INTEGRATING NORMAL AND PATHOLOGICAL MEASURES OF NARCISSISM

A Thesis

by

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ABSTRACT

Narcissism is understood and assessed differently across the most commonly

used measures, the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979) the

Pathological Narcissism Inventory (PNI; Pincus et al., 2009), and the Narcissistic

Personality Disorder (NPD) items of the Personality Diagnostic Questionnaire-4 (PDQ-

4; Hyler, 1994). Due to these differences, the range of the severity of narcissism each

measure covers and the different abilities of each measure to reliably determine a

person's level of narcissism remain unclear. The use of Item Response Theory (IRT)

remedies these issues by allowing each of the three measures to be linked and then

compared on the same metric. The three measures were completed by a sample of 587

undergraduate participants. The latent construct was formed by items of the PDQ-4 and

was designed to reflect narcissism as defined by the Diagnostic and Statistical Manual of

Mental Disorders 5th edition (DSM-5; American Psychological Association, 2013) and

the ability of each measure to indicate that latent continuum was calculated and

analyzed. Results show that the PDQ-4 provided statistically significant information

from .03 to 2.68 *SDs* of the latent continuum. The NPI provided statistically significant

information across a broader swath of the latent continuum, from -.88 to 3.71 *SDs*. The

PNI provided statistically significant information across the widest range and spanned

across -4.0 to 4.0 *SDs* of the latent continuum. Therefore, when considering how

optimally to measure DSM narcissism, evidence suggests that the PNI will likely be best

suited to do so and will afford more precise measurement of the more severe ranges of narcissism.

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Contributors

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The data analyzed was provided by Professor Brent Donnellan. All members of the committee contributed to the data analyses and preparation of the manuscript through suggestions and demonstrations of how to conduct the analyses and editing of the manuscript.

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INTRODUCTION

How narcissism is defined, assessed, and understood has a longstanding history. One of the first attempts can be found in Greek mythology, in which there is a story of a character named Narcissus. Narcissus fell in love with himself when he saw his own reflection cast in a pool of water, and his obsession with his own image eventually caused him to drown in the pool. This story served as a caricature example of people's more self-centered behavior until Havelock Ellis (1898) and Sigmund Freud (1914) each provided extensive theoretical work that helped to develop our understanding of narcissism as we know it today. Years later, narcissism was defined as part of a formal diagnosis when narcissistic personality disorder (NPD) was included in Axis II of the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III; American Psychiatric Association, 1980). DSM narcissism is characterized by a pattern of grandiosity, need for admiration, and a lack of empathy. A diagnosis of NPD using the DSM-5 includes the presence of at least five of the following nine criteria: (1) a grandiose sense of self-importance, (2) preoccupation with fantasies of their own success, (3) believes that he or she is more "special" than others, (4) demands of excessive admiration, (5) a sense of entitlement, (6) is interpersonally exploitative, (7) lacks empathy, (8) is often envious, and (9) displays arrogant behaviors or attitudes (American Psychiatric Association, 2013).

Given the millennia-old articulation of narcissism coupled with the decades of research using the NPD criteria and the retention of the NPD criteria in the most recent

version of the DSM, pathological narcissism as defined by the DSM is likely to remain a central concept in clinical psychology and psychiatry for some time to come. Yet, these disciplines are not the only ones to define and attempt to quantify pathological narcissism. Narcissism also is an important concept in general human interaction and behavior, and so there is an equally important emphasis on the concept in social psychology. Rarely, however, have investigators compared the abilities of measures, derived from these somewhat distinct disciplines, to capture the essence of pathological narcissism.

One instrument used to measure pathological narcissism in both research and clinical practice is the Personality Diagnostic Questionnaire-4 (PDQ-4; Hyler, 1994). The PDQ-4 is a 99 item self-report clinical measure of personality pathology that has an item written to represent each PD criterion. The endorsement of five or more of the nine NPD items of the PDQ-4 can be used to quickly indicate eligibility for a diagnosis of NPD. The brevity, straightforwardness, and ease of implementation are strong practical advantages of the PDQ-4 in the assessment of narcissism.

These practical advantages afforded by the PDQ-4 may come at a cost. In a recent study involving both clinical and a community samples, the PDQ-4 had an internal consistency (Cronbach's alpha) of less than .70 in all four samples (Hopwood et al., 2013). The authors attributed these rather low coefficients to the PDQ-4 yes/no format and the brevity of the measure. Furthermore, the items tap pathological content in a manner that is readily apparent to anybody completing the measure, and thus it might be relatively easy for a narcissistic individual to knowingly deny their negative

personality features. This aspect of the PDQ-4 may hinder it from measuring narcissism accurately. Indeed past research has shown that narcissistic grandiosity is likely to affect an individual's ability and willingness to accurately self-report on their own narcissistic symptoms (e.g. Raskin, Novacek, & Hogan, 1991). Thus, it may be necessary to supplement or replace the PDQ-4 with an instrument that uses an alternative, more subtle format.

In addition to the issues with item content, the PDQ-4 faces issues in its structure. The PDQ-4 is derived from and relates directly to the DSM criteria (Widiger & Coker, 2002). The criteria themselves are used as a diagnostic tool: their main function is to differentiate between those above threshold who would be eligible for a diagnosis of NPD and those below threshold that would not. Therefore, it makes a certain degree of sense that the DSM and measures derived from it, like the PDQ-4, may be aimed at moderate, near threshold, levels of pathological narcissism at the expense of capturing subtle or extremely severe forms of narcissism. Thus, the items based on the NPD criteria may have been written with the intention of identifying these two groups and naturally have been geared to provide information near the point along the narcissism continuum that divides the two groups, somewhere in the moderate range of severity. Simply put, the PDQ-4 may be unable to indicate the difference between someone with severe and someone with very severe narcissism. Likewise, the PDQ-4 may not be able to detect initial clinical change in a patient who enters therapy with very severe narcissism.

As for coverage of subthreshold content, recent research based on correlations between the PDQ-4 and factors of narcissism measured by other instruments suggests that the PDQ-4 does not provide coverage of very mild narcissism (Hopwood et al., 2013). Here again, the instrument would be limited in its ability to discriminate among those with no narcissism and very mild narcissism nor would it be ideally suited to detect positive change in clients with mild degrees of narcissism.

The PDQ-4 has advantages but also has some disadvantages, including poor internal consistency, susceptibility to false negatives, and a potentially narrow scope centered on the moderate range of the construct. One measure of narcissism that offers more items, is less susceptible to false negatives, and offers a more valid representation of the dimensional nature and breadth of narcissism is the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979). The NPI is a 40 item self-report measure, structured in a forced-choice format. The forced-choice format means that each question has a narcissistic option and a non-narcissistic option, with each disguised in such a way that it is not made obvious which is the more pathological option. In fact some of the narcissistic options do not seem pathological at all and may allow for measurement of normal/adaptive narcissism (e.g. "I am assertive"). The potential ability to measure a broader range of narcissism, even including adaptive aspects of narcissism is one of many reasons the NPI is commonly used within the social and personality psychology fields (Raskin & Hall 1979, 1981), which sometimes focus on adaptive qualities of narcissism such as leadership and self-esteem. By extension, this ability to capture less broad aspects of narcissism likely suggests that the NPI may provide more information

at relatively lower levels of pathological narcissism that may be missed by the PDQ-4. These advantages and the large body of literature that has accumulated over decades uniquely position the NPI as a viable tool for the assessment of narcissism in a variety of populations.

