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What's in a blush? Physiological blushing reveals narcissistic children's social-evaluative concerns

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Abstract

Physiological responses can reveal emotional states that individuals are unwilling to admit to others. Here, we studied what blushing reveals about the emotional states of narcissistic children. Narcissistic children (i.e., those high on the personality trait of narcissism) have a pervasive sense of grandiosity. We theorized that narcissistic children are so invested in their sense of grandiosity that even modest praise can make them feel depreciated. Because narcissistic children may not admit this feeling to others, we measured their physiological blushing: an involuntary reddening of the face that occurs when individuals anticipate being depreciated. Unlike other emotional expressions, blushing cannot be faked. Children ($N = 105$, ages 7–12) completed the Childhood Narcissism Scale and were then invited to sing a song on stage. They were randomly assigned to receive inflated praise (e.g., “You sang incredibly well!”), modest praise (“You sang well!”), or no praise for their performance. Blushing was recorded using photoplethysmography and temperature sensing. Afterward, children were asked how much they thought they had blushed. As predicted, narcissistic children—unlike nonnarcissistic children—blushed when they received modest praise, not when they received inflated praise. Specifically, they showed increased blood volume pulse (i.e., fast changes in blood volume with each heartbeat). Strikingly, when asked, narcissistic children denied blushing, perhaps to hide their vulnerabilities. Thus, blushing revealed social-evaluative concerns that narcissistic children wished to keep private.

KEYWORDS

blushing, childhood, experimental, narcissism, praise

1 | INTRODUCTION

Narcissists have pervasive feelings of grandiosity and self-importance. As they desire to portray a grandiose image of themselves, they may hide or conceal their feelings from others, especially those feelings that signal vulnerability. Here, we examined what physiological blushing—an involuntary reddening of the face that cannot be hidden or

concealed—reveals about the emotional states of narcissists. We did so in late childhood (age 7–12), when narcissism first emerges and blushing becomes especially common.

1.1 | Childhood narcissism

Narcissism is an everyday or subclinical personality trait on which people from the general population differ from one

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another (Morf & Rhodewalt, 2001). Narcissism has both grandiose manifestations (such as boastful, aggressive behavior) and vulnerable manifestations (such as a fear of being evaluated negatively; Krizan & Herlache, 2018; Pincus & Lukowitsky, 2010). Even in its subclinical form, narcissism predicts maladjustment ranging from aggression and violence to addiction and depression (Carter, Johnson, Exline, Post, & Pagano, 2012; Dawood & Pincus, 2018; Larson, Vaughn, Salas-Wright, & Delisi, 2015; Rasmussen, 2016). In its extreme form, narcissism can develop into narcissistic personality disorder, marked by “a pervasive pattern of grandiosity (in fantasy or behavior), need for admiration, and lack of empathy” (American Psychiatric Association, 2013). Consistent with a developmental psychopathology perspective (Thomaes, Brummelman, Miller, & Lilienfeld, 2017), narcissistic personality disorder is most likely an extreme manifestation of the trait of narcissism (Miller & Campbell, 2010).

Narcissism first emerges around the age of 7, when children can form global evaluations of themselves, such as “I am incredible” (Barry, Frick, & Killian, 2003; Thomaes, Stegge, Bushman, Olthof, & Denissen, 2008). Children with high narcissism levels (hereafter, narcissistic children) feel superior to others, believe they are entitled to privileges, and crave admiration (Thomaes, Stegge et al., 2008). Much like Narcissus, they are wrapped up in their image of themselves. They have grandiose views of themselves, and they want to impress those views on the minds of others. To do so, they try to be at the center of attention, brag about themselves, and show off (Thomaes & Brummelman, 2016). Unsurprisingly, they expect to be lavished with extremely positive, inflated praise, such as “You are amazing!” and “You did incredibly well!” An observational-longitudinal study (Brummelman, Nelemans, Thomaes, & Orobio de Castro, 2017) found that narcissistic children do not elicit more inflated praise from their parents, but those who receive a lot of inflated praise can develop higher narcissism levels over time. Thus, narcissistic children may be more used to being praised in inflated ways.

