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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 low concern for others and high self-focus. Congruently, reduced automatic imitation in narcissists was reported in one study (23 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.

1. 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; P.K. Jonason & Krause, 2013; Munro, Bore, & Powis, 2005; Ritter et al., 2011; Vonk, Zeigler-hill, Mayhew, & Mercer, 2013; P.J. Watson et al., 1984; P.J. Watson & Biderman, 1994; P.J. Watson, Biderman, & Sawrie, 1994; 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; M. 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 therefore the question of which specific social-cognitive mechanism are altered in narcissists remains open.

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) social cues, such as gestures, tone of voice, and facial

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expressions, activate specific corresponding autonomic, motoric and affective responses and (2) this coupling occurs depending on the extent to which we pay attention to 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 to which individuals are interfered by their tendencies to imitate another person's irrelevant finger movements (Brass, Bekkering, Wohlschläger, & Prinz, 2000). 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 seen movements are uninformative about the participant's instructed movements), which translates into imitation interference that is 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, Giacomin, & 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, 2020, with $N = 203$ then 201). Hence, accumulated evidence supports the view that the finding of reduced automatic imitation in narcissists 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., 2020).

This study aimed to replicate the finding of reduced automatic imitation in narcissists (*goal* 1) 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 two 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. Congruently, researchers currently refer to the automatic imitation paradigm either as a measure of the capacity to control self-other interferences (or self-other distinction), which has been argued to be functionally and anatomically distinct from domain-general cognitive control (M. Brass, Ruby, & Spengler, 2009; Liepelt et al., 2016; Milward & Sebanz, 2016), or as a measure of imitative tendencies that can be increased via factors influencing attention to the other, such as administration of intranasal oxytocin (De Coster, Mueller, T'Sjoen, De Saedeleer, & Brass, 2014) and prosocial priming (Leighton, Bird, Orsini, & Heyes, 2010). Critically, knowing that narcissism has been associated with both low self-control (Jonason & Tost, 2010; Miller et al., 2009; Vaughn et al., 2007; then but see also Foster & Trimm IV, 2008) 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 that the two associations cancel each other out. In this study, we tested both explanations (profiles of narcissism and two opposite relations to automatic imitation) and hypothesized that distinguishing profiles of narcissists based on whether they are highly self-focused and whether they poorly resist interferences could reveal two opposite relationships between narcissism and automatic imitation.

To date, existing research dissociating types of narcissism exploits exclusively self-report questionnaires. The dominant approach is to dissociate the vulnerable type of narcissists, characterized by hypersensitivity, defensiveness, low self-esteem, hostility, and negative emotionality in general, from the grandiose type, characterized by highly positive self-views, exhibitionism, entitlement, assertiveness, and high need for achievement (J.D. Miller et al., 2011; M. Zajenkowski & Szymaniak, 2019). Hence, they do not differ in terms of self-focus. Another similar influential distinction can be made between rivalry and admiration dimensions of narcissism, where the former type describes antagonistic orientations, disagreeableness, and emotional instability and the latter describes highly positive views and assertiveness (Back et al., 2013). A third influential subdivision dissociates grandiose narcissism into agentive narcissism, where the highly positive self-views stem from overstated agentive qualities (e.g., creativity, intellect), and communal narcissism, where it is the communal qualities that are overstated (e.g., agreeableness, cooperativeness, fairness) while still being characterized by grandiosity, high self-esteem, power, entitlement (Gebauer, Sedikides, Verplanken, & Maio, 2012; Nehrlich, Gebauer, Sedikides, & Schoel, 2019). Unfortunately, none of these subdivisions dissociate narcissists in terms levels of self-focus or levels of resistance to interference and none used performance-based assessment tools to distinguish narcissists. In the field of automatic imitation, all studies examining individual differences have assessed automatic imitation as a single unidimensional score confounding attentional focus to the other and resistance to self-other interferences. However, one study recently dissociated two socio-cognitive personality profiles with a battery of socio-cognitive measures (Shaw et al., 2020): The first profile being characterized by a more rigid personality style, negative affect, higher tendencies for personal distress and poor emotion regulation, whereas the second profile is characterized by higher flexibility in personality styles, more adaptive emotional regulation strategies, better emotional cognitive flexibility performance, and, most importantly, a low automatic imitation interference score interpreted by the authors as better resistance to self-other interference. Although promising, this latter subdivision does not dissociate in terms of attentional self-focus. At last, in a very closely related field of social cognition, visual perspective-taking performance was recently shown to vary across two-dimensions: resistance to self-other interferences (also named self-other conflict handling or self-other distinction), and relative attentional focus (also named self-other salience or priority) between the self and the other (H. Bukowski & Samson, 2017). Most importantly, the assessment tool, known as the dot paradigm (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010), is the only socio-cognitive measure that objectified the existence of distinct profiles among healthy individuals on these two dimensions: those characterized by low versus high relative attentional focus on the self, named respectively the *egocentric* and *altercentric* perspective-takers, and those characterized by low versus high resistance to self-other interference, named respectively the *non-flexible* and *flexible* perspective-takers.