Despite its longevity and widespread use, the NPI has certain drawbacks that can be revealed by research on its factor structure. Factor analytic studies of the NPI have demonstrated an unstable factor structure with two- (Corry et al., 2008), three- (Kubarych et al., 2004), four- (Emmons, 1987), and seven- (Raskin & Terry, 1988) factor solutions reported. This debate remains unsettled despite much research over the long history of the NPI. As a result, most researchers simply aggregate responses to all items on the measure, which is problematic due to the fact that such a summary score may conflate various dimensions of personality (Miller & Campbell, 2008). These various dimensions that may exist within the NPI can vary widely and are associated with different outcomes and behavior. Some research indicates that NPI scores correlate with psychological health and resilience (Sedikides, Rudich, Gregg, Kumashiro, & Rusbult, 2004; Wallace, Ready, & Weitenhagen, 2009) while other research indicates that NPI scores correlate with measures of aggression and impaired interpersonal relationships (Campbell, Foster, & Finkel, 2002; Locke, 2009; Raskin, Novacek, & Hogan, 1991). These trends may indicate that, because the NPI measures so many different dimensions, the NPI is limited in its ability to measure any one dimension, including the dimension of pathological narcissism captured by the DSM criteria.

Although the factor scores are often unreported and although there are no official NPI subscales, it is important to be aware of the various possible factor structures to understand what the NPI may be capturing and how scores on the NPI may relate to scores from other measures of narcissism. The seven factor solution proposed by the creators of the measure consists of Authority, Exhibitionism, Superiority, Entitlement, Exploitativeness, Self-sufficiency, and Vanity (Raskin & Terry, 1988). A three factor solution proposed more recently by a different group of researchers consists of Power, Exhibitionism, and Specialness (Kubarych et al., 2004). Although these factor structures are very different, they have consistencies. Both contain adaptive and maladaptive features of narcissism. Adaptive features include leadership and social potency and maladaptive features include entitlement and manipulativeness (Ackerman, Witt, Donnellan, Trzesniewski, Robins & Kashy, 2011).

In an effort to more clearly understand the factor structure of the NPI, a recent study used contemporary factor analytic techniques. This included using exploratory factor analysis (EFA) instead of principal components analysis (PCA), tetrachoric correlation matrix analyses, and scree plots. The authors found a three factor solution and labeled the factors Leadership/Authority, Grandiose Exhibitionism, and Entitlement/Exploitativeness (Ackerman et al., 2011). In a follow-up study, Ackerman, Donnellan, and Robbins (2012) performed a 2PL item response theory (IRT) analysis of the information provided by the NPI within each of these three factors. Only the Leadership/Authority factor had a good range of precision across a large spectrum of the underlying narcissism trait. The other two factors on the other hand, comparatively

lacked precision. This may mean that the NPI provides precision on normal/nonclinical

constructs that some researchers argue should be separated from narcissism (Brown et

al., 2009; Rosenthal & Hooley, 2010) and lacks precision on entitlement and

exploitativeness, features considered to be essential to pathological narcissism by almost

all investigators. Whereas the PDQ-4 directly measures the NPD criteria but may be

susceptible to underreporting bias, the NPI attempts to circumvent this issue through the

use of a disguised forced-choice format. In these ways, the NPI may be able to capture a

broader range of pathological narcissism compared to the PDQ-4. The NPI, however,

does not focus on extreme narcissism. What still is needed then is a measure that is

designed to capture the more pathological aspects of narcissism dimensionally and in a

way that is less susceptible to reporting biases.

The Pathological Narcissism Inventory (PNI; Pincus et al., 2009) is a 52 item

self-report measure that may capture a broader range of narcissism and provide better

coverage of features not well covered by the NPI and PDQ-4. The PNI specifically was

created to measure two important domains of narcissism: grandiosity and vulnerability.

The concept of narcissistic vulnerability has been described in recent research as a

narcissism subtype that appears as a shy person who deals with their self-esteem issues

by engaging in grandiose fantasy while also feeling intense shame regarding their needs

and ambition (Akhtar, 2003; Dickinson & Pincus, 2003; Ronningstam, 2005). The

dominant affect problem of narcissistic vulnerability is shame, and a shy narcissist

would be likely to avoid interpersonal relationships because of hypersensitivity to

rejection and criticism (Ronningstam, 2005). This emerging research and an extensive

factor analysis informed the PNI authors' decision to design their instrument to focus on

both grandiosity and vulnerability so as to capture aspects of narcissism that are

displayed in both normal and clinical settings.

Items of the PNI are assessed on a 6-point scale ranging from "not at all like me"

(0) to "very much like me" (5). This format is very different from the forced-choice

format of the NPI and the Yes/No format of the PDQ-4. Beyond item format, the factor

structure is also somewhat different. Whereas the NPI and PDQ-4 are typically reported

as raw scores, the PNI developers have created seven primary scales that hierarchically

load onto two higher order factors: Grandiosity and Vulnerability. Factors in the

Grandiosity domain include Entitlement Rage, Exploitativeness, Grandiose Fantasy, and

Self-sacrificing Self-enhancement. Factors in the Vulnerability domain include

Contingent Self-esteem, Hiding the Self, and Devaluing. This factor structure was

validated using CFA (Pincus et al., 2009). The structure has been replicated and has

demonstrated gender invariance in that it assesses narcissism equally well in samples of

men and women (Wright, Lukowitsky, Pincus, & Conroy, 2010).

The PNI has been suggested to cover more severe aspects of narcissism and has

displayed negative correlations with self-esteem and empathy, and positive correlations

with shame, interpersonal distress, aggression, and borderline personality organization

(Pincus et al., 2009). The PNI also relates to certain interpersonal problems such as

vindictiveness and coldness (Pincus et al., 2009). PNI scales have significant

associations with parasuicidal behavior, suicide attempts, homicidal ideation, and

therapy utilization, all of which further underscore the potential for the PNI to measure

the more pathological side of narcissism. It has been suggested that this coverage of the more pathological aspects of narcissism along with subscales from the grandiosity factor of the PNI can potentially provide broader coverage of the underlying construct (Pincus & Lukowitzky, 2010). However, this remains an open empirical question.

Studies in recent years have begun to empirically evaluate the similarities and differences in these three measures of narcissism. These similarities and differences provide insight into the way each measure relates to the underlying construct. This small but growing literature contains numerous studies that have compared the psychometric properties of these three measures.

First, in an examination of item content, Maxwell, Donnellan, Hopwood, and Ackerman (2011) conducted an extensive comparison analysis on the NPI, PNI, and PDQ-4 narcissism items. The NPI and PNI had a somewhat weak correlation with each other but had much stronger correlations across certain subscales of each measure, such as scales measuring Exploitativeness. Interestingly, despite the low correlation between the PNI and NPI, the two measures correlated significantly with the NPD subscale of the PDQ. This suggests that the measures do in fact capture different aspects of narcissism and can be linked together to the underlying narcissism construct by NPD symptoms. The question is raised, what range of the core trait of DSM narcissism does each instrument capture?

Second, this same study examined criterion validity. Maxwell and colleagues (2011) conducted an analysis of the three measures as they relate to general self-esteem. Interestingly, the NPI and PNI had a significantly different relation to general self-

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esteem despite both being measures of narcissism. Self-esteem was negatively associated with the PNI but positively associated with the NPI. This finding supports the notion that the NPI measures normal/adaptive narcissism, in that high scores on the NPI would indicate the person has a level of ego resiliency and maintained sense of self-worth that would lead to high self-esteem. The PNI however measures the more pathological side of narcissism and high scores on the PNI likely indicate levels of internal vulnerability and dissatisfaction with the self that would cause lower self-esteem. Due to its basis in the NPD criteria, it would be expected that the PDQ measures a more pathological side of narcissism and therefore would not positively relate to self-esteem, and in this study the PDQ did indeed have a negative association with self-esteem. In addition to measures of global self-esteem, the authors also analyzed relations to counterproductive school behaviors.

The analysis of counterproductive school behaviors by Maxwell et al (2011) revealed that the NPI and PNI were similarly related to counterproductive school behaviors. This finding suggests that even though the measures differently relate to self-esteem, aspects of narcissism (whether they technically are classified as adaptive or maladaptive) are detrimental to educational success. Collectively, the analyses of both item content and criterion validity from this investigation indicate that these instruments tap into different aspects of the narcissism construct, and also share overlapping variance on certain aspects of the construct. Further research may reveal the differences and areas of overlap with greater clarity and precision.