However, reality does not provide narcissistic children with a continuous supply of inflated praise. Only about 25% of the praise children receive is inflated (Brummelman, Thomaes, Orobio de Castro, Overbeek, & Bushman, 2014). What happens when narcissistic children do not receive the praise they think they deserve? When they are criticized blatantly, they may lash out angrily (Thomaes, Stegge, Olthof, Bushman, & Nezelek, 2011) or aggressively (Thomaes, Bushman, Stegge, & Olthof, 2008). Yet, when they are praised in modestly positive, noninflated ways, they may worry that others do not see them as positively as they see themselves. They may feel exposed for being seen as good rather than great (Crozier, 2004). Thus, despite being positive, noninflated praise may undermine the grandiose self that narcissistic children seek to create in the eyes of others.

1.2 | Narcissistic blushing

Even if narcissistic children worry about others’ impressions of them, they may not admit this feeling to others. To maintain their grandiose image, they may hide their vulnerabilities (Thomaes, Brummelman, & Sedikides, 2017). For example, when adult narcissists are ostracized, they show increased activity in the social-pain area of their brain, yet they claim not feeling distressed (Cascio, Konrath, & Falk, 2015). Similarly, adult narcissists have elevated levels of the stress-hormone cortisol, yet they report not feeling stressed (Reinhard, Konrath, Lopez, & Cameron, 2012). Adult narcissists claim having high self-esteem; yet, when pressured to be honest, they tone down this claim (Myers & Zeigler-Hill, 2012). What narcissists say they feel may not be what they actually feel.

To probe whether narcissistic children feel worried—even if they are unwilling to admit to their worries—we recorded an emotional expression that, unlike other emotional expressions, cannot be faked: blushing (De Waal, 2013). Blushing is an involuntary reddening of the face that occurs in response to perceived social scrutiny or evaluation (Leary, Britt, Cutlip, & Templeton, 1992), when individuals are worried that others might form unfavorable impressions of them (Chen & Drummond, 2008; Leary & Meadows, 1991). The reddening of the face arises from an accumulation of red blood cells in the superficial venous plexus in the facial skin (Drummond, 2013). Blushing differs from flushing, which involves the same physiological response in the absence of social scrutiny or evaluation (e.g., when individuals are angered, sexually aroused, or engaging in physical exercise; Leary et al., 1992; Stein & Bouwer, 1997).

Blushing arises in early childhood, when children start evaluating themselves through the eyes of others (Nikolić, Colonesi, de Vente, & Bögels, 2016). Darwin (1872) posited that blushing “depends in all cases on the same principle; this principle being a sensitive regard for the opinion, more particularly for the depreciation of others” (p. 337). Research supports this position, showing that people typically blush when they feel scrutinized (Chen & Drummond, 2008), evaluated (Bögels, Alberts, & De Jong, 1996), exposed (Crozier, 2004), shy (Nikolić, Colonesi et al., 2016), or embarrassed (Drummond & Su, 2012). Thus, blushing does not capture an isolated emotion, but rather a self-conscious state marked by worry about being depreciated by others, which is common to several emotions. If narcissistic children indeed blush when praised in noninflated ways, this would concur with clinical observations that narcissistic children may be burdened “by their terror—revealed only by their blushing—and their inhibition of being exposed as inferior, ugly, or inadequate” (Bleiberg, 2004, p. 123).

1.3 | Capturing the blush

Researchers often assess blushing by asking individuals how much they blush. This is problematic, however, because individuals may not perceive or report blushing accurately (Edelmann & Baker, 2002). Overcoming this limitation, we recorded blushing physiologically, using photoplethysmography and temperature sensing. We recorded core components of blushing: blood volume pulse (i.e., fast changes in blood volume with each heartbeat), average blood volume (i.e., slow changes in blood pooling in arteries, veins, and capillaries), and skin temperature (i.e., slow changes in accumulated effects of blood volume pulse; Shearn, Bergman, Hill, Abel, & Hinds, 1990). When people blush, blood volume pulse rises instantly, but blood volume and skin temperature rise much more slowly, as blood gradually accumulates in the face (Allen, 2007; Drummond, 2013). Thus, blood volume pulse captures a sudden blush, whereas average blood volume and skin temperature capture a slowly accumulating blush.

