**Getting the Personality Inventory for DSM-5 ready for clinical practice: Norm values
and correlates in a representative sample from the German population**

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Abstract

Background

The Personality Inventory for DSM-5 (PID-5) is the gold-standard self-report tool to assess personality pathology according to five maladaptive trait domains (Criterion B) and may also be used to estimate the severity of personality problems (Criterion A). Previous research incorporating the PID-5 has often been limited by sample selection biases and relatively arbitrarily set cut-off values. Thus, our aim was to establish norm values and scrutinize the nomological net of the PID-5 Brief Form Plus (PID5BF+) using a representative sample from the general population.

Methods

We used data (N=4,727) from the ongoing GESIS panel, which includes a representative German sample. Participants completed the PID5BF+ and various measures of psychological functioning. Descriptive norms based on the cumulative percentile distributions and model-based norms for different versions of the PID-5 based on multiple group graded response models were determined. Moreover, the nomological net of PID5BF+ scales was examined using multiple linear and logistic regression analyses.

Results

We established representative norm values for each of the five PID5BF+ domains and the total score, and present model-based norms for four different PID-5 versions. Results confirmed that self-reported personality pathology was associated with lower socio-economic status and greater psychological disturbances.

Conclusion

Our empirically-based representative norm values of the PID5BF+ provide a reference framework for practitioners and researchers to evaluate and interpret the PID-5. Moreover, we highlight the relevance of personality pathology not only in clinical settings but also for wider societal functioning and public mental health.

Introduction

Personality disorders (PDs) are associated with debilitating individual and societal outcomes, including lower quality of life, comorbid mental disorders, interpersonal conflicts, lower levels of education, and economic inactivity (Coid, Yang, Tyrer, Roberts, & Ullrich, 2006; Hengartner, Müller, Rodgers, Rössler, & Ajdacic-Gross, 2014b, 2014a; Penner-Goeke et al., 2015; Yang, Coid, & Tyrer, 2010). Research further suggests that subthreshold PDs may also constitute a risk factor for mental health issues, and may negatively impact social, occupational, and economic outcomes (Westen & Arkowitz-Westen, 1998; Yang et al., 2010). These findings highlight the psychological and social relevance of maladaptive patterns of personality, which are increasingly conceptualized as continuously distributed traits that overlap with the Big Five (Suzuki, Griffin, & Samuel, 2017). The aim of the present study is to map the full range of personality pathology by investigating the distribution and the nomological network of self-reported maladaptive trait domains in a representative sample from the German population. Our key contribution to clinical practice is the establishment of norm values for a widely used self-report measure, the Personality Inventory for DSM-5 (PID-5), which will for the first time allow for interpreting and evaluating test results according to current standards of psychological assessment (American Educational Research Association, 2014).

Moving Towards a Dimensional Model of Personality Pathology

Research has accumulated indicating the dimensional nature of personality pathology with early approaches dating back to the 1990s. For instance, items for prototypical behaviours or traits of each categorical PD diagnosis (DSM-III; APA, 1980) were created and applied to systemise underlying maladaptive personality traits and their distribution (Clark, Livesley, Schroeder, & Irish, 1996; Livesley, 1998; Livesley, Jackson, & Schroeder, 1992). Such work has highlighted the superiority of a dimensional approach of PD classification over the traditional categorical approach (Widiger & Trull, 2007). This has ultimately resulted in

the recent revisions of PD classification systems: For example, the *Alternative DSM-5 Model for Personality Disorders (AMPD)* was included in DSM-5 section III (APA, 2013) and a similar model will be implemented in the ICD-11 (Tyrer, Mulder, Kim, & Crawford, 2019). In the AMPD, PDs are defined in terms of impairments in personality functioning (criterion A) and a hierarchical model of maladaptive personality traits (criterion B). Criterion B consists of five broad maladaptive trait domains (negative affectivity, detachment, antagonism, disinhibition, psychoticism), which comprise 25 specific maladaptive trait facets on a subordinate level. This model can be reliably assessed using the PID-5 (Krueger, Derringer, Markon, Watson, & Skodol, 2012) or one of its short forms (Bach et al., 2020; Bach, Maples-Keller, Bo, & Simonsen, 2016; Kerber et al., 2020; Maples-Keller et al., 2015). Importantly, research using the PID-5 identified one overarching dimension of personality pathology, representing the general factor of the five maladaptive trait domains (Wright et al., 2012). This dimension has been interpreted as indicating the severity of impairment (Oltmanns, Smith, Oltmanns, & Widiger, 2018; Smith, Atkinson, Davis, Riley, & Oltmanns, 2020), suggesting that simply aggregating the maladaptive trait domain scores may offer an approximation for AMPD's criterion A (Zimmermann et al., 2020). In summary, current models of personality pathology are dimensional and hierarchical, ranging from a general severity dimension at the top, to multiple maladaptive trait domains, to their specific facets at the bottom.

The Importance of Establishing Norm Values

Previous research on the severity of personality problems and the five maladaptive trait domains has suggested substantial associations with a variety of socio-demographic and psychological variables in heterogeneous clinical and non-clinical samples (Zimmermann, Kerber, Rek, Hopwood, & Krueger, 2019). While these research findings have deepened our knowledge base, all studies of which we are aware of are limited in terms of generalizability by sample selection biases (Munafò, Tilling, Taylor, Evans, & Smith, 2018). That is, non-

clinical studies were often conducted in college or undergraduate student samples (e.g., Boland, Damnjanovic, & Anderson, 2018; Suzuki et al., 2019), which have been found to differ from the general population (predominately female, younger, better educated, and, more mental health difficulties; Stallman, 2010). Samples recruited online are also known to deviate systematically from the general population (e.g., participants from MTurk are better educated and more distressed; Ophir, Sisso, Asterhan, Tikochinski, & Reichart, 2020; Shapiro, Chandler, & Mueller, 2013; volunteers are higher in openness to experience; Buchanan, 2018). And samples in clinical studies can be limited by specific exclusion criteria, local characteristics of the recruiting institution, or by high refusal and drop-out rates (Höfler, Pfister, Lieb, & Wittchen, 2005). Importantly, selection bias might not only have strong effects on prevalence rates and characteristics of the trait distributions, but can also lead to substantially biased estimates of associations (Munafò et al., 2018). As such, a single study using a representative sample may allow for more generalizable conclusions than meta-analytic estimates. Moreover, research so far has repeatedly relied upon “intuitive” cut-off scores of PID-5 raw values for determining the presence of a clinically relevant problem (e.g., values >1.5 or 2 on a scale from 0 to 3; Bach et al., 2015; Clark et al., 2015). This is not entirely satisfying as it may confound the difficulty of the item wordings with the levels of the latent trait. A representative sample will allow for establishing norm values and cut-off scores, which will ease interpretation of individual test scores in clinical practice (Ruggero et al., 2019).

The Nomological Net of Personality Pathology

In the following, we will summarize previous research findings on the associations of maladaptive trait domains and the severity of personality problems with different socio-demographic and psychological variables. Variables selection was based on constructs that have been included in the GESIS panel (see method section) and deemed of relevance for

describing the nomological net of personality pathology. As noted above, previous findings are based on data of non-representative samples.