Beyond item content and criterion validity, studies have also examined how each instrument relates to the nomological network of personality traits. Miller and Campbell (2008) observed associations between the PDQ-4, the NPI, and the Big Five personality traits. The PDQ-4 and the NPI generated substantially divergent relations with general personality traits. Each was multidimensional in that each related to multiple traits, but each also had very different patterns of correlated traits. PDQ-4 narcissism was comprised of a configuration of high Neuroticism and Antagonism and low Extraversion (primarily, low interpersonal warmth and positive affectivity). Conversely, NPI narcissism was comprised of a configuration of low Neuroticism, high Extraversion (particularly agentic aspects), and Antagonism. This finding suggests that the two measures of narcissism are made up of different aspects of personality and have different behavioral and emotional expressions. The PDQ-4 was positively associated with interpersonal distress, whereas the NPI was negatively associated. This is an important difference that suggests the PDQ-4 measures pathological grandiosity that masks insecurity, fragility, and vulnerability while the NPI measures grandiosity in a way that is more consistent with the lay understanding of the self-important narcissist. This study also replicated a similar relationship to self-esteem for each instrument: positive correlation for the NPI and slightly negative for the PDQ-4.

The NPI, PNI, and PDQ-4 have also been compared in the context of a study of DSM-5 alternate PD model traits. The study replicated the finding that antagonism is a trait consistently found in each instrument (Wright et al., 2013). This convergence and the similar correlations with external constructs mentioned previously suggest that the

three instruments may be tapping into the same latent construct to a certain extent. However, all of these comparison studies rely on correlations between third variables that often are constructs related to narcissism. These studies do not, however, analyze the differential ability of the instruments to indicate narcissism, similarly defined. The use of Item Response Theory (IRT), allows one to define the latent continuum, DSM narcissism, and then link the PDQ-4, NPI, and PNI to that continuum. Once the measures are linked, they can for the first time be compared on the same unified latent continuum in a common metric - information. Information is an IRT metric that quantifies the ability of an item or a set of items to indicate continuum latent construct such as narcissism. The current study used IRT procedures to analyze the ability of the PDQ-4, NPI, and PNI to indicate DSM narcissism.

METHODS

Participants

Undergraduate students at a large public Midwestern university were recruited for participation in this study. The sample of 587 participants was 50.42% female (296) and was an average age of 19.56 years of age. 83.65% (491) of the students were Caucasian, 7.16% (42) were Asian American, and 4.09% (24) were African American. The students received course credit for their participation.

Measures

Personality Disorder Questionnaire – Fourth edition (PDQ-4). The PDQ-4 is a 99 item self-report measure of personality pathology that is structured in a Yes/No answer format. Items were derived from the DSM in such a way that there is an item to represent each of the DSM PD criteria. Thus, since there are nine DSM NPD criteria, there are nine items on the PDQ-4 directly related to narcissism that were used in this study. In this study the latent construct, DSM narcissism, was created using the NPD items of the PDQ-4 due to their similarity to the DSM NPD criteria. The process of creating a unidimensional representation of DSM narcissism using the PDQ-4 items is described in further detail in the procedure and data analysis and results sections.

Narcissistic Personality Inventory (NPI). The NPI is a 40 item self-report measure, structured in a forced-choice format. A forced-choice format means that the individual taking the test must choose either a narcissistic or non-narcissistic option. One point is added to the total NPI score for each narcissistic item endorsed and the total raw score is reported.

Pathological Narcissism Inventory (PNI). The PNI is a 52 item self-report measure, in which items are assessed on a 6-point likert scale ranging from "not at all like me" (0) to "very much like me" (5). The measure produces a raw score that indicates overall narcissism, seven subscale scores, and measures two domains of narcissism: grandiosity and vulnerability.

Procedure and data analysis

The participants completed the nine NPD items of the PDQ-4 (Hyler, 1994), the NPI (Raskin & Hall, 1979), the PNI (Pincus et al., 2009), and provided demographic information and other information not used in this study through an online inventory. These data from the three measures of narcissism were then linked and compared in a series of IRT analyses, described in further detail below. IRT is a family of models in which the probability of an item response is modeled as a function of latent trait (theta) and one or more item parameters (Lord, 1980). Once the latent trait is defined, multiple measures can be evaluated as to their ability to indicate that latent trait.

The procedure used in this study to establish the latent construct, DSM narcissism, and link all three measures is described in somewhat similar studies by Edelen, Thissen, Teresi, Kleinman & Welikson (2006) and Olino et al., (2013). Namely, concurrent calibration methods were used. A commonly used technique for this form of IRT linking between measures is to identify a subset of items referred to as "anchor items" that are judged a priori to be representative of the latent construct (Edelen et al., 2006). In this study, DSM narcissism was defined by a subset of the PDQ-4 items due to their equivalence to the DSM NPD criteria.

To be certain that we were meeting a key assumption of unidimensional IRT and establishing a unidimensional latent construct, categorical confirmatory factor analyses (CFAs) were conducted on the nine PDQ-4 items. We evaluated the fit of the CFAs using the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean squared error of approximation (RMSEA). CFI/TLI values $\geq$ .95, and RMSEA values $\leq$ .06, suggest sufficient fit (Hu & Bentler, 1999). If we found insufficient fit using the candidate items, we removed the lowest loading item iteratively until reaching sufficient unidimensionality and a subsequent iteration no longer improved the fit.

Once we defined the latent continuum, the items of the PDQ-4, NPI, and PNI were linked to it via IRT-linking procedures using the IRT-LR-DIF software program (IRTLRDIF, 2001). IRT-LR-DIF is a statistical software application used to establish parameters for the anchor items that define the latent continuum of interest and then test the extent to which individual candidate items index that latent continuum. Parameters for each of the three measures were established separately using the 2 parameter logistic model (2PL; Birnbaum, 1968). These parameters define the strength and location of each neuropsychiatric symptom as it relates to the latent continuum. The formula for the 2PL is below (with similar notation used in Baker, 2001):

$$\text{Formula 1.1:} \quad P(\theta) = \frac{1}{1+e^{-a(\theta-b)}}$$

In Formula 1.1, the *a* represents the strength of the association between a variable and the latent continuum (θ) and is equivalent to the slope of the item characteristic curve (ICC) at its inflection point. The *b* parameter indicates the θ value that corresponds to

this inflection point. This function defines a monotonically increasing function, which reveals the probability that an item is endorsed at any given level of the latent continuum, known as an ICC (defined precisely in Hambleton, Swanathan, & Rogers, 1991).

We used Formula 1.1 to establish a and b parameters for the PDQ-4, NPI, and PNI. We then plotted the functional relationships between each measure and the latent continuum using a derivative of Formula 1.1, which provides a useful metric of information, which is a metric that can be used to quantify and visualize both the strength of the relationship between an item and the latent continuum (as reflected by the a parameter) as well as the relative strength of the relationship across the latent continuum (as represented by the b parameter). This derivate function is defined by the following formula (Baker, 2001):

Formula 1.2: $\quad I_i(\theta) = a_i^2 P_i(\theta) Q_i(\theta)$

The 2PL model used in this study is mainly designed to be compatible with instruments that contain dichotomously scored items that are either endorsed (1) or not endorsed (0). Different IRT analytic methods that may be more appropriate for the multiple response options of the PNI, such as the Graded Response Model (GRM; Samejima, 1969), or for forced-choice format of the NPI, such as the Thurstonian model (Thurstone 1928; Yen 1986), were not selected to standardize the statistical approach across measures. The PNI and NPI response options were dichotomized to contain response options of either not endorsed (0) or endorsed (1). The 6-point Likert response options (0-5) of the PNI were dichotomously recoded. A response of 0, 1, or 2 was

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considered not endorsed (0) and a response of 3, 4, or 5 was considered endorsed (1).

The two response options of the NPI, a narcissistic option and a non-narcissistic option,

were coded in this study so that the non-narcissistic option was considered not endorsed

(0) and the narcissistic option was considered endorsed (1). The implications of this are

elaborated on in the discussion section.