1.4 | Present study

This experiment, for the first time, examined the psychophysiology of narcissism in late childhood. We theorized that narcissistic children are so invested in creating and maintaining their grandiose self that even modest praise can make them feel depreciated, revealed by their blushing. We assessed children's narcissism levels. We then invited them to sing a song on stage, and gave them inflated praise, noninflated praise, or no praise for their performance. We recorded their blushing, and afterward asked them how much they thought they had blushed. We hypothesized that children with higher narcissism levels would blush more after noninflated praise (but not after inflated praise), and that they would underreport this blushing response.

2 | METHOD

2.1 | Participants

Participants were 105 children (44% boys) ages 7–12 ($M = 9.55$ years, $SD = 1.18$) recruited from elementary schools in the Netherlands. We recruited them for a study on “shyness and self-confidence,” and did not inform them beforehand that they would be invited to sing, so as to avoid oversampling children who enjoy singing. All children received active informed parental consent and provided their own assent. Children's parents were relatively highly educated (highest level of education achieved: 9% secondary school degree, 33% college degree, and 58% university degree or higher). The ethnic makeup of our sample (85% Caucasian) is similar to that of the general Dutch population

(88% Caucasian; Statistics Netherlands, 2017). The study was approved by the Ethics Review Board of the Faculty of Social and Behavioral Sciences, University of Amsterdam.

This study was part of a larger study on the determinants of physiological blushing in children. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study (Simmons, Nelson, & Simonsohn, 2012). Our final sample size ensures sufficient power (.91) for detecting a medium-sized Narcissism \times Praise interaction (pwr package in *R*; numerator $df = 2$, denominator $df = 86$, $f^2 = 0.15$, $\alpha = .05$; Champely et al., 2017). All measures analyzed for this target article's research question are reported in the Method section; all others are reported in the online supporting information. Using data from the same sample, a previous manuscript reported how blushing relates to children's social anxiety (Nikolić, Brummelman, Colonesi, de Vente, & Bögels, 2018). The present article reports, for the first time, how blushing relates to children's narcissism.

2.2 | Procedure

2.2.1 | Narcissism

Children visited the lab together with one of their parents. Children first completed the 10-item Childhood Narcissism Scale (Thomaes, Stegge et al., 2008), the most established method for assessing the overall trait of narcissism in childhood (Thomaes & Brummelman, 2016). Prior research has shown that this scale has a single-factor structure (Thomaes, Stegge et al., 2008). Replicating and extending this finding, we found that the single-factor structure fits our data well, and that the factor loadings are the same for children of different ages (see supporting information). Sample items were: “I am a very special person” and “I love showing all the things I can do” (0 = *not at all true*, 3 = *completely true*). Responses were averaged across items (Cronbach's $\alpha = .73$; $M = 1.28$, $SD = 0.50$).

2.2.2 | Praise

While parents stayed in the waiting room, children accompanied the experimenter to the lab room. Children were told: “You're going to do something really fun: sing a song! I will set up a podium for you. You can then sing your song on this podium!” Children were invited to stand on the podium and sing a song of their own choosing, in front of the experimenter and a camera woman who ostensibly taped the performance with a movie-style camera. When children could not think of a song, they were asked: “What's your favorite song? What song do you really love?” Children were told that the recording would be shown to a professional singer (who, in reality, was a confederate). Children were free to

quit at any time, without giving a reason and without penalty. All children agreed to sing.