Socio-demographic variables

Female sex has been consistently associated with higher levels of negative affectivity and male sex with higher levels of antagonism, whereas findings were mixed with regard to the other trait domains (Bastiaens et al., 2016; Suzuki et al., 2019). With respect to the associations between age and the maladaptive trait domains, Bastiaens et al. (2015) observed that levels of antagonism, disinhibition and psychoticism decrease over the lifespan, while detachment and negative affectivity remain stable. Except for a decrease of negative affectivity, the same results have been reported in a narrative review on PDs across the life span (Newton-Howes, Clark, & Chanen, 2015). Regarding associations of the maladaptive trait domains with educational achievements and marital status research is scarce so far with initial findings showing associations of disinhibition with less years of education as a proxy of educational attainment (Bastiaens et al., 2016). Moreover, while maladaptive trait domains have not been examined with regard to marital status, research using the categorical PD classification has shown positive associations of Cluster A and Cluster C PDs with being separated/divorced or never married (Torgersen, 2012).

Psychological functioning

So far, research has indicated that the maladaptive trait domains and the severity of personality problems are associated with different aspects of psychological functioning. For example, each of the maladaptive trait domains have been associated with difficulties in emotion regulation (Abdi & Pak, 2019) and negative temperament (Watson, Stasik, Ro, & Clark, 2013), which might be reflected in disturbance of positive and negative affect and perceived stress. Moreover, four of the five domains have been linked to lower levels of self-esteem (Lim, Gwee, & Hong, 2019) as well as reduced quality of life (Caluwé, Verbeke, Aken, Heijden, & Clercq, 2019) with antagonism being the only exception. Furthermore,

antagonism has been observed to be robustly associated with narcissism (Wright et al., 2013). With regard to the severity of personality problems, research has suggested associations with lower levels of well-being (Bach & Hutsebaut, 2018) and self-esteem, and with higher levels of narcissism (Gamache, Savard, Leclerc, & Côté, 2019).

The present study

The present study aimed at replicating and extending previous research on personality pathology by presenting norm values and investigating the nomological net using a representative sample from the general German population. We addressed the following questions: How is personality pathology (1) distributed in the general population, (2) related to different socio-demographic variables, including age, sex, marital status, educational achievement, and income, and (3) associated with psychological functioning (self-compassion, self-esteem, narcissism, well-being, perceived stress, and positive and negative affect)? For more detailed hypotheses see Table S1.

Method

Sample

We used data from the GESIS Panel (GESIS, 2020), which is part of the GESIS - Leibniz Institute for the Social Sciences, and is funded jointly by federal and state governments. GESIS Panel is an ongoing probability-based mixed-mode access panel including three cohorts with around $N=5,400$ panellists aged 18 years or older of the German general population. The probability-based participant selection is founded on local population registers of German municipalities to avoid bias in sampling of the target population. Data collection takes place in waves following a bimonthly schedule in two modes either via web-based surveys or via paper-pencil survey. A detailed panel description can be found in (Bosnjak et al., 2018).

We analysed data from five waves between 12/2018 and 11/2019. 4,891 participants filled out the Personality Inventory for DSM-5 Brief Form Plus (PID5BF+; Kerber et al.,

2020) included in wave 10/2019-12/2019. We excluded 164 participants with more than 25% missingness on one of the six PID5BF+ domain scales. The final sample consisted of 4,727 participants ($N_{\text{Female}}=2,373$; 50.2%) with a mean age of 54.13 years ($SD=14.57$). A-Level exam has been obtained by $N=2,199$ (48.0%) and $N=1,389$ (31.3%) received an academic degree. 20.5% of participants were single, 64.9% married, 9.4% divorced, and 5.1% widowed. Table S2 presents an overview of the socio-demographic characteristics of our sample, including a comparison with data from the Federal Office of Statistics of the general German population.

Measures

Personality Inventory for DSM-5 Brief Form Plus (PID5BF+). The German version of the brief 34-item self-report instrument PID5BF+ (Kerber et al., 2020) is based on the Personality Inventory for DSM-5 (Krueger et al., 2012; Zimmermann et al., 2014) and assesses maladaptive personality traits according to the domain scoring algorithm of Criterion B of the AMPD. To capture the trait model, the PID5BF+ contains five superordinate maladaptive trait domains that are each captured by three subordinate trait facets. For the purpose of this study, we did not include assessment of the sixth ICD-11's trait domain Anankastia due to its psychometric limitations. Items are answered on a 4-point Likert scale ranging from 0=*very false* to 3=*very true*. Moreover, we calculated PID5BF+ total score as a proxy measure for the severity of personality problems.

Narcissistic Admiration and Rivalry Questionnaire (NARQ). The 18-item self-report questionnaire of the NARQ (Back et al., 2013) measures grandiose narcissism based on admiration and rivalry subscales on a 6-point Likert scale ranging from 1=*does not apply at all* to 6=*fully applies*.

Self-Compassion Scale – German Version (SCS-D). The 12-item short German version (Hupfeld & Ruffieux, 2011) of the SCS (Neff, 2003) was applied, which measures

different aspects of self-compassion such as self-kindness, mindfulness and common humanity on a 5-point Likert scale ranging from 1=*strongly disagree* to 5=*strongly agree*.

Rosenberg's Self-Esteem scale (RSES). The ten-item revised German version (Collani & Herzberg, 2003) of the self-report scale RSES (Rosenberg, 1965) measures different aspects of self-esteem such as self-respect and self-acceptance on a 4-point Likert scale ranging from 1=*totally agree* to 4=*totally disagree*.

Perceived Stress Scale – 5-item version (PSS-5). The five items German version (Klein et al., 2016) of the PSS-10 (Cohen, Kamarck, & Mermelstein, 1983) was used to measure psychological stress. Items capture the extent to which life has been perceived as unpredictable, uncontrollable and overwhelming throughout the past month on a 5-point Likert scale ranging from 1=*never* to 5=*very often*.

Subjective Well-being. Overall happiness and life-satisfaction were measured with three items each relating to the past, present and future. Items are rated on an 11-point Likert scale from 0=*extremely unhappy* to 10=*extremely happy* and 0=*extremely dissatisfied* to 10=*extremely satisfied*. Time-dependent affect was assessed by eight items representing different affective states of the past week (e.g., “During the last 7 days how often, did you feel sad?”) rated on a 6-point Likert scale ranging from 1=*never* to 6=*always*.

Socio-Demographics. Items on socio-demographic information include sex, age, marital status (single, married, divorced, widowed), educational (A-level exam) and academic degree (University degree), and personal and household income.

Statistical Analyses

Analyses were conducted using the statistical software *R* (R Core Team, 2020) and the packages *lavaan* (Rosseel et al., 2018), *psych* (Revelle, 2020), and *mirt* (Chalmers, 2012). Prior to investigating the distribution and the nomological net of personality pathology, we first replicated the item-level factor structure of the PID5BF+ and the reliability of the PID5BF+ domain scores.

Factor structure and reliability. To examine the validity of the five-factor structure of the PID5BF+ (Kerber et al., 2020), we conducted a confirmatory factor analysis (CFA) based on polychoric correlations using robust weighted least squares (WLSMV) estimation. Therefore, we specified a higher-order factor model with two items loading on their respective first-order factor (e.g., trait facet: manipulativeness) which in turn loaded on their corresponding second-order factor (e.g., trait domain: antagonism). Adequate model fit (Hu & Bentler, 1999) was evaluated using the Comparative Fit Index ($CFI > .95$), Root Mean Square Error of Approximation ($RMSEA < .06$), and Standardized Root Mean Square Residual ($SRMR < .08$). Based on the higher-order model with ordinal data, we further calculated categorical McDonald's Omega total (ω) and categorical Omega hierarchical (ω_H) for each of the respective PID5BF+ domain scores (Brunner, Nagy, & Wilhelm, 2012; Flora, 2020).