The test information functions (TIFs) calculated for the PDQ-4, NPI, and PNI

using Formula 1.2 were plotted and analyzed. When plotting information functions the

horizontal axis is the continuum of DSM narcissism in standard deviation units and the

vertical axis represents the ability of the measure to reliably determine an individual's

standing on the latent continuum (i.e. information). The area under the curve (AUC)

summed from -4.00 to 4.00 *SD* was then calculated for each measure and analyzed via z-

tests to observe statistically significant differences between the total information

provided by each of the three measures.

RESULTS

The first goal of the analyses was to establish the latent continuum defined by DSM narcissism within the PDQ-4. Despite theoretically and conceptually being part of one unified construct, the nine NPD items of the PDQ-4 may not actually emerge as unidimensional in a CFA. Therefore, CFAs of the nine PDQ-4 items were conducted in an iterative process designed to identify if there was a unidimensional construct underlying the nine, or a subset of the nine, items. If an iteration did not demonstrate sufficient unidimensionality, the item that demonstrated the lowest loading was eliminated and we conducted a subsequent reanalysis until a sufficiently unidimensional construct emerged and a subsequent iteration did not statistically improve the fit. Three items were eliminated in this process (1, 3, and then 8) and the CFA using the remaining six PDQ-4 items revealed CFI, TLI, and RMSEA values of 1.00, 1.00, and .01 respectively, and thus demonstrated excellent and sufficient unidimensionality.

The second goal of the analyses was to calculate item parameters and instrument-specific information functions. This procedure can determine the relative ability of each item and each individual instrument to index the latent dimension of DSM narcissism. The parameters produced by the 2PL IRT analysis for each item are listed in Table 1. The ICCs these parameters form were aggregated to construct TIFs (Figure 1). The PNI provided the most total information followed by the NPI and then the PDQ-4.

The AUC was estimated by summing 800 slices of .01 *SD* width ranging from -4 to 4 *SD* of the latent continuum. The TIF of each measure was calculated and analyzed to empirically determine the ranges of the latent continuum that each measure provides

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statistically significant amounts of information. The AUCs in this study were compared

using the area method, described in Hambleton and Rogers (1989). Z-tests of statistical

significance comparing the AUC of the TIF of each measure to zero revealed that all

three measures provide statistically significant information. The PDQ-4 provided

statistically significant information from .03 to 2.68 *SD* of the latent continuum, DSM

narcissism (Figure 2a). The NPI provided statistically significant information across a

wider range of the latent continuum, from -.88 to 3.71 *SD* (Figure 2b). The PNI provided

statistically significant information across the widest range of DSM narcissism, ranging

across the entire latent continuum from -4 to 4 *SD* (Figure 2c).

We then summed total information provided by each of the measures using the

AUC summed from -4.00 to 4.00 *SD*. The PDQ-4 provided the least amount of total

information (954.31 units), the NPI provided more information than the PDQ-4 (1292.20

units) and the PNI provided the most total information (1520.49 units). These results

suggest that the PNI is most well suited to reliably distinguishing among gradations of

the latent continuum, DSM narcissism.

The third goal of the analyses was to analyze the amount of information provided

by combinations of the measures. Tests of statistical significance comparing the AUCs

of each measure were performed for this purpose. The combination of the NPI and PNI

compared to the PDQ-4 revealed that the NPI and PNI together provide significantly

more information than the PDQ-4 alone from -.71 to 4 *SD* (Figure 3c). This suggests

that, as theorized and demonstrated in previous research (Hopwood et al., 2013; Pincus

& Lukowitsky, 2010), the NPI and PNI provide coverage of aspects of narcissism not well assessed by the NPD criteria alone.

The fourth goal of the analyses was to determine whether each measure provided statistically significant information across the range of the latent continuum above and beyond the others. The NPI did not provide statistically significant information above and beyond the PDQ-4 (Figure 3a) across the latent continuum, nor did the PDQ-4 provide statistically significant information above and beyond the NPI (Figure 4a). Therefore, these measures are essentially equivalent in terms of reliable coverage of the latent continuum, despite the difference in total information provided. The PNI on the other hand, did provide statistically significant information above and beyond the information provided by the PDQ-4 from 2.37 to 3.43 *SD* (Figure 3b). The PDQ-4 did not provide statistically significant information above the PNI at any part of the latent continuum (Figure 4b). Therefore, the PNI increases measurement precision at the more severe levels of narcissism as compared to the PDQ-4, without sacrificing any information across the entire latent continuum.

Upon observing the success of the PNI relative to the PDQ-4, it became apparent that the recently designed 28-item brief version of the PNI (B-PNI; Schoenleber, Roche, Wetzel, Pincus, & Roberts, 2015) may be able to provide information that is comparable to the information provided by the PDQ-4. This may be beneficial in situations that necessitate using less than the 52 items of the full PNI, such as in screening situations or when there are constraints on time or resources. The analyses were redone using the B-PNI to examine its ability compared to the PDQ-4. The B-PNI provided statistically

significant information from 1.09 to 4.00 *SD* of the latent continuum (Figure 5). The

PDQ-4 did not provide significantly more information than the B-PNI at any part of the

latent continuum (Figure 6a) and the B-PNI did not provide significantly more

information than the PDQ-4 at any part of the latent continuum(Figure 6b). Therefore,

the B-PNI provides essentially equivalent coverage of DSM narcissism compared to the

PDQ-4.

CONCLUSIONS

This investigation sought to compare the relative ability of the PDQ-4, NPI, and PNI to indicate DSM narcissism. Once DSM narcissism was defined, we then quantified the relative ability of each instrument to capture it. The PDQ-4 provided information primarily around 1.00 *SD* beyond the mean, suggesting that the PDQ-4 indicates narcissism, but does so in a narrow range centered significantly above the mean. These results suggest that the PDQ-4 may be somewhat effective for distinguishing between those who are above and below this very specific level. Notably, the total information provided by the PDQ-4 is substantially lower than the information provided by the other two measures, likely due to the numerous limitations of the PDQ-4, including poor internal consistency, lack of subtlety, and limited dimensionality due to the low number of items.

The PNI, in contrast, provided the most total information across the widest range of DSM narcissism. At the most severe levels of DSM narcissism the PNI substantially outperformed both the PDQ-4 and the NPI in terms of information provided. This additional measurement precision at the extreme levels of narcissism may indicate that the PNI offers utility in a variety of clinical and research settings. For example, using this instrument to detect more severe levels of narcissism can allow researchers and clinicians to detect meaningful differences in external behaviors (e.g. manipulativeness), external variables (e.g. self-esteem, neuroticism), and treatment responsiveness between individuals with high and very high levels of DSM narcissism. Given that the PNI provides essentially equivalent coverage of DSM narcissism to the PDQ-4 at the

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diagnostic threshold, it retains the ability to be used for informing diagnostic decisions while simultaneously adding the ability to differentiate among those with severe and very severe levels of DSM narcissism. Additionally, along with the utility offered by the increased range covered, the PNI also contains an established factor structure that reveals different aspects of narcissism (e.g. narcissistic vulnerability) that are not measured by the PDQ-4 (nor the NPI, to be discussed next) but are nonetheless informative for research and clinical practice.

The NPI did not provide statistically significant informational coverage of the latent continuum above and beyond what was provided by the PDQ-4. Therefore, if the goal is to measure DSM narcissism, it would more than likely not make good sense to use the NPI over the PDQ-4 given that the NPI contains 31 additional items. The additional items introduce increased time and burden of effort for only a relatively small, non-significant, amount of information. The NPI does retain some utility however, in that when it was used in combination with the PNI it did provide some additional information at the less severe end the DSM narcissism latent continuum. This finding that the NPI can provide information on the less severe and perhaps also the more normal/adaptive aspects of narcissism, is consistent with previous research on the NPI (Ackerman, Donnellan, & Robbins, 2012; Hopwood et al., 2013; Maxwell et al., 2011; Miller & Campbell, 2008). It is also possible that the NPI possibly indicates low levels of narcissism differently construed, in that it captures aspects of narcissism not contained within DSM defined narcissism. Although, it should be noted again that the extent to which the NPI provided information, even on the less severe ends of the latent

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continuum, was non-significant and less than might be expected based on previous research. Therefore, the data in this study suggests even though the forced-choice format potentially offers some utility in preventing the denial of symptoms, this benefit is offset by the costs of time and subject burden brought on by the increased number of items and the information provided by the NPI over the PDQ-4 is too insignificant to account for these costs.