After children sang their song, the camera woman brought the recording to the singer, who was waiting in another room. After 2 min, the singer, blind to hypotheses, came into the lab room and told the children that she had watched their performance. Depending on random assignment, she gave children inflated praise (“You sang incredibly well”; $n = 37$), noninflated praise (“You sang well”; $n = 31$), or no praise (“I heard you sing a song”; $n = 37$). This manipulation has been developed to precisely manipulate inflated and noninflated praise (Brummelman et al., 2014). Attesting to its subtlety, the difference between inflated and noninflated praise was just a single word: *incredibly*. Indeed, praise is considered inflated when it contains an adverb (e.g., *incredibly*) or adjective (e.g., *incredible*) signaling a very positive evaluation (Brummelman et al., 2014, 2017; for similar operationalizations, see Kim & Chiu, 2011; Lee, Kim, Kesebir, & Han, 2017; Lemay & Clark, 2008).

2.2.3 | Physiological blushing

Children’s blushing was recorded using an infrared-reflective photoplethysmograph and a platinum PT1000 temperature sensor, both fastened to the skin on the right cheekbone. The photoplethysmograph indexed both alternate current (AC) and direct current (DC). AC indexes blood volume pulse, whereas DC indexes average blood volume (Allen, 2007). After output signals were amplified and filtered (low-pass, 0.75 Hz, 12 dB/oct for the DC signal; high-pass, 0.5 Hz, 36 dB/oct for the AC signal), AC and DC signals were converted to arbitrary values in the range of 0–65,535 (16-bit ADC) at a speed of 200 S/s. Blood volume pulse (AC), average blood volume (DC), and skin temperature are the most well-established measures of blushing (Cooper & Gerlach, 2013; Shearn et al., 1990), both in childhood and in adulthood (Nikolić, Colonnaesi et al., 2016; Nikolić, de Vente, Colonnaesi, & Bögels, 2016). Because these measures capture independent aspects of blushing, they should be analyzed as separate scores (Dijk, Voncken, & De Jong, 2009; Nikolić, Colonnaesi et al., 2016; Voncken & Bögels, 2009).

Calculating changes in blushing relative to baseline is critical to control for individual differences in skin characteristics (Drummond, 2013). We calculated the percentage change from the 2-min period before the praise (i.e., the baseline) to the 30-s period after the praise for all blushing components: blood volume pulse (AC: $M = 27.97\%$, $SD = 47.84$), average blood volume (DC: $M = 5.10\%$, $SD = 28.05$), and skin temperature ($M = 0.26\%$, $SD = 0.76$). Consistent with standard procedures, we used the 2-min prepraise period as baseline so as to capture, and thus control for, potential carryover effects from the preceding signing phase (Drummond et al., 2007); and we

used the 30-s postpraise period as the outcome so as to best capture fast and large changes in blood flow (with maximal change taking place within 15 s after onset of the blushing; Gerlach, Wilhelm, Gruber, & Roth, 2001; Shearn et al., 1990; Shearn, Bergman, Hill, Abel, & Hinds, 1992). All blushing measures were highly reliable in our sample (Cronbach’s $\alpha > .85$ across the four 30-s epochs that constitute the baseline).

2.2.4 | Self-reported blushing

After the singer left, children reported how much they thought they had blushed when the singer was talking to them (1 = *not at all*, 5 = *very much*; $M = 2.13$, $SD = 1.15$). From age 7, children understand the concept of blushing and are able to self-report blushing (Nikolić, Colonnaesi, Hoijsink, de Vente, & Bögels, 2018; also see Bennett, 1989; Crozier & Burnham, 1990).

2.2.5 | Data analysis

Primary analyses were conducted using multivariate analysis of covariance, with blushing scores (blood volume pulse [AC], average blood volume [DC], skin temperature, self-reported blushing) as dependent variables, praise (noninflated, inflated, none) as between-subjects variable, and narcissism (centered) as continuous predictor. Significant interactions were probed using simple slopes (Holmbeck, 2002) and regions of significance (Hayes, 2017) analyses. Associations between physiological and self-reported blushing were explored using Spearman correlations.