Norm values. We used two different approaches to establish norm values: First, we computed descriptive norms for the PID5BF+ domain and total scores based on the cumulative percentile distribution, stratified for age and sex. Second, we estimated model-based norms for domain scales of different versions of the PID-5 based on multiple-group item response theory models that integrate data from the German PID-5 validation study (Zimmermann et al., 2014). A more detailed description of this second strategy can be found in the Supplementary Material. T values ranging from 60-64 can be considered as *mild*, 65-69 as *moderate*, and >70 as *severe* levels of maladaptive traits (Kotov et al., 2021; Ruggero et al., 2019).

Regression analyses. We applied linear and logistic regression analyses – where appropriate – to assess associations between each maladaptive trait domain scale score and the PID5BF+ total score and socio-demographic (age, sex, marital status, educational and academic achievements, personal and household income) and psychological (self-esteem, self-compassion, narcissism, positive and negative affect, perceived stress, and well-being) variables. In these analyses, we controlled for the statistical influence of the potentially

confounding variables age and sex. To simplify interpretation of regression coefficients, variables were standardized. Here, we followed the recommendation of Funder and Ozer (2019) suggesting effect sizes of $r=.05$ to be very small, $r=.10$ small, $r=.20$ medium, $r=.30$ large and $r\geq .30$ to be very large. To reduce the number of false positive findings due to multiple testing, we set the alpha error rate at .01 for individual tests.

Results

Detailed descriptive statistics, data collection waves, reliability and correlations between variables are presented in Table S3.

Factor structure and reliability

Model fit indices of the PID5BF+ demonstrated an acceptable model fit, $\chi^2(380)=6113.613$, $p<.001$, CFI=.925, RMSEA=.060, 90%-CI [.059;.061], SRMR=.057. McDonald's Omega was acceptable for detachment ($\omega=.77$), antagonism ($\omega=.77$), disinhibition ($\omega=.77$), and psychoticism ($\omega=.79$), and good for negative affectivity ($\omega=.86$). OmegaH of negative affectivity ($\omega_H=.68$), detachment ($\omega_H=.69$), antagonism ($\omega_H=.70$), disinhibition ($\omega_H=.66$), and psychoticism ($\omega_H=.71$) scattered closely around the benchmark for essentially unidimensional scales ($\omega_H>.70$; Reise *et al.*, 2013).

Norm Values

Descriptive norms of the PID5BF+ domain scores scaled in T values are presented in Table 1. In the general population, the scale score close to average (T49) for negative affectivity was 0.83, and the score indicating severe problems (T70) was 2.0. For detachment, T51 was 0.67 (T71=1.67), for antagonism, T49 was 0.33 (T68=1.33), for disinhibition, T48 was 0.50 (T70=1.6), for psychoticism, T49 was 0.50 (T70=1.67), and for the PID5BF+ total average score T50 was 0.67 (T71=1.5). Sex- and age-stratified norms are presented in the Tables S4-S7. Similarly, model-based norms indicated an average score (T49) was 0.83 for negative affectivity, and a score indicting severe problems (T70) was 2.17 (see Table 1). For

detachment, T51 was 0.67 (T71=1.83), for antagonism T49 was 0.33 (T68=1.67), for disinhibition T48 was 0.50 (T70=1.83), and for psychoticism T49 was 0.50 (T70=2.00).

Figure 1 shows that the descriptive norms diverged only slightly from model-based norms and that 95% confidence intervals of T values for longer versions of the PID-5 were substantially narrower compared to shorter versions (for more details see Tables S8-S12). However, model fit of domain-specific multidimensional graded response models in the German validation sample was not entirely satisfying and is presented in Table S13.

Regression analyses

Overall, our results suggest that PID5BF+ domain and total scores are higher in males than females and associated with younger age. Throughout analyses adjusted for age and sex, we observed significant associations of personality pathology with lower socio-economic status and adverse psychological functioning. Detailed results of the socio-demographic associates are reported in Table 2 and associations with psychological variables are depicted in Figure 2 and Table S14.

Discussion

Previous research on maladaptive personality traits using the PID-5 was often conducted in non-representative samples suffering from sample selection biases. Norm values and elaboration of the nomological net in a representative sample were lacking so far, which are key for integrating assessment tools into clinical practice. In this paper, we presented norm values of PID-5 domain scores, which provides a framework for interpreting test results in individual cases. Moreover, we found robust associations of PID5BF+ scores with lower socio-economic status and greater psychological disturbance in a general population sample, highlighting the relevance of personality pathology for social functioning and public mental health.

Psychometric evaluation and norm values

Our results showed that the overall model fit of the item-level structure of the PID5BF+ as well as reliability estimates for each domain score were acceptable, albeit slightly lower compared to previous research (Kerber et al., 2020). Overall, the PID5BF+ may be a valuable short screening tool for personality pathology in clinical practice for which representative norm values were lacking so far. Accordingly, we presented representative descriptive norms for each of the five maladaptive trait domains as well as the severity of personality problems using the PID5BF+. For example, consider a person that has a mean score of 2.0 on negative affectivity and a PID5BF+ total score of 1.5. According to the respective T-norms this person scores two SDs above the population mean (0.83 for negative affectivity, 0.67 for PID5BF+ total score), which is indicative of severe personality pathology when using a statistical deviance criterion (Kotov et al., 2021; Ruggero et al., 2019). However, the relatively large confidence intervals of model-based norms suggest that a more fine-grained interpretation of individual test scores may be limited by the PID5BF+'s precision. Thus, we recommend the use of short versions of the PID-5 for screening purpose and longer versions for more precise and nuanced assessments. Further, our results highlight the importance of establishing empirically-informed norm values for each of the trait domains separately as potential clinical cut-offs for marked severity ranged from 1.33 for antagonism up to 2.0 for negative affectivity. Finally, the presented crosswalk tables of four different PID-5 versions help to convert scores from one instrument to another. This was done by scaling the measures along a single latent continuum for each trait following the common metric approach (Zimmermann et al., 2020). These tables can be especially useful for research purposes (e.g., for combining data from different PID-5 versions in the context of individual participant data meta-analyses).

Socio-demographic variables

Ranging from a very small effect size for detachment to a moderate effect size for antagonism, the severity of personality problems and the maladaptive trait domains decreased with increasing age. This is largely in line with previous research (Newton-Howes et al., 2015), including research on the Big Five indicating that individuals become more agreeable, conscientious, emotionally stable and social dominant over the lifespan (Roberts & Mroczek, 2008). From the perspective of social-investment theory (Bleidorn et al., 2013) such changes in personality traits primarily occur in young adulthood and are predominately driven by societal-induced maturation processes that facilitate the accomplishment of universal life tasks such as establishing one's career or starting a family (Roberts, Wood, & Smith, 2005).

