



# Measurement Invariance of Three Versions of the Pathological Narcissism Inventory across Gender-Matched Italian Adolescent High School and Young Adult University Students

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## Abstract

To assess the measurement invariance of the three versions of the Pathological Narcissism Inventory (PNI) across adolescent and young adult participants, 678 Italian adolescent high school students ( $M = 16.83$  years old,  $SD = 1.85$  years) and 678 adult university students ( $M = 23.99$  years old,  $SD = 2.60$  years) matched on gender, civil status, and geographic area, were administered the Italian translation of the original 52-item PNI. The PNI, the Brief-Pathological Narcissism Inventory (B-PNI), and Super Brief-Pathological Narcissism Inventory (SB-PNI) scales all showed adequate reliabilities in both adolescent and young adult samples. In both samples, robust maximum likelihood confirmatory factor analysis indicated that covariation among the PNI/B-PNI first-order scales, as well as among the SB-PNI items, could be adequately explained by two-correlated factors operationalizing narcissistic grandiosity (NG) and narcissistic vulnerability (NV), respectively. Multiple-group confirmatory factor analyses supported scalar invariance for both B-PNI and SB-PNI NG and NV factors, and metric invariance for the PNI NG and NV factors.

**Keywords** Pathological Narcissism Inventory · adolescence · measurement invariance · confirmatory factor analysis

Research and clinical observations indicate that personality pathology does not suddenly appear when a person turns 18 years old; rather, adolescence is likely to represent a critical developmental stage for identifying the “warning signs” of emerging personality dysfunctions (Sharp and Wall 2017). Thus, assessing personality pathology in adolescence is crucial for early intervention and prevention programs (Chanen and Thompson 2018). Indeed, dysfunctional behaviors representing personality pathology in adulthood can be disentangled from adolescence-limited problem behaviors (Bleiberg et al. 2011; De Fruyt and De Clercq 2014; Moffitt 2003), although they are sometimes overlooked because they are mistaken for developmentally appropriate adolescent turmoil (Sharp and Bleiberg 2007).

There is a large research literature focusing on antisocial and borderline personality features in adolescent samples (e.g., Jung et al. 2018; Wright et al. 2016). In contrast, there is a more limited research base on narcissistic personality pathology in adolescence, most commonly focusing on associations with self-esteem and aggression (e.g., Barry et al. 2007; Barry and Kauten 2014; Barry et al. 2015; Kauten and Barry 2016; Lapsley and Aalsma 2006; Thomaes et al. 2008). Bleiberg (1994) integrated developmental research and clinical observations and proposed that adolescence could represent a key developmental stage for the emergence of pathological narcissism. The biological, cognitive, emotional, sexual, and psychosocial changes that occur in adolescence require reorganization of the adolescent’s sense of self, while the creation of a new direction-giving, self-esteem regulating system represents a major developmental task in adolescence (Cramer 1995; Kernberg 1998; Laplanche and Kohut 1970; Wolf et al. 1972). Of course, these developmental tasks are not beyond the reach of adolescents with adaptive developmental pathways (Bleiberg 1994). However, in light of the serious risks and maladaptive outcomes associated with pathological narcissism in adults, including suicide (Ansell et al. 2015); non-suicidal self-injury (Dawood et al. 2018), violence (Lambe et al. 2018), addiction (Dowgwillo et al. 2018), and

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depression (Dawood and Pincus 2018), there is a need for early identification of adolescents who are likely to manifest the emerging features of narcissistic personality dysfunction.

One limiting factor for research on narcissism in adolescence is concern regarding the appropriateness of existing measures of narcissism, typically developed on and for adult populations, for use with adolescent populations. This has led to the construction of narcissism measures specifically for adolescents (e.g., Barry and Ansel 2011; Derry et al. 2019). However, the proliferation of narcissism scales has created difficulties in aggregating research in adult populations (Pincus and Lukowitsky 2010). Before additional age-specific measures are developed, it would be beneficial to examine whether existing measures of narcissism developed on and for adults exhibit measurement invariance across adult and adolescent respondents.

## Pathological Narcissism Inventory

Although there is no consensus regarding the precise definition of narcissism and how best to study the construct (Ackerman et al. 2019; Miller et al. 2017; Pincus et al. 2015), it is generally accepted that pathological narcissism consists of both grandiose and vulnerable elements (Gore and Widiger 2016; Wright and Edershile 2018). Narcissistic grandiosity encompasses an inflated sense of self, lack of empathy, and entitlement, whereas narcissistic vulnerability is characterized by feelings of inferiority, fragile and contingent self-esteem, affective dysregulation, and a constant need for validation (e.g., Cain et al. 2008; Morf 2006).

Pincus and colleagues developed the Pathological Narcissism Inventory (PNI; (Pincus 2013; Pincus et al. 2009) to capture the clinical manifestations of pathological narcissism. The original PNI is a 52-item multidimensional self-report measure that was explicitly designed to assess grandiose and vulnerable manifestations of pathological narcissism. The PNI yields seven first-order scales (Contingent Self-Esteem, Devaluing, Exploitativeness, Self-Sacrificing Self-Enhancement, Hiding the Self, Grandiose Fantasy, and Entitlement Rage), two second-order scales (Narcissistic Grandiosity [NG] and Narcissistic Vulnerability [NV]), as well as a total score measuring the overall level of pathological narcissism. The PNI Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy first-order scales define the PNI NG second-order scale, whereas the PNI Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage first-order scales define the PNI NV second-order scale (Wright et al. 2010).

Although a number of measures have been developed to assess narcissistic grandiosity and narcissistic vulnerability (see, for a review, Wright and Edershile 2018), the PNI was the first instrument that was specifically constructed to yield

scores for NG and NV, and represents a popular measure often used to assess pathological narcissism in young adult, community, and clinical populations (Kealy et al. 2017; Laverdière et al. 2019). A number of studies document that the PNI is cross-sectionally and longitudinally associated in expected directions with a variety of personality and psychopathology constructs (e.g., Dawood and Pincus 2018; Dowgwillo et al. 2016; Fossati et al. 2014; Morf et al. 2017; Roche et al. 2013). In addition, experimental studies demonstrate that the PNI is related to affective reactions to ego threat (Besser and Priel 2010; Besser and Zeigler-Hill 2010) and implicit priming of self-importance (Fetterman and Robinson 2010). Importantly, the PNI was also related to treatment utilization in psychotherapy outpatients (Ellison et al. 2013).