Eight children were excluded from the analyses because blushing data were missing due to equipment failure ($n = 5$), electrodes were not attached properly ($n = 2$), or the singer misphrased the manipulation ($n = 1$). Of the remaining children, two had missing data on average blood volume (DC), one had missing data on skin temperature, and two had missing data on narcissism. Narcissism, skin temperature, and self-reported blushing were relatively normally distributed. Although blood volume pulse (AC) and average blood volume (DC) were positively skewed, we analyzed their raw scores, because analyses of variance are robust against non-normally distributed dependent variables (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010). When we log-transformed them (which normalized their distributions), we obtained the same findings, which attests to the robustness of our findings.

When there were univariate ($z > 3.29$) or multivariate (Cook’s distance > 1) outliers on a variable, we conducted analyses for that variable with and without those outliers, and reported discrepancies, if any. While there were no univariate outliers on self-reported blushing or narcissism,

TABLE 1 Means, standard deviations, and correlations for main variables

	<i>M</i>	<i>SD</i>	Zero-order correlations				
			1	2	3	4	5
1. Narcissism							
Inflated praise	1.27	0.52		-.17	-.02	-.03	.25
Noninflated praise	1.29	0.50		.54**	.34	.02	-.46*
No praise	1.23	0.50		-.02	.16	.12	.25
2. AC blushing							
Inflated praise	24.52	54.44			-.25	-.01	.03
Noninflated praise	27.21	51.93			.42*	-.29	-.38*
No praise	31.20	40.01			.41*	.50**	-.08
3. DC blushing							
Inflated praise	2.41	15.77				.19	-.03
Noninflated praise	12.53	40.68				-.29	-.30
No praise	1.09	23.13				.28	.09
4. Temperature blushing							
Inflated praise	0.27	0.93					-.20
Noninflated praise	0.19	0.77					-.17
No praise	0.31	0.63					-.08
5. Self-reported blushing							
Inflated praise	2.26	1.09					
Noninflated praise	2.00	1.15					
No praise	2.17	1.25					

Note. *Ms* and *SDs* are displayed for the raw percentage change in blushing from baseline to after the praise. The final sample contained 31 children in the inflated-praise condition (with 1 missing data on temperature), 30 in the noninflated-praise condition (without missing data), and 36 in the no-praise condition (with 2 missing data on DC, and 2 missing data on narcissism). AC = alternate current (blood volume pulse); DC = direct current (average blood volume).

* $p < .05$. ** $p < .01$.

there was one on blood volume pulse (AC), two on average blood volume (DC), and two on skin temperature; however, excluding them did not affect our findings for these outcomes, so we retained them. There were no multivariate outliers in predicting any dependent variable, except average blood volume (DC); however, excluding it did not affect our findings for this outcome, so we retained it.

3 | RESULTS

3.1 | Preliminary analyses

Table 1 displays descriptive statistics. Baseline blushing (blood volume pulse [AC], average blood volume [DC], skin temperature), narcissism, age, and sex did not differ between conditions, $ps > .323$, $\phi = .12$, $\eta_p = .06$, confirming successful random assignment. None of our findings were moderated by children's sex, $ps > .413$, $\eta_p < .06$. Consistent with prior research (Nikolić, Colonnesei et al., 2016), the different aspects of blushing were weakly interrelated.

3.2 | Primary analyses

There was no multivariate main effect of narcissism or praise, $ps > .320$, $\eta_p < .05$. The predicted multivariate Narcissism \times Praise interaction arose (Wilks's $\lambda = 0.79$), $F(8, 166) = 2.59$, $p = .011$, $\eta_p = .11$. The interaction was significant for blood volume pulse (AC), $F(2, 86) = 5.07$, $p = .008$, $\eta_p = .11$, and self-reported blushing, $F(2, 86) = 6.23$, $p = .008$, $\eta_p = .11$, not for average blood volume (DC) and skin temperature, $ps > .120$, $\eta_p < .05$ (Figure 1).¹

3.2.1 | Physiological blushing

As predicted, narcissism predicted more physiological blushing (blood volume pulse) after noninflated praise, $t(91) = 3.26$, $p = .002$, $B = 55.90$, 95% CI [21.85, 89.94], $\beta = .58$, but not after inflated praise, $t(91) = -1.08$, $p = .284$, $B = -17.98$,

¹The *SD* of average blood volume (DC) is higher in the noninflated-praise condition than in both other conditions (Table 1). It is possible that the effect of noninflated praise on blood volume was moderated by an unmeasured variable.