In contrast to the NPI, the PNI provided significant information above and beyond the PDQ-4. Therefore, if given sufficient time and access, the PNI would be the best of the three instruments to select when measuring DSM narcissism to maximize information and to increase precision of measurement of the more severe levels of DSM narcissism. This has multiple implications for both research and practice.

From the perspective of a researcher, the ability to differentiate between extreme levels of multiple participants who endorse different degrees of DSM narcissism could be invaluable. The predictive value afforded by better measuring the full continuum could reveal meaningful relationships and allow for a more well-developed understanding of narcissism. Among clinicians, the ability to more fully understand a client's narcissistic presentation could be similarly invaluable. For example, a clinician may be treating an individual who regularly displays severe narcissistic behavior but also often experiences severe suicidal tendencies related to insults to the client's self-esteem and challenges to his or her grandiosity-based self-schemas. Use of the PNI in this situation could reveal, with increased precision of measurement, the client's standing along the DSM narcissism latent continuum. Simultaneously, use of the PNI

would provide scores on grandiosity and vulnerability scales that may better explain the suicidal tendencies.

Even with this potential utility in research and practice, just as was discussed with the NPI, the question of how the utility provided by additional information is weighed against the number of additional items also applies to the PNI. Accordingly, we compared the B-PNI to the PDQ-4 to determine whether or not the brief version could still provide significant information and coverage of DSM narcissism on par with the PDQ-4 even with substantially fewer items than the full PNI. Results show that the B-PNI and PDQ-4 do not provide significantly different amounts of information at any point of the latent continuum and therefore could conceivably be used interchangeably. Although the B-PNI still contains more items than the PDQ-4, it also provides reliable measurement of the seven PNI facets which can be informative for research and practice in ways that extend beyond the capabilities of the PDQ-4.

As was eluded to in the methods section, this is only one way to analyze the data. Different IRT analytic methods that may be more appropriate for the multiple response options of the PNI, such as the Graded Response Model (GRM; Samejima, 1969), or for the NPI, such as the Thurstonian model (Thurstone 1928; Yen 1986). Conceptually, though not empirically tested here, the links between test format and these alternative IRT analyses would lend themselves toward revealing greater amounts of information for the PNI and NPI than was revealed using the 2PL model in this study. This potentially suggests that the 2PL model chosen for this study was, the most conservative estimate of the information provided by the PNI and NPI. The application of the 2PL

across all three measures may suggest that the differences in information provided is only accounted for by the item content of each, rather than from potentially more informative measure structures like the forced-choice format of the NPI or the multiple response options of the PNI. This is speculative however and remains an open empirical question that could be examined in future research via comparison of the information provided by each measure when using the GRM and Thurstonian model for the PNI and NPI respectively. These analyses could also evaluate the ability of the short forms of each measure, the B-PNI and the NPI-13 (Gentile et al., 2013), to provide information about DSM narcissism. In addition, it should be noted that the use of the area method and the AUC of the TIF of each measure is only one of several other viable methods for comparing test information.

There are limitations for this study that should be noted. First, the sample is entirely made up of young adult college students and it may be necessary to replicate these results in samples of different ages and other demographics. Similarly, this is a community sample and it is possible that clinical samples, which may be more or less likely to contain individuals with severe narcissistic pathology may produce slightly different results. Finally, it is worthwhile to mention that these data are mono-method and rely entirely on self-report. Previous research has shown that conclusions drawn from assessments of personality pathology may differ based upon the method of assessment, such as self- and informant report (e.g. Busch, Balsis, Morey, & Oltmanns, 2016). Future research endeavors would likely benefit from the inclusion of informant reports and clinical interviews.

These limitations aside, these results have potential impact on multiple fields in a variety of settings. In clinical psychology and psychiatry, where narcissism as defined by the DSM is often the primary construct of interest, it is extremely beneficial to know how these measures index the latent continuum to maximize research and clinical utility offered by each of them. Being able to identify precisely where an individual falls on the latent continuum offers an opportunity to better understand how narcissism functions and relates to important outcomes. That knowledge is also applicable to the field of social psychology, where research on narcissism is also very common. Placing all of these measures on a common metric, DSM narcissism, allows for newfound integration that could help bridge gaps in knowledge between these fields where narcissism is inconsistently defined and assessed (Pincus & Lukowitzky, 2010). As this line of research continues to grow, it is possible that further integration can lead to combined understanding and translational growth for all three fields.

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Figure 1. Information functions for the PDQ-4, NPI, and PNI.
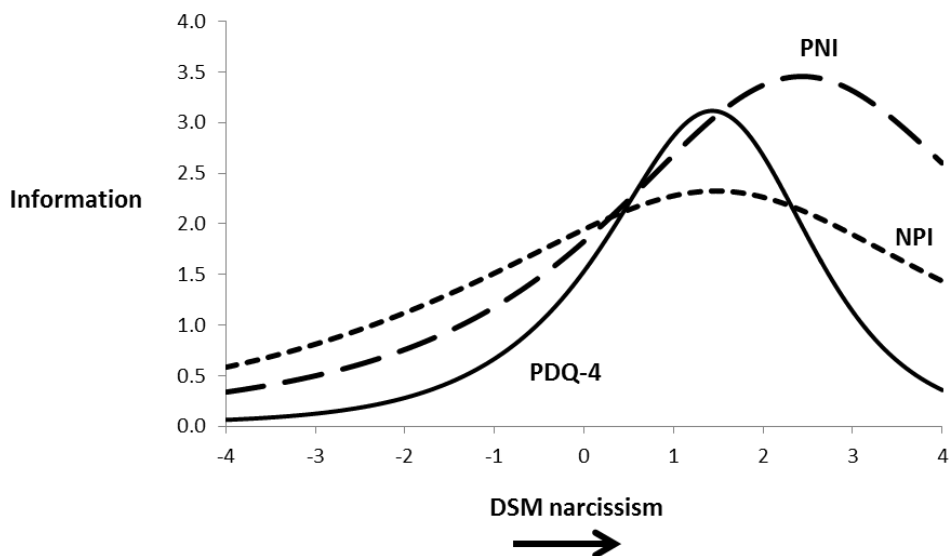
Note. Information functions for the Personality Diagnostic Questionnaire 4th edition (PDQ-4), the Narcissistic Personality Inventory (NPI), and the Pathological Narcissism Inventory (PNI). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The solid line represents the PDQ-4, the dashed line represents the NPI, and the segmented line represents the PNI.

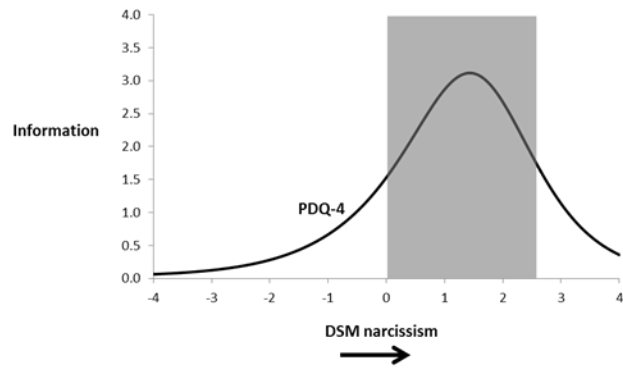**Figure 2a. The PDQ-4 provides statistically significant information from .03 to 2.68.**