Recently, Schoenleber and colleagues (Schoenleber et al. 2015) carried out item response theory (IRT) analyses on four independent samples of community/student and clinical adult participants to retain the four items that best described each first-order scale, creating the 28-item Brief-PNI (B-PNI). The B-PNI exhibited a factor structure consistent with the original PNI and exhibited adequate criterion validity. These promising findings suggested that the B-PNI could be used in place of the original PNI to assess the various facets and higher order factors of pathological narcissism effectively and without loss of information. Additionally, these authors used IRT analyses to create a Super Brief-PNI (SB-PNI), which included the 6 best-performing B-PNI items for the NG and NV composites respectively. Of course, the SB-PNI does not provide first-order scale scores, but initial evaluation indicated adequate reliability and criterion-related validity (see also Dowgwillo et al. 2019a).

Despite evidence for the validity of PNI scores in adult samples, the measure has its critics. Miller and colleagues (Miller et al. 2014; Miller et al. 2016) suggested that in capturing the dysfunctional manifestations of narcissism, the PNI NG and NV scale scores correlate excessively, resulting in a nomological network that lacks discriminant validity. Recently, Edershile et al. (2018) re-examined the nomological network of the PNI NG and NV scales using a multivariate approach in samples of 1,927 undergraduate students and 288 psychiatric adult participants, respectively. Their findings indicated that once accounting for overlapping variance of PNI NG and NV scale scores, the scales exhibited unique nomological networks that closely matched contemporary expert conceptualizations of narcissistic grandiosity and narcissistic vulnerability, respectively, based on expected associations with other personality variables. Notably, all psychometric evidence on the validity of scores on second-order scales of the three versions of the PNI as are limited to adult samples, and most studies focused on the original PNI. The measurement invariance across male and female adults on the PNI, B-PNI, and SB-PNI was confirmed (Wright et al. 2010; Schoenleber et al. 2015). Important for this study, Fossati

and colleagues (Fossati et al. 2015) showed that the higher order two-factor model (i.e., NG and NV factors) of the PNI was the best fitting model in both Italian community-dwelling adult participants and Italian psychotherapy outpatients. However, no examination of measurement invariance was conducted.

Only one prior study (Barry et al. 2015) administered the PNI to adolescent participants, which seemed to yield some inconsistencies suggesting possible construct validity problems. Using the PNI to assess pathological narcissism and the Narcissistic Personality Inventory for Children (NPIC; Barry et al. 2003) to measure non-pathological narcissism, they found that the NPIC correlated positively and significantly with both proactive and reactive manifestations of aggression, and with both PNI NG and NV scales, although the association was stronger for NG ( $r = .29, p < .001$ ) than for NV ( $r = .12, p < .05$ ). Interestingly, in Barry and colleagues' (Barry et al. 2015) study, the PNI NG scale showed no significant association with proactive and reactive aggression measures, whereas the NV scale showed a moderate and significant relationship with reactive aggression. These findings suggest the possibility narcissism measures may not measure the same construct across different developmental stages. Moreover, to the best of our knowledge, no study has administered the B-PNI and/or the SB-PNI to adolescent participants.

## Measurement Invariance

Measurement invariance deals with the psychometric equivalence of a construct across groups or measurement occasions, showing that a construct has the same meaning to those groups or across repeated measurements (Putnick and Bornstein 2016). Measurement invariance applies to group comparisons, to mean comparisons across measurement occasions, and to differential relations between constructs by group (e.g., correlations regression coefficients, and interactions by group), all of which are staples in psychological and developmental science. Measurement invariance represents a highly flexible approach to data analysis, which can be conducted within an IRT or a structural equation modeling (SEM) framework. Widaman and Reise (1997) recommend that measurement invariance testing be articulated in four steps: (1) *configural*, i.e., equivalence of the pattern of free and fixed elements across groups; (2) *metric* (weak factorial), i.e., equivalence of factor loadings across groups; (3) *scalar* (strong factorial), i.e., equivalence of item intercepts or thresholds; and (4) *residual* (strict or invariant uniqueness), i.e., equivalence of items' residuals or unique variances. These steps should be sequentially tested, with consideration of model fit and change in model fit through the steps (Chen 2007; Cheung and Rensvold 2002). A finding of configural non-

invariance leaves two options: (1) redefine the construct or (2) assume that the construct is non-invariant and discontinue invariance and group difference testing (Putnick and Bornstein 2016; Sass and Schmitt 2013). Further steps in measurement invariance testing are carried out only for models showing acceptable fit indices by conventional standards (Hu and Bentler 1999).

## The Current Study

The current study evaluated the measurement invariance of the PNI, B-PNI, and SB-PNI NG and NV factors across two moderately large samples of Italian adolescent high-school students and Italian young adult university students, who were matched on gender and civil status. To increase further sample comparability, all participants were living in Rome, Italy, at the time of the study. Community-based studies are useful in improving our knowledge of personality psychopathology (e.g., Fossati et al. 2015, 2016, 2017). Here, it provides the opportunity to assess the measurement invariance of the PNI, B-PNI, and SB-BPI using moderately large samples. Since 95.8% of the Italian general population adolescents are high school students (ISTAT 2017), we relied on a sample of adolescent high school students. Therefore, we required our young adult sample of university students to be 20 years of age or older to avoid any age overlap. Since all our adolescent participants were unmarried, only unmarried university students were included in the young adult sample. All participants were administered the PNI, whereas the B-PNI and SB-PNI were derived from the 52-item version of the scale following the instructions detailed in Schoenleber and colleagues' (Schoenleber et al. 2015) study. Evidence supporting measurement invariance for the two-factor NG and NV models across adolescent and young adult samples would reduce unnecessary proliferation of narcissism scales and facilitate more cumulative and developmentally informed research on narcissism in adolescence through the transition to adulthood (Thomaes and Brummelman 2016).

## Method

### Participants

A group of 661 Italian adolescent students (age 14 to 19) who were attending public high schools in Rome, Italy, was matched on gender and civil status with 661 young adult university students (age 20 and older) attending a large state university in Rome, Italy. Subject matching was carried out using 'e1071' R package (Meyer et al. 2017). After matching, the proportion of female participants was 49.5% ( $n = 327$ ) and

the proportion of male participants was 50.5% ( $n = 334$ ). All adolescent and young adult participants were unmarried and were living in the Rome metropolitan area when the study was carried out. High school students were on average 16.83 years old,  $SD = 1.85$  years; of course, adult university students ( $M = 23.99$  years,  $SD = 2.60$  years) were significantly older than high school students, separate variance  $t(1077.61) = -60.84$ ,  $p < .001$ , Vargha and Delaney's (2000)  $A = .998$ , 95% confidence interval = .997, .999.