The severity of personality problems was higher for men than for women in line with previous research showing that men are more likely to be diagnosed with at least one PD than women using the categorical PD classification (Torgersen, 2009). Yet, a more heterogeneous pattern of associations between the maladaptive trait domains and sex was observed, which aligns with findings of Suzuki et al. (2019). As such, male sex was associated with higher levels of antagonism, detachment, and psychoticism, whereas female sex was associated with higher levels of negative affectivity. Disinhibition showed no specific association with sex. While previous and our current research shows sex differences in maladaptive trait domains, a better understanding of the underlying mechanisms is crucial. That is, further research is needed to dismantle potential gene and environment interactions (Costa, Terracciano, & McCrae, 2001; Jang, Livesley, & Vernon, 1998; Lee & Ashton, 2020), which may contribute to sex-specificity of the maladaptive trait domains.

Our results of marital status in relation to personality pathology indicate that affected individuals are more likely to be single and less likely to be married. We found evidence that personality pathology was not associated with a greater likelihood of divorce with the exception of psychoticism. The cross-sectional design of our study, however, does not permit clear

interpretations of directionality. On the one hand, our findings may suggest that personality pathology obstructs the initial formation of a romantic relationship. On the other hand, multiple research has indicated that unmarried compared to married individuals report lower levels of life-satisfaction, well-being, and higher levels of depression and psychological distress (Waite & Gallagher, 2001), which could also contribute to increased levels of personality pathology. Notably, the relationship could also be reciprocal or explained by third variables. As such, future longitudinal studies are needed to shed light on the nature of the observed associations and will also allow scrutinization of potential mediators in this relationship such as romantic relationship dissatisfaction (Decuyper, Gistelinck, Vergauwe, Pancorbo, & De Fruyt, 2018) and/or insecure attachment styles (Roche, Jacobson, & Phillips, 2018).

We could replicate findings on the association between disinhibition and lower levels of educational achievements (and income) as well as lack of associations with antagonism and detachment (Bastiaens et al., 2016). Yet, our research also shows that the severity of personality problems as well as the maladaptive trait domains of negative affectivity and psychoticism are associated with lower socio-economic status. Research on the impact of personality pathology on socio-economic status is scarce and preliminary findings of Bastiaens et al. (2016) are limited by a relatively small psychiatric inpatient sample. Yet, such samples likely suffer from selection biases such as dropouts and not covering the full spectrum of personality pathology but rather the severe ends. As such, findings of our large and representative study of the general population underscore the importance of limiting sample selection biases, which may obfuscate important socio-economic association with personality pathology being of personal and societal relevance.

Psychological functioning

Our findings indicate that all spectra of personality pathology are associated with adverse psychological functioning in terms of lower levels of self-esteem, self-compassion,

positive affect and well-being as well as higher levels of negative affect and perceived stress. Here, negative affectivity and the severity of personality problems showed particularly strong associations with almost all psychological variables. This highlights that the severity of personality problems and negative affectivity may be key dispositional vulnerability factors for poor mental health outcomes. As such, Widiger and Oltmanns (2017) argued for the importance of routinely screening individuals for heightened levels of neuroticism (or negative affectivity) during routine medical visits due to considerable public health implications. We agree with Widiger and Oltmanns's proposal and, additionally, suggest considering the severity of personality problems as a useful alternative indicator as it captures all spectra of personality pathology. This may be particularly relevant for externalizing problems. Here, our results show a consistent association of negative affectivity with internalizing problems and rather small or non-significant associations with externalizing problems (i.e., narcissism). Conversely and in line with Lynam and Miller (2019), antagonism was the strongest associate of externalizing problems but the weakest of all internalizing problems. Yet, the severity of personality problems was strongly associated with both internalizing as well as externalizing behaviour and, thus, may be the preferred indicator for poor psychosocial functioning (Buer et al., 2020; Hopwood et al., 2011). Notably, these findings are limited by the restricted versatility of externalizing problems (only narcissism), which should be expanded in future research.

Limitations and future directions

Some limitations need to be considered. First, estimation of model-based norms was based on some assumptions that may not have been met. For example, the model fit in the validation sample was rather unsatisfactory for some domains, suggesting that the assumption of scalar measurement invariance between the validation sample and the GESIS sample may not hold. On the other hand, there were only minor deviations between the model-based and descriptive norms for the PID5BF+ domain scales in the GESIS sample, suggesting that a violation of

this assumption may not have any practical disadvantages. Second, the cross-sectional nature of the study prevents any inferences about causal relationships, for which future longitudinal and experimental research is required. Third, since our data was collected across multiple assessment waves within one year, we cannot rule out potential contextual factors impacting participants' responses. Yet, we believe the influence to be relatively negligible as we assessed traits, which remain relatively stable over time. Fourth, the PID5BF+ total score was used as a proxy of PD severity as high correlations with measures of AMPD Criterion A have been reported (Zimmermann et al., 2020). Therefore, the use of a validated measure of PD severity is recommended for future research. Fifth, our results solely rely on self-reports, which are limited by the extent an individual is able or willing to provide accurate responses. As such, a multi-method replication is needed. Sixth, since the short screening tool PID5BF+ was applied we could not perform analyses on facet level, for which usage of a longer version of the PID-5 is required.

Conclusion

Our study contributes to getting the PID-5 ready for clinical practice by presenting norm values and investigating the nomological net in a representative sample from the German population. We established norm values of the PID5BF+ scales stratified for age and sex and present cross-walk tables for different versions of the PID-5, which will be useful for practitioners and researchers working in the field of personality pathology. Future research is needed to investigate the clinical utility of our norm values with regard to clinical predictions, decision making, and treatment. Further, we observed robust associations between personality pathology and a broad range of potentially unfavourable or adverse outcomes in terms of lower socio-economic status and greater psychological disturbance in the general population. This highlights that personality pathology may not only be relevant in a clinical psychiatric context, but instead for our wider personal and societal functioning. Longitudinal designs are

needed to examine whether personality pathology has a potential causal influence on psychological functioning and socio-economic outcomes. This would inform the necessity of potential targeted screening, prevention, and treatment efforts.

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Conflicts of Interest

None.

Ethical standards

All data collected were anonymous and the study was conducted following the ethical principles of the World Medical Association Declaration of Helsinki of 1975, as revised in 2008.

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Tables

Table 1

Descriptive and model-based norms for the PID5BF+ domain and total scores

Observed	Negative Affectivity		Detachment		Antagonism		Disinhibition		Psychoticism		Total
Score	Descriptive	Model-based	Descriptive	Model-based	Descriptive	Model-based	Descriptive	Model-based	Descriptive	Model-based	Descriptive
0	32	32 [23, 42]	36	35 [22, 47]	40	41 [30, 53]	36	36 [25, 46]	35	39 [28, 50]	24
0.17	37	36 [27, 45]	41	40 [29, 51]	45	46 [35, 56]	41	40 [31, 50]	41	42 [32, 52]	32
0.33	40	39 [31, 48]	45	44 [34, 54]	49	49 [40, 58]	44	44 [35, 54]	45	45 [36, 55]	39
0.5	43	43 [35, 51]	48	48 [38, 58]	53	52 [43, 61]	48	48 [38, 57]	49	49 [40, 57]	44
0.67	46	46 [38, 54]	51	51 [42, 61]	56	55 [46, 64]	52	51 [42, 60]	52	51 [43, 60]	48
0.83	49	49 [41, 56]	55	54 [45, 63]	59	58 [49, 66]	56	54 [45, 63]	55	54 [46, 62]	53
1	53	51 [44, 59]	59	57 [48, 66]	62	60 [52, 68]	60	57 [48, 66]	58	56 [48, 65]	58
1.17	56	54 [46, 62]	62	60 [51, 69]	66	63 [54, 71]	63	60 [51, 69]	61	59 [51, 67]	62
1.33	59	57 [49, 64]	65	63 [53, 72]	68	65 [57, 73]	66	62 [53, 72]	64	61 [53, 69]	67