Figure 2b. The NPI provides statistically significant information from -.88 to 3.71.
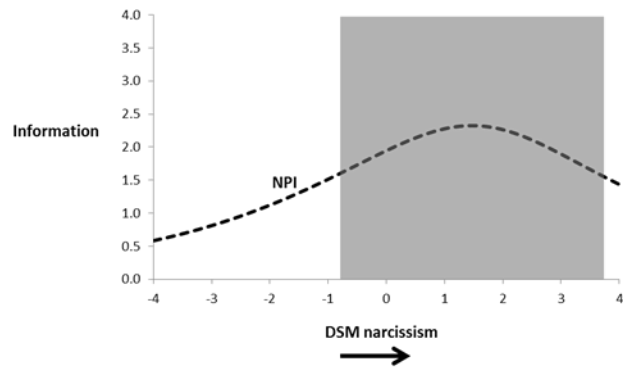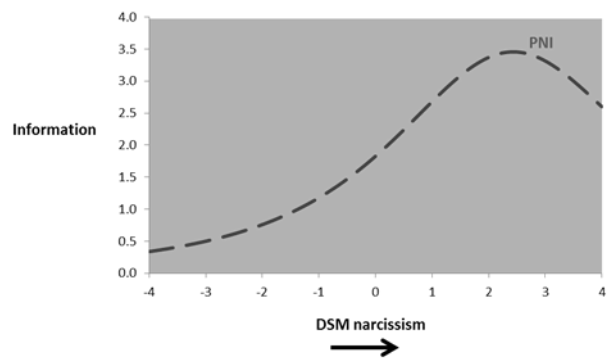

Figure 2c. The PNI provides statistically significant information from -4.0 to 4.0.

Note. Information functions for the Personality Diagnostic Questionnaire 4th edition (PDQ-4), the Narcissistic Personality Inventory (NPI), and the Pathological Narcissism Inventory (PNI). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The solid line represents the PDQ-4, the dashed line represents the NPI, and the segmented line represents the PNI. The shaded region represents the range of the latent continuum that the target measure provides greater amounts of statistically significant information than a zero area curve.

Figure 3a. The NPI does not provide significantly more information than the PDQ-4.
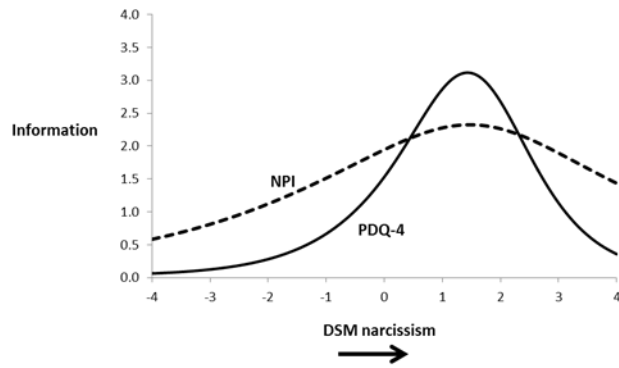

Figure 3b. The PNI provides significantly more information than the PDQ-4.
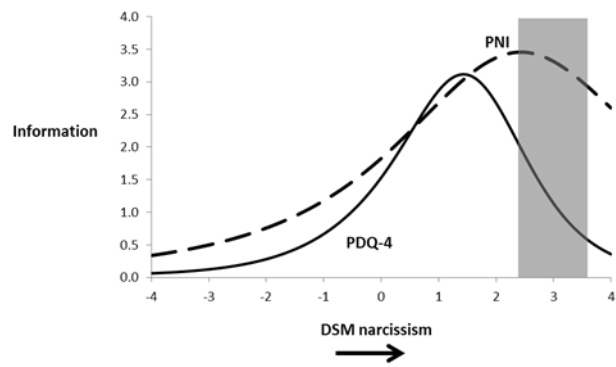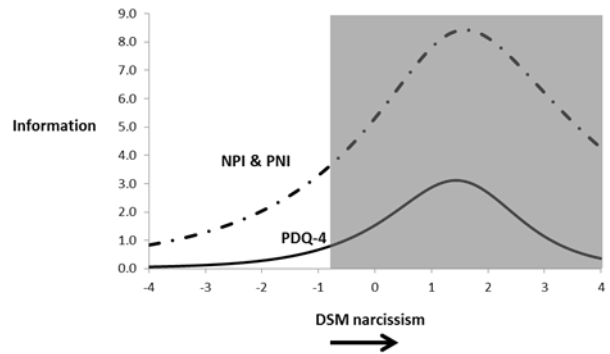

Figure 3c. NPI and PNI combined provide significantly more information than the PDQ-4 alone.

Note. Information functions for the Personality Diagnostic Questionnaire 4th edition (PDQ-4), the Narcissistic Personality Inventory (NPI), and the Pathological Narcissism Inventory (PNI). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The solid line represents the PDQ-4, the dashed line represents the NPI, the segmented line represents the PNI, and the dotted and segmented line represents both the NPI & PNI. The shaded region represents the range of the latent continuum that the target measure(s) provide greater amounts of statistically significant information than provided by the PDQ-4.

Figure 4a. The PDQ-4 does not significantly provide more information than the NPI.
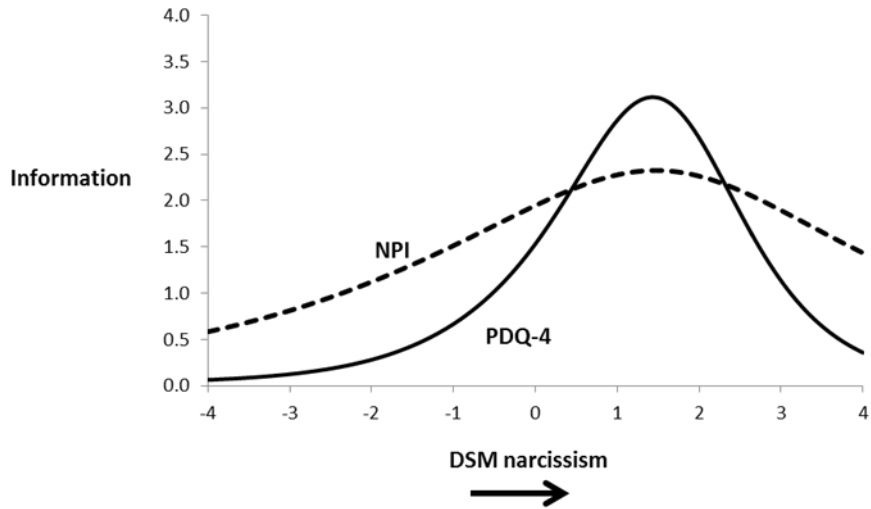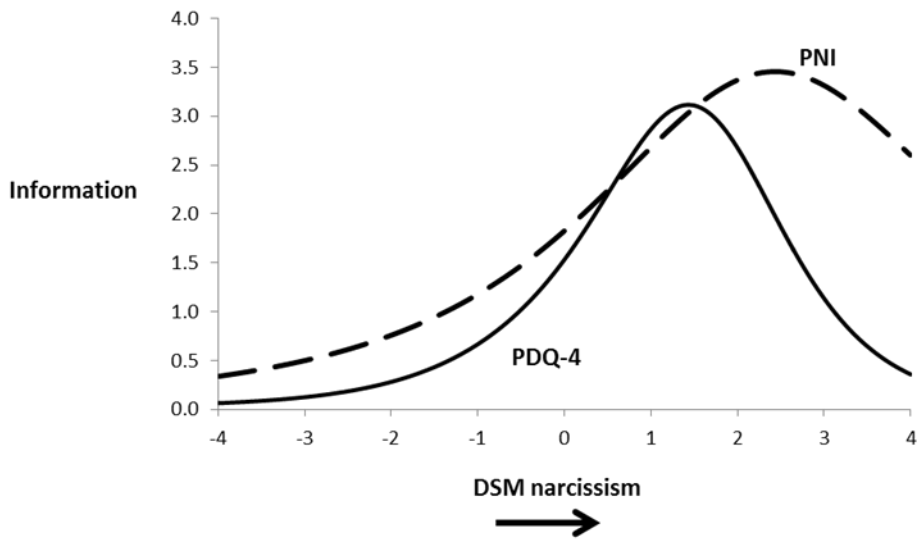

Figure 4b. The PDQ-4 does not significantly provide more information than the PNI.