## Procedures

After obtaining institutional review board approval, school principals authorized the school participation in the present study; then, we were allowed to ask high school students if they were willing to participate in the study. In the case of positive answers, parents' informed consent was asked for all participants who were of minor age when the study was carried out. University students were recruited through messages on the university website and campus libraries. University students had to sign a written informed consent form to participate in the study. All participants volunteered to participate in the study receiving no compensation for their participation.

## Measure

**Pathological Narcissism Inventory (PNI; Pincus 2013; Pincus et al. 2009)** The PNI is a 52-item multidimensional self-report measure of pathological narcissism that assesses overt and covert clinical characteristics of grandiose and vulnerable narcissism. The PNI yields seven scales—Contingent Self-Esteem, Exploitativeness, Self-Sacrificing Self-Enhancement, Hiding the Self, Grandiose Fantasy, Devaluing, Entitlement Rage — as well as a scores for narcissistic grandiosity, narcissistic vulnerability, and a total score measuring the overall level of pathological narcissism (for scales descriptions, see Pincus 2013). PNI item responses range from 0 (*not at all like me*) to 5 (*very much like me*). Because of the variability in scale length, mean scores are used instead of sums for easy comparison across scales. Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy may be summed and averaged to obtain a score for narcissistic grandiosity; Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage may be summed and averaged to obtain a score for narcissistic vulnerability (Wright et al. 2010). The reliability and validity of scores on the Italian translation of the PNI have been documented in samples of community dwelling adults, adult psychotherapy patients, and university students (Fossati et al. 2014, 2015, 2017).

## Data analysis

Cronbach's  $\alpha$  and mean inter-item correlation (MIC) were used to evaluate the internal consistency of the PNI, B-PNI, and SB-PNI scale scores in both samples. Pearson's  $r$  coefficient was computed to assess relationships between continuous variables. In the present study, we relied on multiple-group confirmatory factor analysis to assess the invariance of the two-factor models of the PNI and B-PNI first-order scales and of the SB-PNI items. In both samples, the hypothesis of multivariate normality of the PNI and B-PNI first-order scales, as well as of the 12 SB-PNI item scores, was assessed by computing Royston's (1992)  $H$  test for multivariate normality, which represents a multivariate extension of Shapiro-Wilk test. In the case of violation of the multivariate normality assumption, in line with previous studies on the PNI and B-PNI (e.g., Pincus et al. 2009; Schoenleber et al. 2015), we relied on robust maximum likelihood (MLR) estimation. The weighted least square mean and variance adjusted (WLSMV) estimator was used for categorical indicators (i.e., SB-PNI items). In order to identify the best fitting model in configural invariance models (i.e., models in which the number of factors and pattern of indicator-factor loadings are identical across adolescent and young adult participant samples) multiple-group CFAs were carried out on the variance-covariance matrices of the seven first-order PNI/B-PNI scales, as well as on the polychoric correlation matrix of the SB-PNI items.

In line with previous studies on the PNI (e.g., Fossati et al. 2015), we tested four models of PNI and B-PNI scale factor structure: (a) a unidimensional model; (b) a unidimensional model in which all first-order scales were expected to load on a single factor, but specific error terms were allowed to correlate. Error terms were selected based on Fossati and colleagues' (Fossati et al. 2015) study; thus, residuals between Contingent Self-Esteem and Exploitativeness, Exploitativeness and Entitlement Rage, Devaluing and Hiding the Self, and Devaluing and Grandiose Fantasy, were allowed to correlate; (c) a two-factor model with correlated factors based on Wright and colleagues' (Wright et al. 2010) best-fitting model, in which the four PNI scales measuring narcissistic vulnerability (Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage) were assigned to a NV factor and the three scales measuring grandiosity (Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy) were assigned to a NG factor; (d) a two-factor model based on Fossati and colleagues' (Fossati et al. 2015) best-fitting model, in which in which Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy defined a NG factor, and Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage were assigned to a NV factor, but error terms for Contingent Self-Esteem and Exploitativeness, for Exploitativeness and Entitlement Rage,

for Devaluing and Hiding the Self, and for Devaluing and Grandiose Fantasy were allowed to correlate.

The Satorra-Bentler robust goodness-of-fit  $\chi^2$  (S-B  $\chi^2$ ), Browne and Cudeck's (1993) root mean square error of approximation (RMSEA), Bentler's (1990) comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean square residual (SRMSR) were used to assess CFA model fit. In addition, we used also Akaike information criterion (AIC), Schwartz Bayesian information criterion (BIC), and sample size adjusted BIC (SABIC) as further indices of model fit. Following Hu and Bentler's (1999) suggestions, TLI and CFI values  $\geq .95$ , SRMSR  $< .06$ , and RMSEA values close to  $.06$  were considered as indicating good model fit, whereas TLI and CFI values of  $.90$  and higher, an RMSEA of  $.08$  and lower, and a SRMSR  $< .08$  are indications of an adequate fit.

Similarly, WLSMV CFA were carried out to formally assess the goodness-of-fit of four models of SB-PNI scale factor structure: (a) a unidimensional model; (b) a unidimensional model in which specific error terms were allowed to correlate. Error terms were selected based on SB-PNI item content; thus, residuals between PNI item 22 ("I feel important when others *rely on me*") and item 33 ("I like to have friends who *rely on me* because it makes me feel important"), item 26 ("*I often fantasize about* accomplishing things that are probably beyond my means") and item 31 ("*I often fantasize about* being rewarded for my efforts"), item 26 and item 42 ("*I often fantasize about* performing heroic deeds"), item 42 and item 31, item 45 ("*I often fantasize about* being recognized for my accomplishments") and item 42, item 45 and item 31, and item 26 and item 31 were allowed to correlate; (c) a two-factor model with correlated factors based on Schoenleber and colleagues' (Schoenleber et al. 2015) study, in which the six SB-PNI items measuring narcissistic vulnerability were assigned to a NV factor and the six SB-PNI items were assigned to a NG factor; (d) a two correlated factor model in which the same error terms entered in model (a) were allowed to correlate. The WLSMV  $\chi^2$  goodness-of-fit statistic, TLI and CFI values  $\geq .95$  and RMSEA values close to  $.06$  were considered as indicating good model fit; TLI and CFI values of  $.90$  and higher, and an RMSEA of  $.08$  and lower were considered indicators of an adequate fit. Information statistics (i.e., AIC, BIC, SABIC) and SRMSR were not used as further goodness-of-fit indices because they cannot be computed under the WLSMV estimation method (Muthén and Muthén 1998-2015).