1.5	62	59 [51, 67]	68	65 [56, 75]	72	67 [59, 76]	70	65 [56, 74]	67	63 [55, 71]	71
1.67	65	62 [54, 70]	71	68 [59, 77]	75	70 [61, 78]	73	68 [58, 77]	70	66 [58, 74]	76
1.83	67	64 [57, 72]	75	71 [61, 80]	77	72 [64, 80]	76	70 [61, 79]	72	68 [60, 76]	80
2	70	67 [59, 75]	78	73 [64, 83]	79	74 [66, 83]	79	73 [63, 82]	75	70 [62, 78]	82
2.17	72	70 [61, 78]	79	76 [67, 86]	82	77 [68, 85]	81	75 [66, 84]	77	73 [65, 81]	83
2.33	74	72 [64, 81]	81	79 [70, 89]	83	79 [71, 87]	85	78 [68, 87]	79	75 [67, 83]	
2.5	78	75 [67, 83]	85	82 [73, 91]	85	81 [73, 90]	85	80 [71, 89]	83	78 [70, 86]	
2.67	81	78 [69, 86]		85 [76, 95]	85	84 [75, 92]	85	82 [73, 92]	85	80 [72, 88]	
2.83	85	80 [71, 89]		88 [79, 98]	85	86 [78, 95]		85 [75, 95]		83 [75, 92]	
3		83 [73, 93]		92 [81,		89 [80, 98]		88 [77, 98]		86 [77, 95]	
				102]							

Note. Norms are scaled in T values ($M = 50$, $SD = 10$) and are based on the cumulative percentile distribution. 95% confidence limits for individual scores are presented in brackets.

Table 2

Associations between PID5BF+ subscale and total scores with socio-demographic variables using multiple linear and logistic regression analyses

	PID5BF+					
	Antagonism	Detachment	Disinhibition	Negative Affectivity	Psychoticism	Severity
Age, β	-0.24**	-0.04*	-0.13**	-0.07**	-0.08**	-0.14**
Female sex, OR	0.65**	0.78**	0.97	1.38**	0.88**	0.88**
Education, OR						
A-levels	1.02	0.96	0.87**	0.86**	0.88**	0.87**
Graduation	1.01	0.95	0.89**	0.84**	0.87**	0.86**
Income, β						
Household	-0.04	-0.11**	-0.11**	-0.15**	-0.16**	-0.15**
Personal	-0.01	-0.07**	-0.12**	-0.14**	-0.13**	-0.13**
Marital status, OR						
Single	1.13**	1.41**	1.13**	1.17**	1.19**	1.25**
Married	0.87**	0.76**	0.85**	0.87**	0.80**	0.80**
Divorced	1.02	1.06	1.12	1.02	1.14*	1.09
Widowed	1.04	1.05	1.09	1.11	1.08	1.08

Note. Standardized regression coefficients (β) are reported. OR = Odds Ratio. Analyses are adjusted for sex and age. * $p \leq 0.01$. ** $p \leq 0.001$.

Figure 1. Crosswalk table of descriptive norms (white dots) and model-based norms (solid lines) including 95% confidence intervals (shaded area) for each domain subscale of four versions of the PID-5.

Figure 2: Associations between PID5BF+ subscale and total scores with psychological variables using multiple linear regression analyses.

Standardized regression coefficients (β) are reported. Analyses are adjusted for sex and age. * $p \leq 0.01$. ** $p \leq 0.001$.

Supplementary Material

Estimation of model-based norms for different versions of the PID-5

The descriptive norms were based on the cumulative percentile distribution of the PID5BF+ domain scale scores in the GESIS sample. One limitation of this approach is that the resulting norms cannot be used for different versions of the PID-5, including the original version with 220 items (Krueger et al., 2012), the short form with 100 items (Maples-Keller et al., 2015), and the brief form with 25 items (Bach et al., 2016). To address this limitation, we derived model-based norms for domain scores of all PID-5 variants using the common metric approach (e.g., Zimmermann et al., 2020). Our analyses were based on a combined sample of 611 participants who completed the full set of 220 PID-5 items (i.e., the German validation sample; Kerber et al., 2020; Zimmermann et al., 2014) and the 4727 participants from GESIS who only completed the 34 PID5BF+ items. For each of the five domains, we specified a bifactor model including one general factor and three (uncorrelated) specific factors representing the three core facets of the DSM-5 trait model (Watters & Bagby, 2018). Items were allowed to load on the general factor and on their corresponding specific factor. The six items of the PID-5 brief form that are not related to the core facets were only allowed to load on the general factor. This resulted in five models comprising 25 (Negative Affectivity), 25 (Detachment), 23 (Antagonism), 23 (Disinhibition), and 33 (Psychoticism) items, respectively. The models were estimated as two-group graded response models with the assumption of multivariate normally distributed latent variables and scalar measurement invariance (i.e., equal slopes and thresholds of the items) between the validation sample and the GESIS sample. The mean and variance of the latent variables were fixed to 0 and 1 in the validation sample, respectively, and were freely estimated in the GESIS sample. Models were estimated using the mirt package (Chalmers, 2012) in the statistical environment R (R Core Team, 2020) applying Cai's (2010) Metropolis-Hastings Robbins-Monro (MH-RM)

algorithm. We adopted the default mirt settings for this estimation procedure¹. Model fit was evaluated in the validation sample using the collapsed M2* statistic (Cai & Hansen, 2013) and several derivatives, including the root mean square error of approximation (< 0.06), the comparative fit index (> 0.95) and the standardized root mean square residual (< 0.08) (L. T. Hu & Bentler, 1999). We then estimated the expected a posteriori factor scores (theta estimates) for each possible total score for each PID-5 version (Thissen, Pommerich, Billeaud, & Williams, 1995) in the validation sample to allow easy transformation of total scores to a common metric. Because factor score estimation in multidimensional graded response models is computationally expensive, we fixed the parameters of the specific factors at zero and kept the parameters of the general factor fixed at their estimated value for this purpose (i.e., we used a unidimensional model for score estimation) (Friedrich et al., 2019; Zimmermann et al., 2020). Finally, we linked factor scores to T scores ($M = 50$, $SD = 10$) representing the distribution of the respective trait domain in the general population by standardizing factor scores by the freely estimated latent mean and variance of the general factor in the GESIS sample:

$$Model - based\ T\ score = \frac{Factor\ score - M(\eta)_{GESIS}}{\sqrt{VAR(\eta)_{GESIS}}} \cdot 10 + 50$$

¹ That is, we used the Newton-Raphson optimizer with one update, maximum number of 2,000 MHRM cycles, 150 burnin cycles, 100 stochastic EM cycles, and 5 Metropolis-Hasting draws at each iteration.