Hence, the present study aimed to test the possibility that distinct profiles in automatic imitation might be differently related to narcissism (*goal 2*) by using our two-dimensional classification of perspective-takers in accordance with the Narcissistic Personality Inventory (Raskin & Terry, 1988) and automatic imitation task (Brass et al., 2000) used in the original study of Obhi et al. (2013). Specifically, the two-dimensional classification tool is based on a measure of level-1 visual perspective-taking performance, that is, the ability to judge which objects another person can see. The task requires to flexibly shift between the self-perspective and the other person's visual perspective and to perform as fast and accurately as possible despite self-other interferences are being experienced when visual perspectives are in conflict (e.g., I see 2 dots from my perspective but she can see only one dot from her perspective). In order to classify individuals in profiles, performance in terms of reaction times and accuracy was combined to obtain two indices: (1) the performance advantage at judging from one's own perspective over judging from the other person's visual perspective and (2) the extent of performance reduction caused by the self-other interferences in trials with conflicting visual perspectives in comparison to the easier trials devoid of perspective conflicts and interferences. A two-step (i.e., unsupervised hierarchical) cluster analysis conducted

on two indices from 346 participants (replicated on 260 other participants) revealed that partitioning them in the four aforementioned profiles best explained individual differences. Exploiting this already established classification in perspective-taking performance allowed to distinguish self-focused narcissists from low self-control narcissists, paving the way to examining distinct profiles of narcissists as well as addressing the issue that the automatic imitation interference confounds two elements.

At last, the present study aimed to test the hypothesis that there are two opposite relationships between narcissism and the automatic imitation interference (*goal 3*) – low attentional focus on the other reducing the interference strength and low resistance to interference allowing the interfering source to produce a strong interference with limited or no resistance – we predicted that narcissists classified as egocentric would have the lowest automatic imitation interference whereas the narcissists classified as non-flexible would show the highest automatic imitation interference.

2. Method

2.1. Participants

One-hundred healthy adults (31 females, mean age: 22.52, age range: 19–26) participated in the study in return for 10 euros. A power analysis with Gpower 3.1 (alpha = 0.05, power = 0.80, *F* test for within/between interaction) was conducted based the sole study (Obhi et al., 2013) linking narcissism to reduced automatic imitation at time of completion of the study; based on the narcissism x congruency interaction effect on efficiency scores ($\eta_p^2 = 0.26$ reported page 4, penultimate paragraph), it was recommended to recruit a minimal sample size of 26 participants. Because the reported effect came from a small-sample study and given the fact 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. 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 study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain (Projet2012-27, November 2012). 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.

2.2. Apparatus

The experiment was run on a Dell Pentium 4 (2.8 GHz) computer with a 17-inch monitor (1024 × 768, 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.

2.3. Stimuli and procedure

After completing the consent forms, participants completed the Positive and Negative Affects Scale (PANAS; D. 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 et al. (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., 2000) then completed the task. Before being debriefed, participants completed the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988).