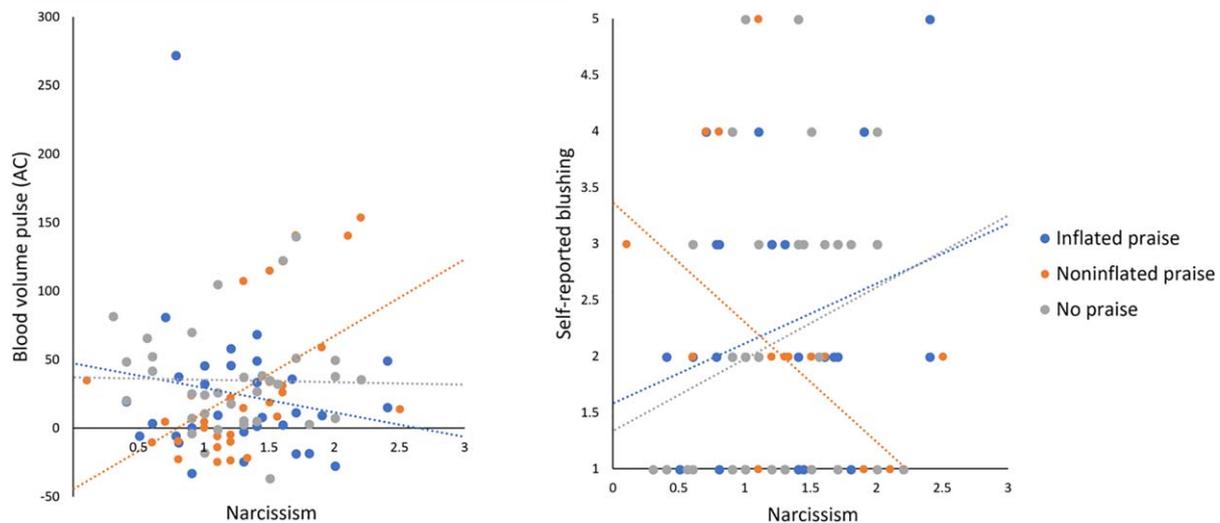


FIGURE 1 The effects of praise on blood volume pulse (AC; left) and self-reported blushing (right), depending on children's narcissism levels. There were no multivariate outliers for these variables. Excluding the univariate blood volume pulse (AC) outlier did not affect our findings

95% CI $[-51.09, 15.14]$, $\beta = -.19$, or no praise, $t(91) = -.11$, $p = .917$, $B = -1.76$, 95% CI $[-35.17, 31.64]$, $\beta = -.02$. Noninflated praise, compared to inflated and no praise, caused more physiological blushing in children high in narcissism ($> 0.96 SD$ above the mean) and less physiological blushing in children low in narcissism ($> 0.60 SD$ below the mean).

3.2.2 | Self-reported blushing

Results for self-reported blushing were opposite to those for physiological blushing. Narcissism predicted less self-reported blushing after noninflated praise, $t(91) = -2.54$, $p = .013$, $B = -1.06$, 95% CI $[-1.90, -0.23]$, $\beta = -.45$, but not after inflated praise, $t(91) = 1.28$, $p = .204$, $B = 0.53$, 95% CI $[-0.29, 1.35]$, $\beta = .23$, or no praise, $t(91) = 1.56$, $p = .123$, $B = 0.64$, 95% CI $[-0.18, 1.45]$, $\beta = .27$. Noninflated praise, compared to inflated and no praise, caused less self-reported blushing in children high in narcissism ($> 0.45 SD$ above the mean) and more self-reported blushing in children low in narcissism ($> 1.11 SD$ below the mean).