After identifying the best fitting models of the PNI and B-PNI first-order scales within each sample, we tested the following invariance models: (a) a configural invariance model with invariant factor loading pattern; (b) a metric invariance model with invariant factor loadings, and (c) a scalar invariance model with invariant factor loadings and intercepts; (d) a residual factorial invariance model with invariant indicator residual variances. In order to identify the best fitting model,

we relied on the difference chi-square test between nested models for the Satorra-Bentler scaled chi-square (Satorra and Bentler 2001), as well as on the fit indices that were described above (Hu and Bentler 1999). In addition, we relied on Cheung and Rensvold's (2002)  $\Delta CFI < .01$  criterion to compare nested models because it is the criterion most often used in the empirical literature (Putnick and Bornstein 2016) and because it was based on the largest Monte Carlo study to date (Sass and Schmitt 2013). Meade colleagues (Meade et al. 2008) recommended a  $\Delta CFI < -.002$  based on the results of their Monte Carlo simulation; however, Little (2013) concluded that the simulation parameters used by Meade and colleagues were too strict for real-world models and therefore their  $\Delta CFI$  proposed cut-off was likely too conservative.

After identifying the best fitting model of the SB-PNI items in each sample, we tested the following invariance models: a) a scalar invariance model, and b) a strict invariance model. It is important to stress that metric invariance model was not computed since it could not be legitimately tested when categorical indicators are used because thresholds are estimated rather than intercepts and the factor model is only indirectly connected to the observed data (Millsap and Yun-Tein 2004; Muthén and Muthén 1998-2015; Sass 2011). The DIFFTEST procedure was used to evaluate the presence of significant differences in goodness-of-fit function between nested models (Muthén and Muthén 1998-2015). Moreover, in order to identify the best fitting model, we relied on the same fit indices that were described above.

## Results

The PNI descriptive statistics, Cronbach's  $\alpha$  values, mean inter-item correlations, and first-order scale correlation matrices in the adolescent high school student and adult university student samples are summarized in Table 1, The same statistics for the B-PNI and SB-PNI scales are reported in Table 2. The nominal significance level of Pearson  $r$  coefficients was corrected according to the Bonferroni procedure for the overall number of comparisons and set at  $p < .0012$ . As it was expected in the case of measures of dysfunctional personality dimensions, the Royston's  $H$  test did not support the hypothesis of multivariate normality of the PNI first-order scales in both adolescent high school students, Royston's  $H = 127.08$ ,  $p < .001$ , and young adult university students, Royston's  $H = 153.36$ ,  $p < .001$ . As expected, the B-PNI scale scores also did not show a multivariate normal distribution in both adolescent high school students, Royston's  $H = 214.62$ ,  $p < .001$ , and young adult university students, Royston's  $H = 271.13$ ,  $p < .001$ . Finally, the distribution of the SB-PNI item ordinal scores was significantly different from the multivariate normal distribution in both adolescent high school students,

**Table 1** The Pathological Narcissism Inventory: Descriptive Statistics, Cronbach’s  $\alpha$  Values, Mean Inter-Item Correlations, and First-Order Scale Correlation Matrices in Adolescent High School Students ( $N = 661$ ) and Young Adult University Students ( $N = 661$ )

Pathological Narcissism Inventory Scales	<i>M</i>	<i>SD</i>	$\alpha$	MIC	1	2	3	4	5	6	7
Adolescent High School Students ( $N = 661$ )											
1. Contingent Self-Esteem (12 items)	1.83	1.03	.90	.42	--						
2. Exploitative (5 items)	2.22	0.94	.69	.31	<b>-.13</b>	--					
3. Self-Sacrificing Self-Enhancement (6 items)	2.82	0.86	.71	.29	<b>.33</b>	.10	--				
4. Hiding the Self (7 items)	2.65	0.94	.73	.28	<b>.40</b>	<b>.18</b>	<b>.19</b>	--			
5. Grandiose Fantasy (7 items)	2.50	1.01	.78	.34	<b>.43</b>	<b>.26</b>	<b>.39</b>	<b>.35</b>	--		
6. Devaluing (7 items)	1.62	0.93	.75	.30	<b>.54</b>	.06	<b>.27</b>	<b>.47</b>	<b>.31</b>	--	
7. Entitlement Rage (8 items)	2.44	0.99	.79	.33	<b>.45</b>	<b>.23</b>	<b>.41</b>	<b>.34</b>	<b>.49</b>	<b>.48</b>	--
Narcissistic Grandiosity (18 items)	2.51	0.67	.79	.18	--	--	--	--	--	--	--
Narcissistic Vulnerability (34 items)	2.13	0.74	.91	.23	--	--	--	--	--	--	--
Total Score (52 items)	2.25	0.65	.91	.17	--	--	--	--	--	--	--
Young Adult University Students ( $N = 661$ )											
1. Contingent Self-Esteem (12 items)	1.54	0.94	.91	.47	--						
2. Exploitative (5 items)	1.98	0.84	.72	.34	.09	--					
3. Self-Sacrificing Self-Enhancement (6 items)	2.58	0.82	.72	.30	<b>.49</b>	<b>.27</b>	--				
4. Hiding the Self (7 items)	2.47	0.89	.76	.31	<b>.47</b>	<b>.19</b>	<b>.40</b>	--			
5. Grandiose Fantasy (7 items)	2.04	1.03	.85	.45	<b>.55</b>	<b>.41</b>	<b>.58</b>	<b>.51</b>	--		
6. Devaluing (7 items)	1.59	0.90	.81	.37	<b>.66</b>	<b>.16</b>	<b>.43</b>	<b>.57</b>	<b>.49</b>	--	
7. Entitlement Rage (8 items)	1.95	0.93	.84	.39	<b>.65</b>	<b>.30</b>	<b>.53</b>	<b>.52</b>	<b>.67</b>	<b>.65</b>	--
Narcissistic Grandiosity (18 items)	2.20	0.71	.86	.26	--	--	--	--	--	--	--
Narcissistic Vulnerability (34 items)	1.89	0.76	.94	.31	--	--	--	--	--	--	--
Total Score (52 items)	1.97	0.69	.95	.25	--	--	--	--	--	--	--

MIC Mean inter-item correlation. The nominal significance level of Pearson  $r$  coefficients was corrected according to the Bonferroni procedure for the overall number of comparisons and set at  $p < .0012$ ; Pearson  $r$  values  $\geq .13$  were significant at  $p < .0012$ ; bold highlight Bonferroni-significant  $r$  values; -- Statistic not computed

Royston’s  $H = 1062.17, p < .001$ , and young adult university students, Royston’s  $H = 1050.55, p < .001$ .

In our adolescent high school student sample, the NG and NV scale scores were moderately intercorrelated with Pearson  $r$  values of .48, .46, and .38, all  $ps < .001$ , for the PNI, B-PNI, and SB-PNI, respectively. In our young adult university student sample, these values were larger,  $rs$  of .63, .63, and .51, all  $ps < .001$ , for the PNI, B-PNI, and SB-PNI, respectively.