The automatic imitation task (Brass et al., 2000) is a behavioral measure of automatic imitation and the capacity to resist to the interference caused by the automatic imitation. The present study used the original paradigm (Brass et al., 2000; see Fig. 1) in order to closely replicate the study of Obhi et al. (2013). Performance was 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. In half of the trials, the participant had to lift a finger identical to the one being simultaneously lifted on screen, which formed the congruent condition, and in the other half, the participant had to lift a finger different from 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 task[1] (Samson et al., 2010) is a behavioral measure of perspective-taking performance measured through mental chronometry across 128 trials where the participant judges what is displayed on screen from her/his own perspective or from another person's viewpoint depicted in the center of displayed scene (see Fig. 1; stimuli available on Figshare, Samson & Apperly, 2015). What could be seen from the participant's 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 to which participants managed to suppress the interference caused by the irrelevant differing perspective and the extent to which participants are more performant at judging from their own than from the other person's perspective. Details on how these performance dimensions resulted into a classification can be found in H. Bukowski and Samson (2017).

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 was changed to the extent of agreement on a 7-point Likert scale ranging from "Strongly disagree" to "Strongly agree"; this format change was also adopted for the Dutch adaptation by Barelds and Dijkstra (2010) who showed a high equivalence with its dichotomous rating format ($r = 0.97$, $p < .001$). NPI scores were normally distributed (Shapiro-Wilk: $p = .988$) and show an excellent internal consistency (40 items; $\alpha = 0.91$). However, aiming to replicate Obhi et al. (2013) and Butler et al. (2015), we calculated the NPI-16 score from the NPI-40. Results with the NPI-40 are qualitatively identical and provided in Supplementary materials.

2.4. Data analysis

2.4.1. Exclusions, losses, and partition of participants

The NPI data of one participant and the automatic imitation data of 2 participants were lost due to technical failures and therefore not