3.3 | Exploratory analyses

Did narcissistic children deny blushing? Consistent with this possibility, after noninflated praise, physiological blushing (blood volume pulse) and self-reported blushing were strongly negatively correlated in narcissistic children (above the mean), $r_s(12) = -.75$, $p = .002$, but not in nonnarcissistic children (below the mean), $r_s(14) = .01$, $p = .978$.

4 | DISCUSSION

What's in a blush? Consistent with our predictions, we found that narcissistic children blushed when they received

modestly positive, noninflated praise—not when they received extremely positive, inflated praise. Strikingly, when asked whether they blushed, they denied doing so, perhaps in an attempt to conceal their vulnerabilities. Narcissistic children may attempt to radiate an image of grandiosity, even when they feel vulnerable (Bleiberg, 2004). Thus, blushing may reveal social-evaluative concerns that narcissistic children wish to keep private.

4.1 | Theoretical implications

Extending previous work (Malkin, Barry, & Zeigler-Hill, 2011; Muñoz Centifanti, Kimonis, Frick, & Aucoin, 2013), ours is the first to examine how social context shapes narcissistic children's physiology. While modest, noninflated praise increased blushing in narcissistic children, it reduced blushing in nonnarcissistic children. What psychological process underlies these effects? Children compare the feedback they receive to their existing views of themselves (Swann, 1983). When narcissistic children receive noninflated praise, they may detect a discrepancy, and worry that others do not see them as positively as they see themselves. They may blush as they feel exposed (Crozier, 2004) and believe they lost esteem from others (De Jong & Dijk, 2013). By contrast, when nonnarcissistic children receive noninflated praise, they may detect no such discrepancy, and feel relieved that others see them just as they see themselves. Thus, blushing may reflect undesired discrepancies between how children see themselves and how they think they are seen by others.

Are there alternative explanations? One could be that narcissistic children blushed, not because they were worried, but because they felt flattered by the noninflated praise. However, if they felt flattered by the noninflated praise, they should have felt even more flattered by the inflated praise. Another explanation could be that narcissistic children

blushed because they were unsatisfied with their singing, and thus perceived the noninflated praise as undeserved. However, if they perceived noninflated praise as undeserved, they should have perceived inflated praise as even more undeserved. Contrary to both explanations, narcissistic children blushed more after noninflated praise than after inflated praise, consistent with the idea that noninflated praise did not match their grandiose image of themselves.

Our study uncovered a striking discrepancy, with narcissistic children claiming that they did not blush while they clearly did. Why did they deny blushing? Blushing is a sign of appeasement (Leary & Meadows, 1991): “Those who are blushing are somehow saying that they know, care about, and fear others’ evaluation,” and “communicate their sorrow over any possible faults or inadequacies on their part” (Castelfranchi & Poggi, 1990, p. 240). Thus, when people blush, they often feel submissive, and express dependence on others’ evaluations of them (aan het Rot, Moskowitz, & De Jong, 2015). This conflicts with the image that narcissistic children wish to radiate, so they may deny blushing to save their image.

Our findings revealed a disconnect between physiology and self-report in narcissistic children. A similar disconnect has been observed in other individuals with dark personality traits, such as psychopaths (Ellis, Schroder, Patrick, & Moser, 2017), and may reflect interoceptive blindness (such that individuals are unaware of their physiological responses) or denial (such that individuals deny their physiological responses, whether or not they are aware of them). The opposite pattern has been observed in socially anxious individuals. For example, socially anxious adults are highly aware of their heartbeat while giving a speech (Stevens et al., 2011). Similarly, in the same sample as the current study, we discovered that socially anxious children blush, and readily acknowledge their blush, when lavished with inflated praise (Nikolić, Brummelman et al., 2018).