Note. Information functions for the Personality Diagnostic Questionnaire 4th edition (PDQ-4), the Narcissistic Personality Inventory (NPI), and the Pathological Narcissism Inventory (PNI). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The solid line represents the PDQ-4, the dashed line represents the NPI, and the segmented line represents the PNI. The shaded region represents the range of the latent continuum that the PDQ-4 provides greater amounts of statistically significant information than the NPI and PNI.

Figure 5. B-PNI is better than 0 from 1.09 to 4.
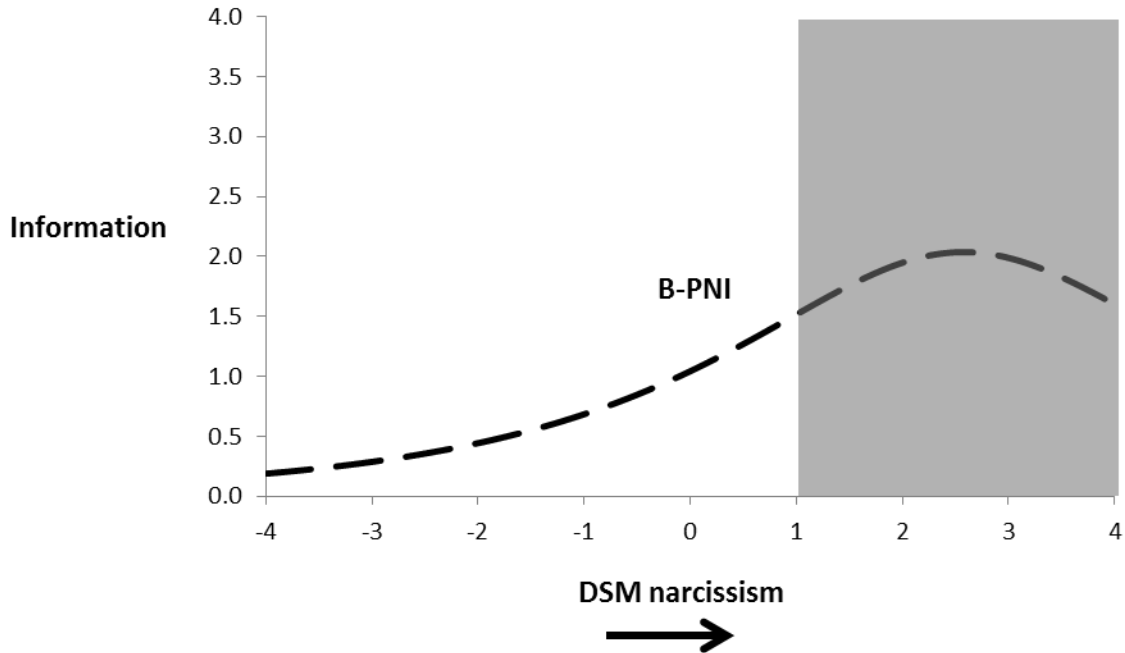
Figure 5. Information function for the Brief version of the Pathological Narcissism Inventory (B-PNI). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The segmented line represents the B-PNI. The shaded region represents the range of the latent continuum that the B-PNI provides greater amounts of statistically significant information than a zero area curve.

Figure 6a. The PDQ-4 does not provide significantly more information than the B-PNI.
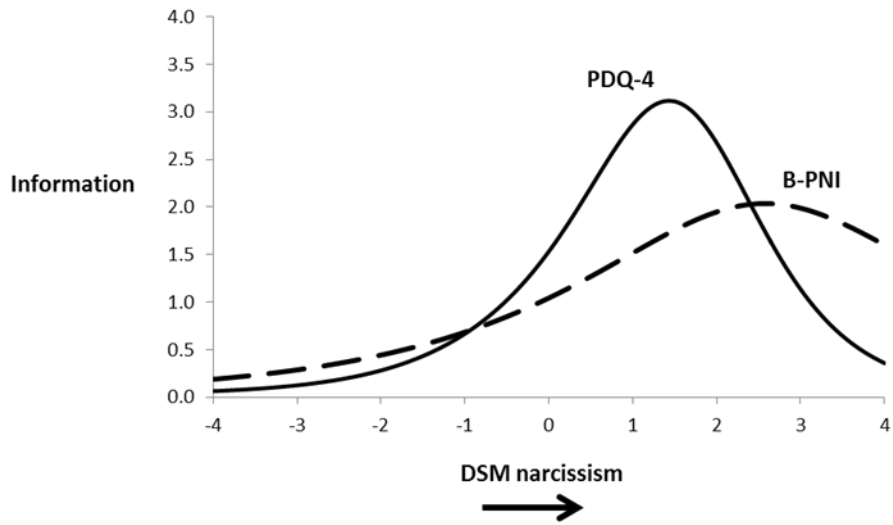
Figure 6b. The B-PNI does not provide significantly more information than the PDQ-4.
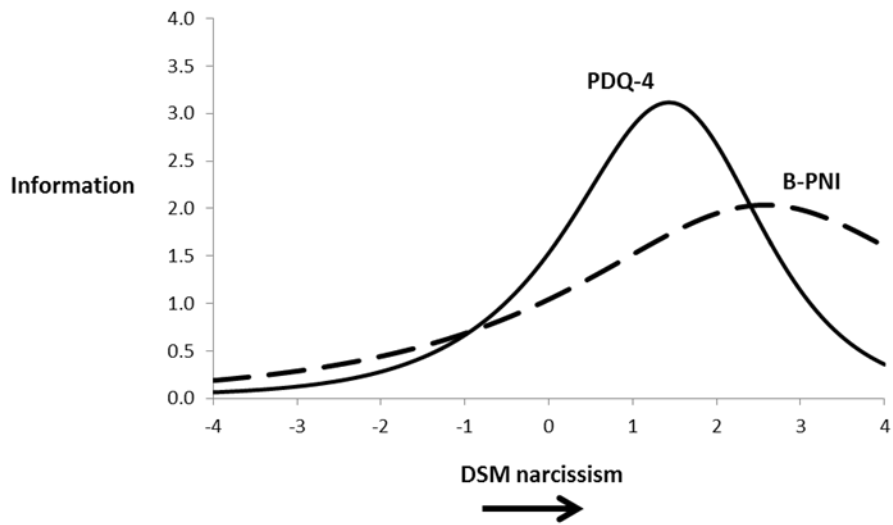
Note. Information functions for the Brief version of the Pathological Narcissism Inventory (B-PNI) and the Personality Diagnostic Questionnaire-4th edition (PDQ-4). The horizontal axis represents the latent construct of narcissism as defined by DSM-5 in *SD* units (range from low, -4.0, to high, 4.0) and the vertical axis represents the probability that an item would be endorsed from .00 (no probability) to 1.00 (certainty). The segmented line represents the B-PNI and the solid line represents the PDQ-4. The shaded region represents the range of the latent continuum that each measure provides greater amounts of statistically significant information than the other.