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

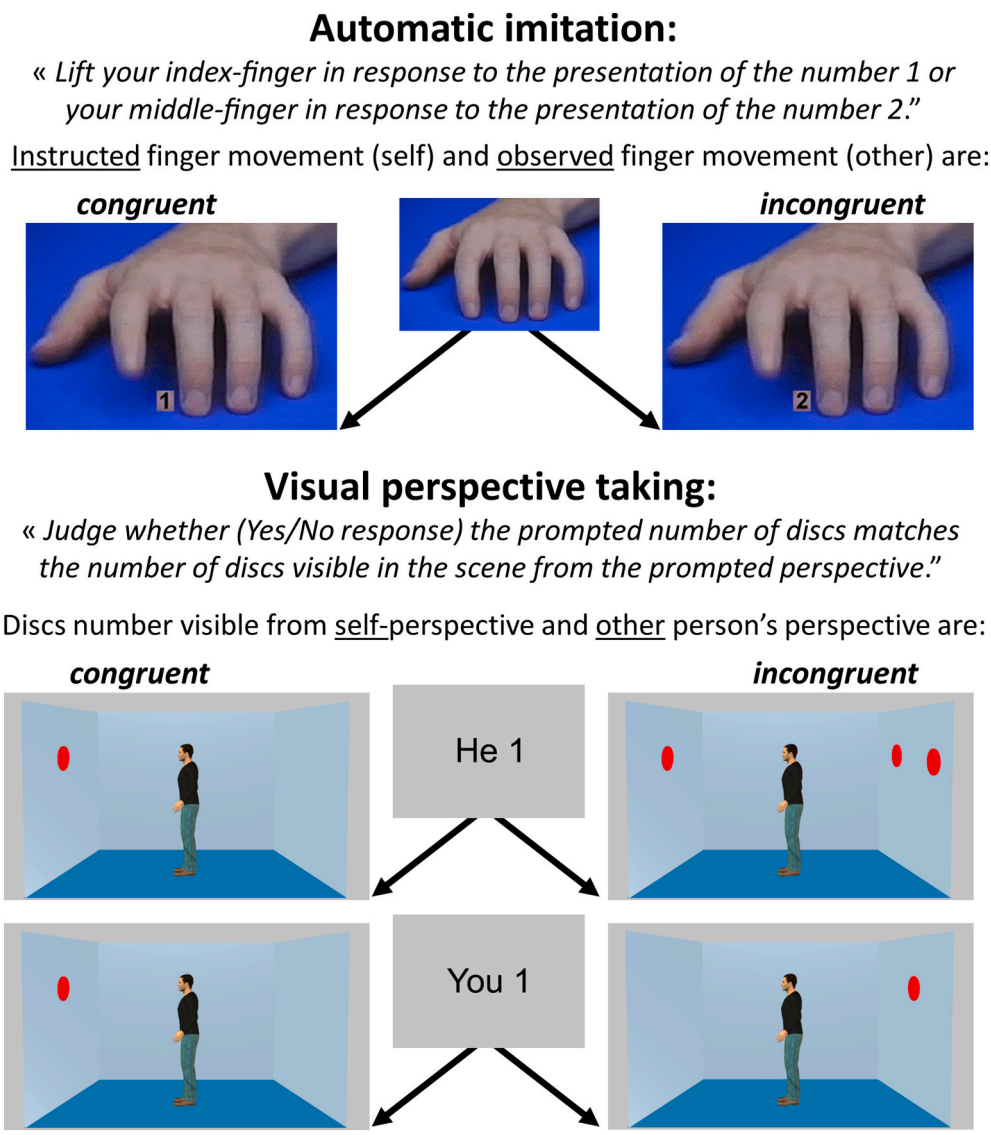

Fig. 1. Schematic of automatic imitation and visual perspective-taking tasks. Both tasks compare congruent and incongruent trials on speed and accuracy performance to measure the extent of self-other interference. In the depicted four perspective-taking trials the correct answer is "Yes/match".

included in the analyses, leaving 97 participants for the whole sample analyses. As in Obhi et al. (2013), the 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 (H. Bukowski & Samson, 2017) via unsupervised (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.

2.4.2. Analyses plan

In line with our first goal to replicate the main findings of Obhi et al. (2013), we examined the performance difference between congruent and incongruent trials (i.e., the automatic imitation interference) on the same three dependent variables as in the Obhi et al. (2013), reaction times (RT), accuracy rates, and inverse efficiency scores (IES; calculated by dividing the RT by the accuracy rate), between the low and high narcissists and the continuous relation between individual differences in narcissism and the size of the automatic imitation interference. The high versus low comparisons were conducted via three separate ANOVAs (RT, accuracy rates, IES) 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. The continuous relation was tested via three correlations between the NPI-16 score and the size of the performance difference between congruent and incongruent trials. Our second goal was to test the possibility that distinct profiles in automatic imitation might be differently related to narcissism To this aim, we used the clustering results of the visual perspective-taking performance to partition the participants according to their level of self-focus (i.e., relative performance advantage for the self-perspective) and self-control (i.e., extent of self-other interference)

and re-examined the analyses described in the previous paragraph (automatic imitation interference in three ANOVAs for high vs. low narcissism and in three correlations to narcissism).

Our third goal was to test the hypothesis that there are two opposite relationships between the automatic imitation interference and narcissism – a negative association with the self-focus feature of narcissism and a positive association with the low self-control feature of narcissism. We tested this hypothesis by examining with a priori planned contrasts whether the highly narcissistic participants classified as egocentric have a lower automatic imitation interference than the highly narcissistic classified as non-flexible.

3. Result

3.1. Goal 1: replication of relation between automatic imitation and to narcissism (whole sample)

3.1.1. Reaction times

The ANOVA on RT revealed a significant main effect of Congruency, F (1, 95) = 348.857, $p < .001$, $\eta_p^2 = 0.786$, with slower RTs for incongruent than congruent trials, a non-significant main effect of Narcissism (i.e., high vs. low narcissism), F (1, 95) = 1.762, $p = .188$, $\eta_p^2 = 0.018$, and a non-significant Congruency x Narcissism interaction effect, F (1, 95) = 0.577, $p = .450$, $\eta_p^2 = 0.006$.

