squared
<u>RT</u>	<u>Conflicted</u>	Congruency	68.012	0	0.756
		Group	0.132	0.72	0.006
		Congruency*Group	0.008	0.929	0
	<u>Flexible</u>	Congruency	124.327	0	0.811
		Group	0.336	0.567	0.011
		Congruency*Group	0.021	0.886	0.001
	<u>Egocentric</u>	Congruency	210.865	0	0.886
		Group	0.517	0.478	0.019
		Congruency*Group	10.305	0.003	0.276
<u>Accuracy</u>	<u>Conflicted</u>	Congruency	24.492	0	0.527
		Group	2.737	0.112	0.111
		Congruency*Group	1.308	0.265	0.056
	<u>Flexible</u>	Congruency	15.438	0	0.347
		Group	2.756	0.108	0.087
		Congruency*Group	0.653	0.426	0.022
	<u>Egocentric</u>	Congruency	22.508	0	0.455
		Group	1.912	0.178	0.066
		Congruency*Group	0.027	0.871	0.001
<u>IES</u>	<u>Conflicted</u>	Congruency	47.743	0	0.685
		Group	1.686	0.208	0.071
		Congruency*Group	1.583	0.221	0.067
	<u>Flexible</u>	Congruency	97.6	0	0.771
		Group	0.822	0.372	0.028
		Congruency*Group	0.736	0.398	0.025
	<u>Egocentric</u>	Congruency	103.969	0	0.794
		Group	1.605	0.216	0.056
		Congruency*Group	6.308	0.018	0.189

Visual perspective taking task. Participants were shown a room with discs pinned on one or both lateral walls (up to 3 discs). A human avatar (gender congruent with the participant) was positioned in the center of the room and was facing either the left or the right wall. Participants were instructed to make judgments about the number of discs that they can see from their own point of view (self-perspective condition) or about the number of discs that the avatar can see (other-perspective condition). The avatar and the participants could see either the same number of discs (consistent perspective condition) or a different number of discs (inconsistent perspective condition). Each trial was a sequence of a fixation cross, a 500 ms blank screen, a perspective prompt ('SHE'/'HE' or 'YOU'), a 500 ms blank screen, a number prompt (0/1/2/3), and the picture of the room (see Figure 1). The number prompt could match or mismatch the number of red discs visible from the prompted perspective. For example, a male participant could be prompted with the word "HE" and the number "0" to judge whether the avatar sees 0 disc in a scene with two discs behind the avatar. This trial would be an other-perspective / inconsistent perspectives trial in which the number prompt matches what is visible in the room from the prompted perspective. Participants had to press the upward arrow when the number prompt matched or the downward arrow when the number prompt mismatched. A feedback was presented after each response indicating whether the response was correct ('CORRECT' or 'INCORRECT') or when 2000 ms had elapsed ('NO RESPONSE'). The task included a total of 128 trials, evenly spread across experimental conditions (Perspective x Consistency x Matching) and divided into 2 blocks of 52 trials plus a set of 26 practice trials. Trials within each block were presented in a randomized order. Within these 128 trials, there were 18 filler trials to avoid anticipatory responses. Reaction times and errors were collected but only matching trials were taken into account for the analyses because the task difficulty between conditions was unbalanced in mismatching trials (for details, see the original study by Samson et al., 2010).