Table 1. Item Parameters

Item	Item Content	*a*	*b*
PDQ 1	NPD 1 (grandiosity)	0.26	0.73
PDQ 2	NPD 2 (fantasies of unlimited success, power, etc.)	1.19	1.23
PDQ 3	NPD 3 (special and unique)	0.45	-0.4
PDQ 4	NPD 4 (requires excessive admiration)	1.08	1.19
PDQ 5	NPD 5 (sense of entitlement)	1.58	1.63
PDQ 6	NPD 6 (interpersonally exploitative)	1.36	1.54
PDQ 7	NPD 7 (lacks empathy)	1.55	1.45
PDQ 8	NPD 8 (envious of others/others envious of him or her)	1.05	-0.02
PDQ 9	NPD 9 (arrogant, haughty behavior)	1.64	1.5
NPI 1	I have a natural talent for influencing people. I am not good at influencing people	0	-463.2
NPI 2	Modesty doesn't become me. I am essentially a modest person	0.33	5.84
NPI 3	I would do almost anything on a dare. I tend to be a fairly cautious person	0.2	5.66
NPI 4	I know that I am good because everybody keeps telling me so. When people compliment me I sometimes get embarrassed	0.9	1.43
NPI 5	If I ruled the world it would be a better place. The thought of ruling the world frightens the hell out of me	0.23	3.01
NPI 6	I can usually talk my way out of anything. I try to accept the consequences of my behavior	0.64	0.62
NPI 7	I like to be the center of attention. I prefer to blend in with the crowd	0.37	1.58
NPI 8	I will be a success. I am not too concerned about success	-0.43	4.06
NPI 9	I think I am a special person. I am no better or worse than most people	0.45	0.49
NPI 10	I see myself as a good leader. I am not sure if I would make a good leader	-0.06	10.71
NPI 11	I am assertive. I wish I were more assertive	-0.02	4.89

NPI 12	I like to have authority over people. I don't mind following orders	0.38	0.16
NPI 13	I find it easy to manipulate people. I don't like it when I find myself manipulating people	0.65	0.96
NPI 14	I insist upon getting the respect that is due to me. I usually get the respect that I deserve	0.5	2.12
NPI 15	I like to show off my body. I don't particularly like to show off my body	0.36	2.99
NPI 16	I can read people like a book. People are sometimes hard to understand	0.01	-48.11
NPI 17	I like to take responsibility for making decisions. If I feel competent I am willing to take responsibility for making decisions	0.11	0.97
NPI 18	I want to amount to something in the eyes of the world. I just want to be reasonably happy.	0.26	0.43
NPI 19	I like to look at my body. My body is nothing special	0.38	0.99
NPI 20	I will usually show off if I get the chance. I try not to be a show off	0.82	1.67
NPI 21	I always know what I am doing. Sometimes I am not sure of what I am doing	0.17	4.8
NPI 22	I rarely depend on anyone else to get things done. I sometimes depend on people to get things done	-0.17	0.58
NPI 23	Everybody likes to hear my stories. Sometimes I tell good stories	0.51	2.43
NPI 24	I expect a great deal from other people. I like to do things for other people	0.67	2.43
NPI 25	I will never be satisfied until I get all that I deserve. I take my satisfactions as they come	0.64	2.48
NPI 26	I like to be complimented. Compliments embarrass me	0.03	-26.14
NPI 27	I have a strong will to power. Power for its own sake doesn't interest me	0.46	0.8
NPI 28	I like to start new fads and fashions. I don't care about new fads and fashions	0.38	1.71
NPI 29	I like to look at myself in the mirror. I am not particularly interested in looking at myself in the mirror	0.66	-0.25

NPI 30	I really like to be the center of attention. It makes me uncomfortable to be the center of attention	0.39	0.86
NPI 31	I can live my life in any way I want to. People can't always live their lives in terms of what they want.	0.03	-14.49
NPI 32	People always seem to recognize my authority. Being an authority doesn't mean that much to me	0.3	2.38
NPI 33	I would prefer to be a leader. It makes little difference to me whether I am a leader or not	0.04	-4.39
NPI 34	I am going to be a great person. I hope I am going to be successful	0.03	-8.63
NPI 35	I can make anybody believe anything I want them to. People sometimes believe what I tell them	0.43	1.03
NPI 36	I am a born leader. Leadership is a quality that takes a long time to develop.	0.16	4.43
NPI 37	I wish somebody would someday write my biography. I don't like people to pry into my life for any reason	0.5	1.12
NPI 38	I get upset when people don't notice how I look when I go out in public. I don't mind blending into the crowd when I go out	1.02	1.63
NPI 39	I am more capable than other people. There is a lot I can learn from other people	0.4	2.59
NPI 40	I am an extraordinary person. I am much like everybody else.	0.47	0.78
PNI 1	I often fantasize about being admired and respected	0.17	2.31
PNI 2	My self-esteem fluctuates a lot	-0.03	-12.5
PNI 3	I sometimes feel ashamed about my expectations of others when they disappoint me	0.05	23.87
PNI 4	I can usually talk my way out of anything	0.53	1.52
PNI 5	It's hard to feel good about myself when I'm alone	0.42	3.59
PNI 6	I can make myself feel good by caring for others	-0.21	3.23

PNI 7	I hate asking for help	0.11	4.04
PNI 8	When people don't notice me, I start to feel bad about myself	0.71	2.54
PNI 9	I often hide my needs for fear that others will see me as needy and dependent	0.12	7.35
PNI 10	I can make anyone believe anything I want them to	0.65	2.57
PNI 11	I get mad when people don't notice all that I do for them	0.46	2.11
PNI 12	I get annoyed by people who are not interested in what I say or do.	0.47	3
PNI 13	I wouldn't disclose all my intimate thoughts and feelings to someone I didn't admire	-0.39	0.31
PNI 14	I often fantasize about having a huge impact on the world around me	0.12	2
PNI 15	I find it easy to manipulate people	0.63	2.7
PNI 16	When others don't notice me, I start to feel worthless	0.95	2.39
PNI 17	Sometimes I avoid people because I'm concerned that they'll disappoint me	0.71	2.93
PNI 18	I typically get very angry when I'm unable to get what I want from others	0.98	2.31
PNI 19	I sometimes need important others in my life to reassure me of my self-worth	0.26	2.89
PNI 20	When I do things for other people, I expect them to do things for me	0.76	2.1
PNI 21	When others don't meet my expectations, I often feel ashamed about what I wanted	0.58	4.04
PNI 22	I feel important when others rely on me	-0.22	1.85
PNI 23	I can read people like a book	0.07	7.79
PNI 24	When others disappoint me, I often get angry at myself	0.43	5.28
PNI 25	Sacrificing for others make me the better person	0.07	4.56
PNI 26	I often fantasize about accomplishing things that are probably beyond my means	0.1	1.62
PNI 27	Sometimes I avoid people because I'm afraid they won't do what I want them to	0.57	4.64

PNI 28	It's hard to show others the weaknesses I feel inside	-0.19	-2.77
PNI 29	I get angry when criticized	0.31	2.82
PNI 30	It's hard to feel good about myself unless I know other people admire me	0.68	2.78
PNI 31	I often fantasize about being rewarded for my efforts	0.43	1.37
PNI 32	I am preoccupied with thoughts and concerns that most people are not interested in me	0.63	2.98
PNI 33	I like to have friends who rely on me because it makes me feel important	0.45	1.98
PNI 34	Sometimes I avoid people because I'm concerned they won't acknowledge what I do for them	1.17	2.62
PNI 35	Everybody likes to hear my stories	0.36	3.55
PNI 36	It's hard for me to feel good about myself unless I know other people like me	0.5	2.8
PNI 37	It irritates me when people don't notice how good a person I am	0.66	2.15
PNI 38	I will never be satisfied until I get all that I deserve	0.72	2.59
PNI 39	I try to show what a good person I am through my sacrifices	0.29	3.35
PNI 40	I am disappointed when people don't notice me	1.01	2.05
PNI 41	I often find myself envying others' accomplishments	0.37	2.33
PNI 42	I often fantasize about performing heroic deeds	0.49	1.51
PNI 43	I help others in order to prove I'm a good person	0.5	2.17
PNI 44	It's important to show people I can do it on my own, even if I have some doubts inside	-0.03	-3.12
PNI 45	I often fantasize about being recognized for my accomplishments	0.4	1.35
PNI 46	I can't stand relying on other people because it makes me feel weak	0.19	5.47
PNI 47	When others don't respond to me the way that I would like them to, it is hard for me to still feel ok with myself	0.73	2.96
PNI 48	I need others to acknowledge me	0.87	1.81
PNI 49	I want to amount to something in the eyes of the world	0.09	1.71

PNI 50	When others get a glimpse of my needs, I feel anxious and ashamed	0.46	3.65
PNI 51	Sometimes it's easier to be alone than to face not getting everything I want from other people	0.61	3.18
PNI 52	I can get pretty angry when others disagree with me	0.79	2.32

Note. Item parameters for the Narcissistic Personality Disorder (NPD) items of the Personality Diagnostic Questionnaire-4th edition (PDQ-4), the Narcissistic Personality Inventory (NPI) and the Pathological Narcissism Inventory (PNI)