3.1.2. Accuracy

The ANOVA on accuracy rates revealed a significant main effect of Congruency, F (1, 95) = 72.045, $p < .001$, $\eta_p^2 = 0.431$, with lower accuracy rates for incongruent than for congruent trials, a non-significant main effect of Narcissism, F (1, 95) = 1.449, $p = .232$, $\eta_p^2 = 0.015$, and a non-significant Congruency x Narcissism interaction effect, F (1, 95) = 0.046, $p = .831$, $\eta_p^2 = 0.001$.

3.1.3. Inverse efficiency scores

The ANOVA on IES revealed a significant main effect of Congruency, F (1, 95) = 238.010, $p < .001$, $\eta_p^2 = 0.715$, with higher IES for incongruent than for congruent trials, a non-significant main effect of Narcissism, F (1, 95) = 2.913, $p = .091$, $\eta_p^2 = 0.030$, and a non-significant Congruency x Narcissism interaction effect, F (1, 95) = 0.003, $p = .950$, $\eta_p^2 = 0.001$.

3.1.4. Correlations

The narcissism (i.e., NPI-16) scores were not significantly correlated with the congruency effects (i.e., self-other interference) measured on the RTs, $r(96) = 0.002$, $p = .981$, $BF_{10} = 0.153$, the accuracy rates, $r(96) = -0.049$, $p = .638$, $BF_{10} = 0.148$, and the IES, $r(96) = -0.011$, $p = .912$, $BF_{10} = 0.127$. 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 no 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 Butler et al. (2015).

3.2. Goal 2: relation between automatic imitation and narcissism across perspective-taker profiles

As stated in the analysis plan, 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 (H. Bukowski & Samson, 2017). These profiles were named the "egocentric" ($N = 29$), "conflicted" (N = 24), "flexible" (N = 31), and the "altercentric" ($N = 6$; not analyzed due to small sample size) based on their performance (a normalizing index combined accuracy and RT) at judging what another person and oneself can see in scenes with objects hanging on walls (for details of the task, see Methods and supplementary materials Section 2). Specifically, the egocentric group was characterized by egocentrism in the sense of a strong performance advantage at adopting one's own perspective over the other person's viewpoint, whereas the altercentric group had a particularly high performance advantage at adopting the other person's perspective; the conflicted group was characterized by strong interferences on performance caused by the incongruence (or conflict) between viewpoints, whereas the flexible group had small or normal range interferences.

The ANOVA results for the Congruency x Narcissism (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 Fig. 2) 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.

3.3. Goal 3: automatic imitation between egocentric and non-flexible narcissists

The a priori planned contrasts on the RT interference of high-narcissism individuals revealed that the egocentric group experienced a significant lower interference than the conflicted group, $t(23) = 2.091$, $p = .048$ (all means and standard deviations are reported in Table 3). The same contrast on the accuracy rates revealed no statistical difference between the two groups, $t(23) = 0.273$, $p = .787$. The same contrast on the IES revealed that the egocentric group experienced a significant lower interference than the conflicted group, $t(23) = 2.836$, $p = .009$.

4. 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., 2020). This study tested the same association with a larger sample and did not replicate the original finding. However, a re-examination of the automatic imitation–narcissism relationship by dividing the sample according to an established classification (H. 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 recent efforts to replicate the significant effects reported by weakly powered studies, Butler et al. (2015) attempted to replicate the reduced automatic imitation in the narcissism findings of Obhi et al. (2014) 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. (2014). At last, recent results from Darda et al. (2020) 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 finding of reduced automatic imitation in narcissism is a spurious result caused by a low-powered design. This conclusion corroborates the lack of relationships between automatic imitation and other personality characteristics associated with social behavioral and social cognitive disorders reported by Butler et al. (2015) and Darda et al. (2020) 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

Table 1
Associations between narcissism (NPI-16) and automatic imitation interferences across perspective takers profiles.