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Table S1

Hypotheses of associations between PID5BF+ domain and total scores with socio-demographic und psychological variables

	PID5BF+					
	Antagonism	Detachment	Disinhibition	Negative Affectivity	Psychoticism	Severity
<i>Socio-demographics</i>						
Age	↓		↓	?	↓	?
Female sex	↓	?	?	↑	?	?
Education			↓			?
Income			↓			?
Marital status	?	?	?	?	?	?
<i>Psychological functioning</i>						
Positive Affect	↑	↑	↑	↑	↑	?
Negative Affect	↑	↑	↑	↑	↑	?
Perceived Stress	↑	↑	↑	↑	↑	?
Self-esteem		↓	↓	↓	↓	↓
Self-compassion		↓	↓	↓	↓	↓
Well-being: Affective		↓	↓	↓	↓	↓
Well-being: Satisfaction		↓	↓	↓	↓	↓
Well-being: Happiness		↓	↓	↓	↓	↓
Narcissism: Admiration	↑					↑
Narcissism: Rivalry	↑					↑
Narcissism: Total	↑					↑

Note: Arrows (“↑” & “↓”) indicate predicted significant associations in regression models. “?”

indicates unknown associations that are explored in this study.

Table S2

Sociodemographic characteristics overview of our GESIS sample and the general German population

	Sample, % (n)	Population, %
Female sex	50.2 (2373)	50.7
Age groups		
20-30 years	8.1 (384)	16.1
31-40 years	12.1 (573)	15.5
41-50 years	16.8 (792)	15.9
51-60 years	25.6 (1208)	19.7
61-70 years	23.6 (1117)	14.7
71+ years	13.8 (651)	18.1
Educational achievements		
A-Level	48.0 (2199)	32.5
Academic degree	31.3 (1389)	18.0
Marital Status		
Single	20.5 (938)	42.7
Married	64.9 (2966)	43.0
Divorced	9.4 (431)	7.5
Widowed	5.1 (235)	6.8

Note. Population data from destatis.de – Federal Office of Statistics (2018). Data on sex, educational achievements and marital status of the general German population are based on an age range of 15 to 65+ years, while the age range was 20 to 65+ years in the sample of the GESIS Panel.

Table S3

Descriptive statistics and overview of associations between variables

	N	M	SD	Wave	α	Age	Sex	PID: Neg	PID: Det	PID: Ant	PID: Dis	PID: Psy	PID: total	PAN: Pos	PAN: Neg	Well: aff	Well: Hap	Well: Sat	PSS	NAR: Tot	NAR: Adm	NAR: Riv	RSS	SCS	BFI: Emo	BFI: Extra	BFI: Agree	BFI: Con
Age	4725	54.1 3	14.5 7	Dec 18 - Jan 19																								
Sex (Female)	4727			Dec 18 - Jan 19		-.05*																						
PID: Neg	4727	0.96	0.53	Oct 19 - Nov 19	.76	-.08**	.15**																					
PID: Det	4727	0.70	0.45	Oct 19 - Nov 19	.72	-.04*	-.12**	.34**																				
PID: Ant	4727	0.52	0.43	Oct 19 - Nov 19	.73	-.22**	-.19**	.34**	.44**																			
PID: Dis	4727	0.67	0.42	Oct 19 - Nov 19	.71	-.13**	-.01	.52**	.45**	.53**																		
PID: Psy	4727	0.71	0.47	Oct 19 - Nov 19	.74	-.08**	-.06**	.47**	.49**	.54**	.56**																	
PID: total	4727	0.75	0.35	Oct 19 - Nov 19	.90	-.13**	-.05**	.73**	.69**	.72**	.77**	.80**																
PAN: Pos	4496	3.42	0.63	Dec 18 - Jan 19	.79	.13**	-.05**	-.26**	-.30**	-.14**	-.28**	-.16**	-.28**															
PAN: Neg	4495	1.68	0.62	Dec 18 - Jan 19	.79	-.10**	-.03	.41**	.27**	.25**	.34**	.32**	.42**	-.17**														
Well: aff	4559	4.37	0.75	Feb 19 - Mar 19	.88	.07**	-.06**	-.46**	-.34**	-.19**	-.32**	-.31**	-.42**	.41**	-.43**													
Well: Hap	3913	7.07	1.61	Feb 19 - Mar 19	.88	-.02	-.01	-.29**	-.32**	-.13**	-.22**	-.23**	-.31**	.35**	-.30**	.66**												
Well: Sat	3825	7.26	1.61	Feb 19 - Mar 19	.90	.00	.01	-.30**	-.31**	-.14**	-.24**	-.24**	-.32**	.35**	-.31**	.63**	.89**											
PSS	4507	2.45	0.66	Dec 18 - Jan 19	.81	-.23**	.11**	.48**	.30**	.22**	.37**	.31**	.43**	-.45**	.53**	-.63**	-.50**	-.50**										
NAR: Total	4569	2.12	0.66	Feb 19 - Mar 19	.89	-.30**	-.16**	.13**	.16**	.48**	.24**	.27**	.33**	.05**	.19**	-.07**	.00	.01	.12**									
NAR: Adm	4543	2.45	0.84	Feb 19 - Mar 19	.86	-.27**	-.11**	.01	-.03	.35**	.10**	.17**	.16**	.19**	.04**	.09**	.14**	.15**	-.03	.89**								
NAR: Riv	4569	1.80	0.70	Feb 19 - Mar 19	.85	-.25**	-.18**	.24**	.33**	.49**	.33**	.31**	.44**	-.13**	.31**	-.23**	-.17**	-.17**	.26**	.83**	.48**							
RSES	4440	3.31	0.45	Feb 19 - Mar 19	.87	.08**	.01	-.42**	-.41**	-.19**	-.37**	-.32**	-.45**	.43**	-.38**	.52**	.46**	.47**	-.51**	.07**	.27**	-.19**						
SCS	4492	3.38	0.50	Dec 18 - Jan 19	.76	.16**	-.04	-.50**	-.31**	-.24**	-.37**	-.28**	-.45**	.40**	-.42**	.45**	.35**	.35**	-.58**	-.11**	.08**	-.30**	.58**					
BFI: Emo	4420	3.19	0.83	Aug 19 - Sep 19	.57	.09**	-.17**	-.45**	-.19**	-.11**	-.31**	-.17**	-.32**	.28**	-.35**	.35**	.25**	.23**	-.43**	-.03	-.10**	.17**	-.36**	-.45**				
BFI: Extra	4426	3.16	0.88	Aug 19 - Sep 19	.64	.01	.10**	-.12**	-.40**	-.03	-.08**	-.09**	-.18**	.28**	-.14**	.22**	.23**	.23**	-.17**	.08**	.20**	-.09**	.26**	.19**	.20**			
BFI: Agree	4423	3.18	0.71	Aug 19 - Sep 19	.17	.06**	.09**	-.09**	-.17**	-.19**	-.09**	-.14**	-.18**	.03	-.15**	.11**	.13**	.13**	-.10**	-.17**	-.05**	-.26**	.08**	.15**	.08**	.06**		
BFI: Con	4425	3.9	0.71	Aug 19 - Sep 19	.37	.21**	.11**	-.13**	-.27**	-.28**	-.37**	-.22**	-.28**	.30**	-.14**	.17**	.12**	.14**	-.21**	-.18**	-.08**	-.25**	.24**	.19**	.15**	.21**	.09**	
BFI: Open	4447	3.39	0.88	Aug 19 - Sep 19	.50	.04*	.13**	-.02	-.18**	-.04*	-.05*	.05*	-.06**	.17**	-.03	.03	.04	.04	-.03	.07**	.15**	-.05**	.12**	.12**	.07**	.20**	.06**	.11**

Note. N = Sample Size; M = Mean; SD = Standard Deviation, α = Cronbach's Alpha; PID = Personality Inventory for DSM-5 Brief Form Plus; Neg = Negative Affectivity; Det = Detachment;

Ant = Antagonism; Dis = Disinhibition, Psy = Psychoticism; PAN = Positive and Negative Affect; Pos = Positive Affectivity; Neg = Negative Affectivity; Well = Well-being; aff = affective;

Hap = Happiness; Sat = Life Satisfaction; NAR = Narcissistic Admiration and Rivalry Questionnaire; Adm = Admiration; Riv = Rivalry; RSES = Rosenberg's Self-Esteem scale; SCS = Self-

Compassion Scale; PSS = Perceived Stress Scale; BFI = Big Five Inventory-10; Emo = Emotional stability; Extra = Extraversion; Agree = Agreeableness; Con = Conscientiousness; Open =

Openness; Spearman correlation was applied only for binary sex, otherwise Pearson correlations are reported; * indicates $p < .01$. ** indicates $p < .001$.