The multiple-group MLR and WLSMV CFA goodness-of-fit statistics for configural invariance of the competing factor models of the PNI/B-PNI first-order scale correlation matrices and SB-PNI items across adolescent high school students and adult university students are summarized in Table 3. Based on the best-fitting two-factor model of the PNI first-order scale correlation matrix, error correlations were  $-.41 (p < .001$ ; Exploitative with Contingent Self-Esteem),  $.07 (p > .10$ , Exploitative with Entitlement Rage),  $.17 (p < .01$ ; Devaluing with Hiding the Self) and  $-.29 (p < .001$ ; Devaluing with Grandiose Fantasy) in the adolescent high school student sample. In the young adult University student sample, error correlations were  $-.27 (p < .001$ ; Exploitative with Contingent Self-Esteem),  $.04 (p > .40$ , Exploitative with Entitlement

Rage),  $.20 (p < .001$ ; Devaluing with Hiding the Self) and  $-.31 (p < .001$ ; Devaluing with Grandiose Fantasy). Similar considerations held for the B-PNI first-order scale error correlations based on the best-fitting two-factor model, which were  $-.34, p < .001, .04, p > .30, .19, p < .001$ , and  $-.06, p > .05$ , in the adolescent student sample, and  $-.18, p < .001, .00, p > .90, .13, p < .001$ , and  $-.08, p < .01$ , in the adult student sample. Finally, in WLSMV CFA of the SB-PNI items only three error correlations reached statistical significance, namely, the error correlation between item 22 (“I feel important when others rely on me”) and item 31 (“I often fantasize about being rewarded for my efforts”),  $r = .31, p < .001$ , the error correlation between item 26 (“I often fantasize about accomplishing things that are probably beyond my means”) and item 31,  $r = -.14, p < .001$ , and the error correlation between item 42 (“I often fantasize about performing heroic deeds”) and item 31,  $r = -.07, p < .05$ .

Table 4 lists the measurement invariance results of the two-factor models with correlated factors and selected correlated errors of the PNI first-order scales, B-PNI first-order scales, and SB-PNI items across adolescent high school students and young adult university students. PNI factors only met benchmarks for metric invariance, however the B-PNI and SB-PNI

**Table 2** The Brief and Super Brief Pathological Narcissism Inventory: Descriptive Statistics, Cronbach's  $\alpha$  Values, Mean Inter-Item Correlations, and First-Order Scale Correlation Matrices in Adolescent High School Students ( $N = 661$ ) and Young Adult University Students ( $N = 661$ )

Brief Pathological Narcissism Inventory Scales	<i>M</i>	<i>SD</i>	$\alpha$	MIC	1	2	3	4	5	6	7
Adolescent High School Students ( $N = 661$ )											
1. Contingent Self-Esteem	1.57	1.23	.86	.60	--						
2. Exploitative	2.28	1.01	.70	.37	<b>-.14</b>	--					
3. Self-Sacrificing Self-Enhancement	2.79	0.96	.69	.35	<b>.33</b>	.09	--				
4. Hiding the Self	2.23	1.07	.68	.35	<b>.40</b>	<b>.15</b>	<b>.19</b>	--			
5. Grandiose Fantasy	2.52	1.09	.67	.34	<b>.33</b>	<b>.20</b>	<b>.38</b>	<b>.31</b>	--		
6. Devaluing	1.55	1.07	.77	.46	<b>.47</b>	.05	<b>.25</b>	<b>.47</b>	<b>.30</b>	--	
7. Entitlement Rage	2.36	1.08	.67	.33	<b>.39</b>	<b>.22</b>	<b>.48</b>	<b>.36</b>	<b>.43</b>	<b>.43</b>	--
Narcissistic Grandiosity (12 items)	2.53	0.71	.73	.18	--	--	--	--	--	--	--
Narcissistic Vulnerability (16 items)	1.93	0.84	.87	.30	--	--	--	--	--	--	--
Super Brief Pathological Narcissism Inventory Scales											
Super Brief Narcissistic Grandiosity	2.86	0.97	.76	.35	--	--	--	--	--	--	--
Super Brief Narcissistic Vulnerability	1.69	1.09	.83	.44	--	--	--	--	--	--	--
Young Adult University Students ( $N = 661$ )											
1. Contingent Self-Esteem	1.28	1.08	.89	.67	--						
2. Exploitative	2.02	0.88	.71	.38	.07	--					
3. Self-Sacrificing Self-Enhancement	2.37	0.96	.74	.42	<b>.52</b>	<b>.28</b>	--				
4. Hiding the Self	2.13	0.98	.71	.38	<b>.41</b>	<b>.20</b>	<b>.39</b>	--			
5. Grandiose Fantasy	2.03	1.06	.74	.42	<b>.49</b>	<b>.37</b>	<b>.59</b>	<b>.45</b>	--		
6. Devaluing	1.32	0.99	.82	.53	<b>.60</b>	<b>.16</b>	<b>.44</b>	<b>.53</b>	<b>.44</b>	--	
7. Entitlement Rage	1.92	1.04	.77	.46	<b>.58</b>	<b>.29</b>	<b>.59</b>	<b>.43</b>	<b>.58</b>	<b>.58</b>	--
Narcissistic Grandiosity (12 items)	2.14	0.76	.83	.29	--	--	--	--	--	--	--
Narcissistic Vulnerability (16 items)	1.67	0.82	.91	.39	--	--	--	--	--	--	--
Super Brief Pathological Narcissism Inventory Scales											
Super Brief Narcissistic Grandiosity	2.43	1.00	.83	.46	--	--	--	--	--	--	--
Super Brief Narcissistic Vulnerability	1.41	0.99	.87	.53	--	--	--	--	--	--	--

MIC Mean inter-item correlation. The nominal significance level of Pearson  $r$  coefficients was corrected according to the Bonferroni procedure for the overall number of comparisons and set at  $p < .0012$ ; Pearson  $r$  values  $\geq .13$  were significant at  $p < .0012$ ; bold highlight Bonferroni-significant  $r$  values; --: Statistic not computed

factors both met benchmarks for scalar invariance. Finally, the unstandardized factor loadings for the metric invariance model of the PNI two-factor model, and for the scalar invariance of the B-PNI and SB-PNI two-factor models are reported in Table 5. For model identification purposes, the unstandardized factor loadings of the first indicator for both NG and NV factor were fixed at 1.00 (Muthén and Muthén 1998-2015).