Automatic imitation interference (Congruent – Incongruent) across profiles of perspective takers		High vs. low NPI-16			Correlation to NPI-16		
		F	*p*	η_p^2	*r*	*p*	BF_{10}
Conflicted (*N* = 24)	RT	0.008	0.929	0.000	0.095	0.659	0.278
	ER	1.308	0.265	0.056	−0.110	0.610	0.286
	IES	1.583	0.221	0.067	−0.087	0.685	0.274
Flexible (*N* = 31)	RT	0.021	0.886	0.001	0.105	0.572	0.260
	ER	0.653	0.426	0.022	0.055	0.768	0.233
	IES	0.736	0.398	0.025	0.069	0.712	0.238
Egocentric (*N* = 29)	RT	**10.305**	**0.003**	**0.276**	**−0.583**	**0.001**	**43.244**
	ER	0.027	0.871	0.001	−0.075	0.700	0.248
	IES	**6.308**	**0.018**	**0.189**	**−0.579**	**0.001**	**39.566**

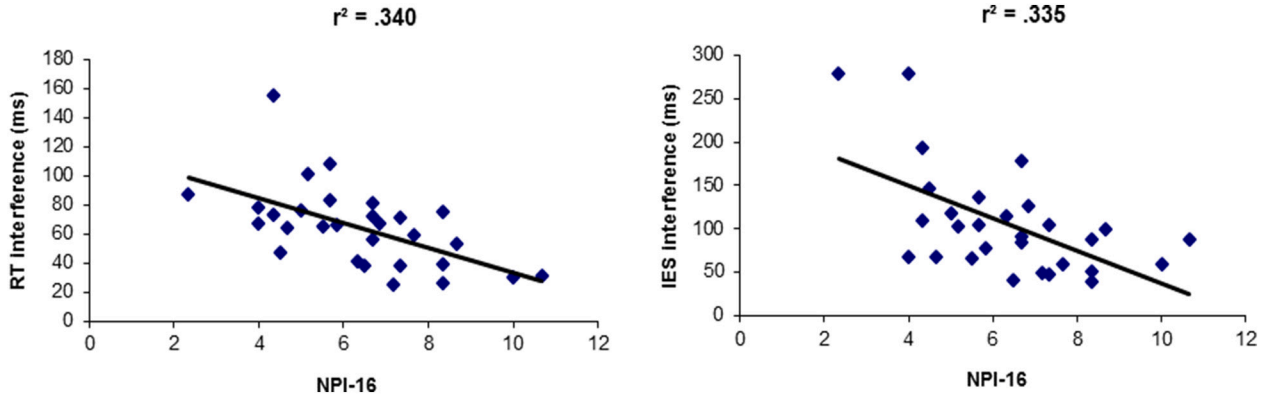

Fig. 2. How narcissism, measured with the 16 items version of Narcissistic Personality Inventory relates to visual perspective-taking and automatic imitation performance? Among egocentric perspective takers, narcissism is associated with reduced automatic imitation interferences.

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

Perspective takers	Narcissism groups	RT interference	Accuracy interference	IES interference	NPI-16
Conflicted	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
Flexible	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
Egocentric	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

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 finding of reduced automatic imitation in narcissism. More specifically, we found the same association as Obhi et al. (2014) within a specific subsample formed by the application of a recent classification of individuals (H. Bukowski & Samson, 2017) based on their performance on a visual perspective-taking task (Samson et al., 2010). This novel classification allows to classify a person, not merely as a poor or good perspective taker, but also as self-centered or not, and as being able, or not, 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; hereafter we develop two lines of potential reasoning.