Table S4

Descriptive norms for PID5BF+ domain and total score based on female sex and separated into different age groups

Mean Score	PID5BF+ Scale scores																																					
	Negative Affectivity						Detachment						Antagonism						Disinhibition						Psychoticism						Severity							
	Age Group						Age Group						Age Group						Age Group						Age Group													
	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284	20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284		
0	24	29	32	31	30	25	37	36	40	38	37	35	38	40	41	43	43	42	34	35	36	36	37	34	31	36	37	36	36	34		27	28	25	23			
0.17	30	35	36	36	35	32	40	41	44	43	42	41	42	43	47	48	49	48	37	41	41	40	42	40	38	42	42	42	41	39	24	32	34	34	33	29		
0.33	35	39	40	39	39	36	44	45	47	47	46	44	46	47	51	52	54	53	41	44	45	44	46	44	43	46	47	47	46	44	34	38	40	40	40	38		
0.50	37	42	42	42	42	42	47	49	50	51	50	48	49	50	54	56	57	57	45	47	49	48	49	49	46	49	50	50	50	48	39	44	45	45	46	44		
0.67	39	44	45	45	46	45	50	52	53	54	53	51	52	54	58	59	61	60	48	50	52	53	55	53	48	52	53	53	54	52	43	47	49	50	51	48		
0.83	43	47	48	48	49	49	53	56	57	57	57	55	55	57	61	63	64	64	52	54	57	57	59	58	52	54	56	56	57	56	48	51	53	54	56	55		
1.00	47	50	51	52	53	53	57	60	60	60	61	59	58	61	64	67	69	69	55	57	61	61	63	63	55	57	58	59	60	59	52	56	59	60	62	60		
1.17	50	53	54	54	56	56	59	63	63	64	65	62	60	65	68	69	72	71	58	60	64	64	67	66	59	59	62	62	64	64	56	60	63	64	66	66		
1.33	53	56	57	57	59	58	62	66	67	67	69	66	63	68	70	73	74	73	61	64	67	67	69	71	61	62	65	66	66	67	63	65	68	68	72	69		
1.50	55	58	60	61	63	61	64	69	69	71	73	69	66	72	72	76	77	77	64	67	70	70	74	75	63	65	67	68	69	70	66	70	71	73	79	77		
1.67	57	62	64	63	67	64	66	70	74	75	77	71	71	75	78		79		67	69	71	74	77	77	65	69	71	70	72	73	72	75	74					
1.83	59	64	66	66	70	68	69	73	76	79		75	73	75	78				72	72	72	79	79		67	72	72	73	77	75	73		78					
2.00	63	66	67	69	74	70	70		78	79		77	76	75	78				76	75	74	79			71	77	74	79		75	76							
2.17	64	70	68	71	77	72	72			79		77	76						76	77	76	79			73	77	74			75	76							
2.33	66	73	70	75	79	75	73						76						76						76	77	78											
2.50	70	77	74			77													76								78											
2.67		77	76																76																			
2.83		77																																				
3																																						

Note. The T-Norm values are based on the cumulative percentile distribution.

Table S5

T-Norm values of PID5BF+ subscales and total score based on male sex and separated into different age groups

Mean Score	PID5BF+ Scale scores																																				
	Negative Affectivity						Detachment						Antagonism						Disinhibition						Psychoticism						Severity						
	Age Group						Age Group						Age Group						Age Group						Age Group						Age Group						
	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	
0	33	34	34	35	34	32	36	33	36	36	35	34	32	36	37	39	40	41	34	34	37	37	37	34	32	34	36	36	35	33		23	22	21	23	25	
0.17	38	39	38	40	37	35	42	39	40	41	39	38	37	40	42	44	45	46	38	39	41	42	42	40	38	39	40	41	40	39	29	30	32	33	33	32	
0.33	42	41	42	43	41	39	44	43	44	44	43	42	42	43	46	48	49	49	43	43	45	45	45	44	42	44	45	46	45	43	35	36	39	40	39	37	
0.50	45	44	45	46	45	43	46	46	47	48	47	46	46	46	49	52	52	53	47	46	48	48	49	47	45	47	48	50	48	46	41	41	44	46	44	43	
0.67	48	47	48	49	48	47	49	49	50	51	50	50	49	50	53	55	56	55	49	50	51	53	53	52	48	49	51	53	51	50	45	45	48	50	49	48	
0.83	51	50	51	52	51	50	53	52	53	54	54	53	52	53	57	58	59	58	53	54	55	57	57	57	51	52	54	56	55	54	50	50	52	54	53	53	
1.00	54	54	54	55	54	53	55	57	56	58	59	58	56	56	60	61	63	63	56	58	58	61	61	61	55	56	57	59	58	57	55	55	56	58	59	57	
1.17	57	56	57	59	58	56	59	60	60	62	62	61	60	60	64	64	68	67	61	62	62	65	64	64	57	60	60	62	62	61	59	60	60	63	64	62	
1.33	59	60	60	61	61	60	63	62	62	66	66	66	63	63	67	68	70	70	64	65	65	69	67	68	60	62	63	65	65	64	63	65	66	68	69	67	
1.50	63	64	64	65	64	63	64	64	65	69	69	72	65	68	72	73	72	74	67	69	68	72	71	70	63	65	66	68	68	67	67	69	72	73	72	72	
1.67	65	68	67	69	66	67	67	66	68	74	72	75	67	71	76	74	74	78	69	72	72	75	77	74	66	66	69	72	70	69	69	72			77	75	
1.83	68	69	68	70	71	71	73	68	74	79	79		70	73		77		78	71	74	74	77	79		68	69	74	73	74	73	71	77					
2.00	70	73	71	73	74	74		72		79	79		73	77		79		78		77			79		69	72	76	77	77	75	73						
2.17	70		73	77	77	78		77		79	79		75			79									70	74		79	79	78	75						
2.33	71		78		77			77			79		75												71	77		79		78							
2.50	71							77					75												75												
2.67	75												75												75												
2.83													75																								
3																																					

Note. The T-Norm values are based on the cumulative percentile distribution.