## Discussion

To the best of our knowledge, our study is the first to demonstrate that the NG and NV dimensions of the PNI, and especially the B-PNI and SB-PNI exhibit measurement invariance across samples of adolescent high school students and young adult university students, who were also matched on marital status and gender. Overall, our CFA results suggested that the PNI and B-PNI first-order scale scores, as well as the SB-PNI

item scores, were influenced by two substantially correlated, albeit dissociable factors, namely, the NG factor and the NV factor. Factor invariance findings suggested that at the very least NG and NV factors had the same meaning for adolescent and young adult participants when the PNI scores were used, whereas they also exhibited equal observed variable metrics (i.e., intercepts/thresholds) when the B-PNI and the SB-PNI scores were considered. Thus, our findings suggested that both B-PNI and SB-PNI allow for legitimate intergroup comparisons on latent NG and NV means and external associations in adolescent high school students and young adult university students.

Confirming and extending previous reports on adult (e.g., Fossati et al. 2015, 2014; Pincus et al. 2009; Schoenleber et al. 2015; Wright et al. 2010) and adolescent participants (e.g., Barry et al. 2015; Lee-Rowland et al. 2017), our data supported the hypothesis that the PNI scales yield reliable scores in both high school students and university students, purportedly

**Table 3** Multiple-Group Robust Maximum Likelihood (Pathological Narcissism Inventory and Brief Pathological Narcissism Inventory First-Order Scales) and Weighted Least Square Mean and Variance Adjusted (Super Brief Pathological Narcissism Inventory 12 Items) Confirmatory Factor Analyses: Goodness-of-Fit Statistics of the Configural Invariance Model Across Adolescent High School Students (N = 661) and Young Adult University Students (N = 661)

Pathological Narcissism Inventory	$\chi^2$	CFI	TLI	RMSEA	90% CI	SRMSR	AIC	BIC	SABIC
One-factor model	367.74 (28) ***	.87	0.80	.135	.123, .148	.061	22152.99	22370.84	22237.43
One-factor model (correlated errors)	114.71 (20) ***	.96	0.92	.085	.070, .100	.038	21866.47	22125.81	21966.99
Two-factor model	297.73 (26) ***	.90	0.83	.126	.113, .139	.056	22062.02	22290.24	22150.47
Two-factor model (correlated errors)	90.37 (18) ***	<b>.97</b>	<b>0.93</b>	<b>.078</b>	.062, .094	<b>.032</b>	<b>21838.44</b>	<b>22108.16</b>	<b>21942.98</b>
Brief Pathological Narcissism Inventory									
One-factor model	304.61 (28) ***	.88	0.82	.122	.110, .135	.059	24456.73	24674.58	24674.58
One-factor model (correlated errors) <sup>a</sup>	117.34 (20) ***	<b>.96</b>	<b>0.91</b>	<b>.086</b>	.071, .101	.038	24243.99	24503.34	24344.51
Two-factor model	260.05 (26) ***	.90	0.83	.117	.104, .130	.055	24400.65	24628.88	24489.11
Two-factor model (correlated errors) <sup>a</sup>	105.85 (18) ***	<b>.96</b>	<b>0.91</b>	<b>.086</b>	.071, .102	<b>.034</b>	<b>24231.75</b>	<b>24501.47</b>	<b>24336.29</b>
Super Brief Pathological Narcissism Inventory <sup>1</sup>									
One-factor model	2790.12 (108) ***	.81	0.77	.194	.188, .200	--	--	--	--
One-factor model (correlated errors) <sup>b</sup>	1356.16 (94) ***	.91	0.87	.143	.136, .149	--	--	--	--
Two-factor model	806.69 (106) ***	.95	0.94	.100	.094, .107	--	--	--	--
Two-factor model (correlated errors) <sup>b</sup>	452.19 (92) ***	<b>.97</b>	<b>0.96</b>	<b>.077</b>	.070, .084	--	--	--	--

CFI Comparative fit index; TLI Tucker-Lewis index; RMSEA Root mean square error of approximation; 90% CI: 90% confidence interval for RMSEA; SRMSR Standardized root mean square residual; AIC Akaike information criterion; BIC Schwartz Bayesian information criterion; SABIC Sample size adjusted Bayesian information criterion. Bold highlights CFI and TLI maximum values, and RMSEA, SRMSR, AIC, BIC, and SABIC minimum values

1: based on weighted least square mean and variance adjusted estimator; a: correlated errors ( $n = 4$ ) were based on the same error correlation pattern that was observed for the Pathological Narcissism Inventory scales; b: correlated errors ( $n = 7$ ) were based on a priori considerations of item wording; --: Statistic not computed because SRMSR, AIC, BIC, and SABIC cannot be estimated when the weighted least square mean and variance adjusted estimator is used

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

assessing different facets of narcissistic grandiosity and narcissistic vulnerability. Considering the PNI, only the Exploitative scale showed a Cronbach’s  $\alpha$  value slightly lower than .70 in the adolescent sample; however, the corresponding average inter-item  $r$  value (MIC = .31) was in the .15-.50 range for MIC values adequate for internal consistency (Clark and Watson 1995), while being almost identical to the MIC value observed for the PNI Exploitative scale in the young adult sample, Fisher’s  $z = -0.61, p > .50$ .

Notwithstanding their limited length (i.e., four items), all B-PNI scales showed adequate Cronbach’s  $\alpha$  values in our young adult student sample, whereas Cronbach’s  $\alpha$  values slightly lower than .70 were observed among our adolescent high school students for the B-PNI Self-Sacrificing Self-Enhancement, Hiding the Self, Grandiose Fantasy, and Entitlement rage first-order scales. Even for these scales, all MIC values were  $\geq .30$ , suggesting adequate internal consistency particularly for short scales (Clark and Watson 1995). Finally, the SB-PNI scales yielded adequately reliable scores in terms of both Cronbach’s  $\alpha$  and MIC values in both samples.

Confirming and extending the available confirmatory factor analysis literature on the PNI in adult samples (e.g., Fossati et al. 2015; Pincus et al. 2009; Schoenleber et al. 2015; Wright

et al. 2010), our data suggested that a two-factor model (Wright et al. 2010; Fossati et al. 2015) where the four PNI/B-PNI scales measuring narcissistic vulnerability (Contingent Self-Esteem, Hiding the Self, Devaluing, and Entitlement Rage) were assigned to a NV factor and the three scales measuring grandiosity (Exploitativeness, Self-Sacrificing Self-Enhancement, and Grandiose Fantasy) were assigned to a NG factor was the best fitting model in both high school and university students. Extending Schoenleber and colleagues’ (Schoenleber et al. 2015) findings, our WLSMV CFA results suggested two correlated factors, corresponding to NG and NV dimensions, adequately reproduced the polychoric correlations among the SB-PNI items, particularly when seven error correlations were entered in the model based on the SB-PNI item wording.