Narcissistic children did not blush much when they received no praise. This may have occurred because children were not informed beforehand that the singer would evaluate their performance; in such a nonevaluative setting, the absence of praise might not have been surprising to them. Previous research similarly found that narcissistic children do not respond more strongly than others to neutral feedback (Thomaes et al., 2010).

When narcissistic children received noninflated praise, their blood volume pulse rose sharply, but their average blood volume and skin temperature did not. Why? Blood volume pulse rises instantly, but blood volume and skin temperature rise much more slowly (Allen, 2007; Drummond, 2013). Indeed, in our study, during the interaction with the professional singer, children’s blood volume pulse rose sharply (a 28% increase), while their average blood volume and skin temperature remained fairly constant (a 5% and 0%

increase, respectively). Similar findings have been obtained in earlier research (Nikolić, Colonnesi et al., 2016). Thus, average blood volume and skin temperature might be too inert to index a sudden blush.

Narcissism has both grandiose and vulnerable manifestations (Krizan & Herlache, 2018; Pincus & Lukowitsky, 2010). Because grandiosity typically co-occurs with high self-esteem and vulnerability with low self-esteem, they can be distinguished based on narcissists’ self-esteem levels (Thomaes, Bushman et al., 2008). Exploratory analyses suggest, however, that the effects of narcissism on blushing did not depend on children’s self-esteem levels (see supporting information). Our findings do not reflect either grandiosity or vulnerability, but rather a dynamic interplay between them. Indeed, the more narcissistic children blushed (reflecting their vulnerability), the more strongly they denied blushing (reflecting their grandiosity). This supports the notion that grandiosity and vulnerability co-exist and fluctuate within individuals (Pincus & Lukowitsky, 2010; Thomaes & Brummelman, 2016).

4.2 | Clinical implications

Our findings concur with clinical observations that narcissistic patients feel depreciated when others do not acknowledge their greatness, yet they attempt to hide this feeling (Bleiberg, 2004). Clinical implications of our study are twofold. First, a disconnect between physiology and self-report—feeling depreciated but not wanting to admit to this feeling—may identify children who are at risk for narcissistic development. Second, interventions, such as mindfulness-based interventions, may encourage narcissistic children to adopt an open, nonjudgmental awareness of their negative feelings (Thomaes & Brummelman, 2016), so as to help them acknowledge, understand, and regulate those feelings more effectively. Preliminary evidence suggests that mindfulness interventions should be long lasting and teach self-compassion to be effective in narcissists (Ridderinkhof, de Bruin, Brummelman, & Bögels, 2017).

4.3 | Strengths, limitations, and future directions

Strengths of our study include its rigorous experimental design, its timing in late childhood, and its multimethod assessment of blushing. Our study also has limitations. First, we focused specifically on blushing. Researchers should corroborate our findings using other methods that circumvent narcissistic impression management strategies (Paulhus & Vazire, 2007), such as neuroimaging (Jauk, Benedek, Koschutnig, Kedia, & Neubauer, 2017). Second, we conducted the study in the Netherlands, a Western country where children are used to being praised in inflated ways

(Brummelman, Crocker, & Bushman, 2016). Being praised in noninflated ways, then, might feel underwhelming to them. Researchers should test this possibility. Third, we timed our study in late childhood. As narcissistic children grow older, they may become less sensitive to feedback from authority figures (Ruck, Abramovitch, & Keating, 1998; Smetana & Bitz, 1996), and their narcissistic beliefs may become more deeply ingrained (Wetzel & Robins, 2016), so that they become less likely to feel depreciated by noninflated praise. Researchers should explore such developmental change.

4.4 | Conclusion

Narcissists' grandiose selves are "perpetually 'under construction,' as if the construction site were on quicksand" (Morf & Rhodewalt, 2001, p. 178). Our research suggests that, from an early age, narcissists are so invested in creating and maintaining their grandiose self that even modest praise can make them feel depreciated—a feeling that is revealed only by a blush.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

Appendix S1

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