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 (Delič 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; for a meta-analysis, see Urbonaviciute & Hepper, 2020). Moreover, in the study of H. 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 to which one gives a higher attentional priority to her/his own way of thinking and experiencing the world, and automatic imitation results from the extent to which 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 of 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 a significantly lower automatic imitation interferences for RTs and IES in comparison to the conflicted group (see Table 3). Consequently, it could be that the 24 white North-American young adults recruited in Obhi et al. (2014) 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 significantly lower than in the two other groups, which makes us wonder if 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 self-other interference (or bias or intrusion) experienced in perspective taking consists 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, self-salience, or self-priority. Importantly, the automatic imitation interference also consists, theoretically, 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 (H. Bukowski & Samson, 2016), sleep privation (Deliens et al., 2017), and individual differences (H. Bukowski & Samson, 2017) are expressed on only one of these two elements. Unfortunately, the automatic imitation paradigm does not allow to control for the relative attentional priority element because all trials require a 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 homogeneously 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 the resolution of automatic imitation interferences. Alternatively, it is possible that narcissism was associated with 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 individual scores 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 of attentional priority and interference resolution being confounded when measuring automatic imitation interferences, which is what allowed us to capture the association with narcissism. This interpretation is speculative, however, 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 failure to find a reliable association between narcissism and automatic imitation results from the presence of two opposite links between narcissism and automatic imitation: Higher narcissism predicts lower interference resolution capacities and thus higher interference while at the same time higher narcissism predicts stronger self-focus priority and thus lower interference. Although interference-resolution capacities of narcissists, to our knowledge, have never been tested, narcissism is associated with stronger impulsivity (i.e., lack of self-control) (Jonason & Tost, 2010; Miller et al., 2009; Vaughn et al., 2007; then but see also Foster & Trimm IV, 2008). Moreover, results from the present study support this possibility: participants of the conflicted group, characterized by a low capacity to resolve the interference in perspective taking, also showed the highest automatic-imitation interferences (and, statistically, significant higher than the egocentric group) and the highest level of narcissism (with, statistically, significant differences) of all three groups (see Supplementary materials Section 3). 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 automatic-imitation 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 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 adequate to 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., 2020; 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; J.D. 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; M. 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.

Several methodological limitations must be highlighted. First, although our power analysis suggested our sample sizes were adequate to replicate Obhi et al. (2013), our sample sizes were not sufficiently powered according to more recent standards for correlations in individual differences studies (e.g., Schönbrodt & Perugini, 2013) and especially so for the analyses conducted within each profile of perspective takers. In this respect, the reported results should be considered as preliminary findings that await replication. Second, although we adopted the same automatic-imitation paradigm as Obhi et al. (2013) to replicate their methods, in this paradigm the spatial compatibility (i.e., directional alignment) between the depicted hands and the participants' hand contribute to the interference, albeit to a smaller extent than the imitative compatibility (Brass et al., 2000; C. Catmur & Heyes, 2011; Heyes, 2011; Jiménez et al., 2012). Nevertheless, the interference confounds spatial compatibility and imitative compatibility, which implies that our findings are probably only partially explained by socio-cognitive interpretations advanced so far. Third, regarding the dot perspective-taking paradigm, it is debated whether the interference observed when participants judge their own

perspective reflects a spontaneous inference of what the other person sees (i.e., implicit mentalizing) or merely a directional cueing by the person's gaze (Catmur, Santiesteban, Conway, Heyes, & Bird, 2016; Santiesteban, Catmur, Hopkins, Bird, & Heyes, 2014). However, this potential issue concerns the inferential process inducing the interference for a particular experimental condition but it does not relate to the capacity to resist the interference, nor to the extent of relative attentional focus on the other person. We have shown, however, that in a non-mentalizing context the interference is several times smaller than in the dot paradigm, and that artificially increasing the attentional focus on the other person's gaze was necessary to reproduce the interference obtained in the dot paradigm (H. Bukowski, Hietanen, & Samson, 2016).

5. Conclusion

Aiming to replicate a potentially spurious finding according to which automatic imitation is reduced in narcissists (Obhi et al., 2014), we both replicated the original finding and the non-replication findings of later studies (Butler et al., 2015; Darda et al., 2020) by introducing a novel classification of individuals in distinct profiles of perspective takers (H. Bukowski & Samson, 2017). Although these findings encourage us to think that the imitative tendencies might after all relate to social functioning (Cracco et al., 2018), we also put forward a critical stance whereby imitative tendencies might be inadequately captured by the automatic imitation interference.

CRediT authorship contribution statement

Henryk Bukowski: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Writing - original draft; Writing - review & editing.

Dana Samson: Conceptualization; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Roles/Writing - original draft.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2020.103235.

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