Thus, our CFA findings supported the hypothesis that the two correlated factor model proved to be the best fitting model for the PNI indicators across three different versions of the scale (i.e., the PNI, the B-PNI, and the SB-PNI). Although the PNI NG and NV factors were positively correlated in both adolescent and young adult participants, our data strongly supported that they could and should be dissociated. It could be argued that in our study the unidimensional model with four correlated error terms (Exploitative with Contingent



**Table 4** Measurement Invariance Results of the Two-Factor Model of the Pathological Narcissism Inventory First-Order Scale Correlation Matrices Across Adolescent High School Students (N = 661) and Young Adult University Students (N = 661)

PNI	$\chi^2$	$\Delta\chi^2$ /DIFFTEST $\chi^2$	CFI	$\Delta$ CFI	TLI	RMSEA	90% CI	SRMSR	AIC	BIC	SABIC
Configural	90.37 (18)***	--	.97	--	0.93	.078	.062, .094	.032	21838.44	22108.16	21942.98
Metric	92.39 (23)***	1.69 (1)	.97	<b>.001</b>	0.95	.068	.053, .082	.034	<b>21830.42</b>	<b>22074.21</b>	<b>21924.91</b>
Scalar	159.17 (28)***	71.49 (5)***	.95	-.024	0.92	.084	.072, .097	.047	21896.20	22114.05	21980.63
Residual	277.30 (35)***	114.77 (7)***	.91	-.039	0.89	.102	.091, .114	.080	22023.69	22205.23	22094.05
B-PNI											
Configural	105.85 (18)***	--	.96	--	0.91	.086	.071, .102	.034	24231.75	24501.47	24336.29
Metric	109.52 (23)***	2.34 (5)	.96	<b>-.000</b>	0.93	.075	.062, .090	.036	<b>24224.42</b>	24468.20	24318.90
Scalar	126.48 (28)***	16.08 (5)**	.96	<b>-.005</b>	0.93	.073	.060, .086	.041	24231.04	<b>24448.89</b>	<b>24315.48</b>
Residual	233.59 (35)***	104.91 (7)***	.91	.045	0.89	.093	.082, .104	.080	24344.10	24525.65	24414.47
SB-PNI <sup>1</sup>											
Configural	452.19 (92)***	--	.97	--	0.96	.077	.070, .084	--	--	--	--
Scalar	621.23 (148)***	215.92(56)***	.97	<b>-0.008</b>	0.97	.070	.064, .075	--	--	--	--
Residual	723.57 (162)***	183.20 (12)***	.96	<b>-0.006</b>	0.97	.072	.067, .078	--	--	--	--

PNI Pathological Narcissism Inventory; B-PNI Brief Pathological Narcissism Inventory; SB-PNI Super Brief Pathological Narcissism Inventory; CFI Comparative fit index; TLI Tucker-Lewis index; RMSEA Root mean square error of approximation; 90% CI: 90% confidence interval for RMSEA; SRMSR Standardized root mean square residual; AIC Akaike information criterion; BIC Schwartz Bayesian information criterion; SABIC Sample size adjusted Bayesian information criterion; --: Statistic not computed. Bold highlights  $\Delta$ CFI values <-.01; the minimum values reached by AIC, BIC, and SABIC indices are underlined. 1: based on weighted least square mean and variance adjusted estimator (WLSMV); the metric invariance model was not computed. The  $\Delta\chi^2$ /DIFFTEST $\chi^2$  and  $\Delta$ CFI statistics were computed for comparisons between nested models, i.e., configural vs. metric invariance, metric vs. scalar invariance, and scalar vs. residual. --: Statistic not computed because SRMSR, AIC, BIC, and SABIC cannot be estimated when the weighted least square mean and variance adjusted estimator is used

\* p <.05; \*\* p <.01; \*\*\* p <.001

Self-Esteem, Exploitative with Entitlement Rage, Devaluing with Hiding the Self, and Devaluing with Grandiose Fantasy) showed acceptable fit indices for both the PNI and the B-PNI first-order scales. However, the Satorra-Bentler scaled difference  $\chi^2$  value suggested that the goodness-of-fit of the two correlated factor model with correlated errors was significantly better than the goodness-of-fit of the unidimensional model with the same number of correlated errors both for the PNI,  $\Delta\chi^2(2) = 22.06, p <.001$ , and the B-PNI,  $\Delta\chi^2(2) = 11.50, p <.01$ . This conclusion was also supported by the fact that all the information criteria that were used in the present study reached their minimum values in correspondence of the two-correlated factor model with four correlated errors. Moreover, when we considered the SB-PNI CFA results, no evidence was found for an adequate fit of the one-factor model of the items, even when seven errors were allowed to be inter-correlated.

We are aware that correlated errors are frequently used in CFA to spuriously increase model fit (Schweitzer 2012). However, it is known that error correlation may arise in scale development from several sources, such as measurement method (e.g., similar number of reverse-scored items in the scales), multidimensionality of the scales, and similarity in wording among the items that compose different scales (see, for instance, Bollen 1989). The relevant number of psychometric articles using CFA that included correlated error terms

documented the importance of these sources of error correlation in psychometric literature (Schweitzer 2012). Although strong a priori hypotheses about the structure of the error correlations of the PNI scales may be premature, it should be observed that our findings largely replicated Fossati and colleagues' (Fossati et al. 2015) results. Indeed, in our study all error correlations were in the small-to-moderate range and showed opposite signs in both adolescent and young adult participants. Marginally, these findings suggest it is unlikely that additional method factors exist.

Our results indicated that the pattern of factor loadings of the PNI first-order scales on the NG and NV factors were identical in our adolescent and young adult participants. This result supported the hypothesis that the narcissistic grandiosity and narcissistic vulnerability constructs had the same meaning to our adolescent and young adult participants, at least when the PNI was used to assess them (Putnick and Bornstein 2016). Interestingly, the non-significant  $\Delta\chi^2$  value indicated that the B-PNI NG and NV factors exhibited metric invariance. However,  $\Delta$ CFI values suggested to retain the scalar invariance model of the B-PNI NG and NV factor as the best fitting model; this conclusion was supported also by the BIC and SABIC values. It should be observed that the  $\Delta$ CFI value clearly indicated the residual (i.e., strict) invariance model as the best fitting measurement invariance model for the SB-PNI. Our results suggest that the shorter the version of the PNI, the

**Table 5** Multiple-Group Robust Maximum Likelihood (Pathological Narcissism Inventory and Brief Pathological Narcissism Inventory First-Order Scales) and Weighted Least Square Mean and Variance Adjusted (Super Brief Pathological Narcissism Inventory 12 Items) Confirmatory Factor Analyses Across Adolescent High School Students (N = 661) and Young Adult University Students (N = 661): Invariance Unstandardized Factor Loadings and Factor Covariance

First-Order Scales	Pathological Narcissism Inventory		Brief Pathological Narcissism Inventory		Items	Super Brief Pathological Narcissism Inventory	
	Unstandardized Metric Invariant Solution		Unstandardized Scalar Invariant Solution			Unstandardized Scalar Invariant Solution	
	NG	NV	NG	NV		NG	NV
Exploitativeness	1.00	--	1.00	--	22. I feel important when ...	1.00	--
Self-Sacrificing Self-Enhancement	1.68 ***	--	2.07 ***	--	26. I often fantasize about ...	1.19 ***	--
Grandiose Fantasy	2.76 ***	--	2.44 ***	--	31. I often fantasize about ...	1.42 ***	--
Contingent Self-Esteem	--	1.00	--	1.00	33. I like to have friends ...	1.20 ***	--
Hiding the Self	--	0.74 ***	--	0.69 ***	42. I often fantasize about ...	1.04 ***	--
Devaluing	--	0.94 ***	--	0.88 ***	45. I often fantasize about ...	1.38 ***	--
Entitlement Rage	--	1.05 ***	--	1.06 ***	8. When people don't notice me...	--	1.00
					17. Sometimes I avoid people ...	--	0.74 ***
					30. It's hard to feel good ...	--	1.16 ***
					32. I am preoccupied with ...	--	1.14 ***
					36. It's hard for me to feel ...	--	1.18 ***
					50. When others get a glimpse...	--	0.82 ***
Factor Covariance					Factor Covariance		
NG	--		--		NG	--	
NV	.21 ***	--	.25 ***	--	NV	.25 ***	--

NG Narcissistic Grandiosity factor; NV Narcissistic Vulnerability factor; --: Statistic not computed

\* p <.05; \*\* p <.01; \*\*\* p <.001

stronger the evidence for measurement invariance across adolescent and young adult participants.

The PNI NG and NV factors exhibited metric invariance, suggesting that the PNI may be confidently used in both adolescent high school students and university students, respectively, to test hypotheses concerning the nomological networks of the narcissistic grandiosity and narcissistic vulnerability. However, if both latent mean comparisons and nomological network validity testing in adolescent and adult participants are at issue, the B-PNI and the SB-PNI may represent the instruments of choice as they exhibited scalar invariance (B-PNI) and even strict invariance (SB-PNI). Importantly, the briefer length of these versions of the PNI makes them particularly useful to screen for pathological narcissism dimensions in contexts and populations where lengthy assessment could not be carried out or when using intensive repeated assessments. Moreover, the opportunity to rely on the shorter B-PNI and SB-PNI may increase the likelihood that clinicians, alerted to the possibility of pathological narcissism, would pursue a more formal evaluation (Noblin et al. 2014; Patel et al. 2011). Overall, we recommend the use of the PNI, B-PNI, and SB-PNI to assess narcissistic grandiosity and

vulnerability in adolescent samples. This will help establish continuity with research using adult samples and facilitate research on pathological narcissism during the developmental transition from adolescence to adulthood.

### Limitations

Of course, our data should be considered in the light of several limitations. We are aware that multiple-group CFA is not the only method for assessing measurement invariance; indeed the multiple indicators, multiple causes approach (MIMIC; Jöreskog and Goldberger 1975; Muthén 1989) and extended alignment method (Marsh et al. 2018) represent viable alternative to multiple-group CFA. However, MIMIC modeling can only test the invariance of indicator intercepts and factor means (Brown 2014). Thus, it assumes that all other measurement and structural parameters (i.e., factor loadings, error variances–covariances, factor variances–covariances) are the same across all levels of the groups. The extended alignment method was specifically developed for comparisons among a large number of groups (Marsh et al. 2018), with no data

suggesting its superiority to multiple-group CFA when only two groups are compared.

Emerging adulthood represents a relevant developmental period (e.g., Donnellan et al. 2007), in which people face new maturational and environmental demands (Arnett 2000; Arnett et al. 2014). It is also a developmental period where personality and personality pathology are changing (Wright et al. 2011) including narcissism (Dowgwillo et al. 2019b; Paulsen et al. 2016). Therefore, it may be important to examine narcissism in the college student population; moreover, our adult participants were sampled with the aim to maximize their comparability with our adolescent high school student participants. However, this sampling strategy inherently limited the representativeness of our young adult participant sample with respect to the Italian general population (or even young adult population). Thus, future studies on the measurement invariance properties of the PNI across adolescence and adulthood are required; however, the current study may be helpful in providing the first data on the measurement invariance properties of the PNI across adolescents and young adults. Indeed, our findings are intended to support justification for future investigations (for instance, allowing for comparing the nomological networks of the three versions of the PNI across adolescent and young adult samples). Our study did not include participants from clinical or forensic populations; this also limits the generalizability of our findings to psychiatric/forensic samples of adolescent and adult participants, respectively.

We designed the present study to assess the measurement invariance of the PNI, B-PNI, and SB-PNI NG and NV factors across adolescent and young adult participants, yielding evidence for their measurement invariance. However, we were not able to provide any data on the nomological network validity of the PNI across the two samples. Further studies should address this important issue. In our study, NG and NV factors were moderately intercorrelated. It should be noted that the theory on which the PNI is based hypothesizes that NG and NV represent related aspects of pathological narcissism which can dynamically oppose each other or oscillate within person across time and occasions (Pincus et al. 2016; Pincus and Wright *in press*).

Finally, in our study, both adolescent participants and young adult participants were only administered the original 52-item PNI. Thus, future studies on the B-PNI and SB-PNI are badly needed in order to assess the factor structure and measurement invariance properties of these shorter version of the PNI when they are administered in their specific forms (Schoenleber et al. 2015; Smith et al. 2000).

Keeping these limitations in mind, we believe that our findings extend some measurement properties of the three versions of the PNI to adolescent participants. Indeed, our findings suggest that the PNI/B-PNI/SB-PNI NG and NV scales capture the same phenomena across adolescent and

young adult participants. Thus, there is no need to develop new scales to assess pathological narcissism specifically for adolescent populations. Finally, the assessment of pathological narcissism may have important developmental applications and clinical implications across the lifespan (e.g., Cramer 2011; Goldstein 1995; Heisel et al. 2007; Thomaes and Brummelman 2016).

## Compliance with ethical standards

**Conflict of Interest** Antonella Somma, Aaron Pincus, Andrea Fontana, Beatrice Cianfanelli and Andrea Fossati declare that they have no conflict of interest.

**Experiment Participants** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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