Table S6

T-Norm values of PID5BF+ subscales and total score based on total sample separated into different age groups

Mean Score	PID5BF+ Scale scores																																				
	Negative Affectivity						Detachment						Antagonism						Disinhibition						Psychoticism						Severity						
	Age Group						Age Group						Age Group						Age Group						Age Group						Age Group						
	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	
0	30	32	33	33	32	30	37	35	38	37	36	35	36	39	39	41	42	41	34	35	37	37	37	34	31	35	36	36	35	34		25	26	24	23	23	
0.17	35	37	37	38	36	34	41	40	42	42	41	39	40	42	45	46	47	47	38	40	41	41	42	40	38	41	41	41	41	39	27	31	33	33	33	31	
0.33	39	40	41	41	40	38	44	44	45	46	45	43	44	46	48	50	51	50	42	43	45	45	46	44	42	45	46	47	46	44	35	37	39	40	39	38	
0.50	42	43	43	44	44	43	46	48	49	50	49	47	48	39	52	54	55	55	46	46	48	48	49	48	46	48	49	50	49	47	40	43	44	45	45	43	
0.67	44	45	46	47	47	46	50	51	52	52	52	50	51	52	56	57	58	57	49	50	52	53	54	52	48	51	52	53	53	51	44	46	48	50	50	48	
0.83	47	48	49	50	50	50	53	54	55	56	56	54	54	55	59	60	61	60	52	54	56	57	58	58	52	53	55	56	56	54	49	50	52	54	54	54	
1.00	50	52	52	53	53	53	56	58	58	59	60	58	57	59	62	64	65	65	55	58	59	61	62	62	55	56	58	59	59	58	53	55	58	59	60	58	
1.17	53	54	55	56	57	56	59	61	62	63	63	61	60	62	66	66	69	68	59	61	63	64	66	65	58	60	61	62	63	62	57	60	62	64	65	64	
1.33	55	57	58	59	60	59	62	64	64	66	67	66	63	65	69	70	71	71	62	64	66	68	68	69	61	62	64	66	66	65	63	65	67	68	70	68	
1.50	58	60	62	62	63	62	64	66	67	70	71	71	66	70	72	74	74	75	65	68	69	71	73	72	63	65	67	68	68	68	66	69	71	73	74	74	
1.67	60	64	65	66	67	66	66	68	70	74	74	73	69	73	77	76	76	80	68	70	72	74	77	75	66	68	70	71	71	71	70	73	77		79	77	
1.83	62	66	67	68	70	70	70	70	75	79	81	77	72	74	80	79		80	72	73	73	78	79		67	71	73	73	76	74	72	79	80				
2.00	66	68	69	71	74	72	72	75	80	79	81	80	74	76	80	81		80	78	76	77	81	81		70	74	75	78	79	75	74						
2.17	66	73	70	73	77	74	74	79		79	81	80	76			81			78	79	78	81			72	76	77	81	81	80	76						
2.33	68	76	72	77	78	77	76	79			81		76						78						73	77	80	81		80							
2.50	70	79	77			80		79					78						78						78		80										
2.67	78	79	78										78						78						78												
2.83		79											78																								
3																																					

Note. The T-Norm values are based on the cumulative percentile distribution.

Table S7

T-Norm values of PID5BF+ Anankastia subscale based on female, male total sample and separated into different age groups

Female sex							Mal sex						All sex						All sex
Age Group							Age Group						Age Group						
20-30 N=200	31-40 N=313	41-50 N=401	51-60 N=615	61-71 N=560	>71 N=284		20-30 N=184	31-40 N=260	41-50 N=391	51-60 N=593	61-71 N=557	>71 N=367	20-30 N=384	31-40 N=573	41-50 N=792	51-60 N=1208	61-71 N=1117	>71 N=651	
0	32	34	37	36	37	33	32	35	34	35	34	33	32	35	35	35	35	33	35
0.17	32	34	37	36	37	33	32	35	34	35	34	33	32	35	35	35	35	33	35
0.33	38	39	41	42	41	39	36	38	39	40	39	38	37	38	40	41	40	39	40
0.50	43	43	45	46	46	44	42	42	43	44	42	43	42	43	44	45	44	44	44
0.67	43	43	45	46	46	44	42	42	43	44	43	43	42	43	44	45	44	44	44
0.83	47	47	49	50	50	49	47	46	47	49	48	47	47	47	48	49	49	48	48
1.00	52	53	54	55	55	56	52	51	53	55	55	53	52	52	53	55	55	54	54
1.17	52	53	54	55	55	56	52	51	53	55	55	53	52	52	53	55	55	54	54
1.33	56	57	59	61	61	59	57	57	58	60	60	59	57	57	58	60	60	59	59
1.50	61	62	66	66	66	64	62	63	65	66	66	64	62	62	65	66	66	64	65
1.67	61	62	66	66	66	64	62	63	65	66	66	64	62	62	65	66	66	64	65
1.83	66	67	69	72	71	72	67	68	70	69	71	70	67	67	69	70	71	71	69
2.00	71	72	72	77	76	77	70	74	78	75	77	74	70	73	74	76	76	75	74
2.17	71	72	72	77	76	77	70	74	78	75	77	74	70	73	74	76	76	75	74
2.33	76	77	78		79	77	73		78	79		75	74	79	78	81	81	76	78
2.50							75		78				78						83
2.67							75						78						85
2.83							75						78						85
3																			

Note. The T-Norm values are based on the cumulative percentile distribution.

Table S8

Model-based norms for the negative affectivity domain subscale of the four versions of the PID-5

PID-5						PID-5-SF						PID5BF+						PID-5-BF					
Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL
0.00	-3.35	0.53	24	14	34	0.00	-2.59	0.49	31	22	40	0.00	-2.47	0.53	32	23	42	0.00	-2.03	0.56	36	26	46
0.04	-3.12	0.49	26	17	35	0.08	-2.22	0.43	34	27	42	0.17	-2.07	0.49	36	27	45	0.20	-1.54	0.50	41	32	50
0.09	-2.87	0.45	28	20	37	0.17	-1.93	0.40	37	30	44	0.33	-1.68	0.46	39	31	48	0.40	-1.12	0.49	44	36	53
0.13	-2.65	0.41	30	23	38	0.25	-1.70	0.38	39	32	46	0.50	-1.33	0.44	43	35	51	0.60	-0.75	0.48	48	39	57
0.17	-2.45	0.39	32	25	39	0.33	-1.49	0.36	41	35	48	0.67	-0.99	0.44	46	38	54	0.80	-0.42	0.47	51	42	59
0.22	-2.27	0.36	34	27	40	0.42	-1.30	0.35	43	37	49	0.83	-0.67	0.43	49	41	56	1.00	-0.13	0.46	54	45	62
0.26	-2.11	0.35	35	29	42	0.50	-1.12	0.35	44	38	51	1.00	-0.37	0.43	51	44	59	1.20	0.17	0.47	56	48	65
0.30	-1.96	0.33	37	31	43	0.58	-0.96	0.34	46	40	52	1.17	-0.09	0.43	54	46	62	1.40	0.48	0.47	59	51	68
0.35	-1.82	0.32	38	32	44	0.67	-0.80	0.34	47	41	54	1.33	0.20	0.43	57	49	64	1.60	0.79	0.47	62	54	71
0.39	-1.70	0.31	39	34	45	0.75	-0.64	0.33	49	43	55	1.50	0.48	0.43	59	51	67	1.80	1.08	0.47	65	56	73
0.43	-1.58	0.30	40	35	46	0.83	-0.50	0.33	50	44	56	1.67	0.76	0.43	62	54	70	2.00	1.37	0.48	67	59	76
0.48	-1.47	0.29	41	36	47	0.92	-0.35	0.33	52	46	58	1.83	1.03	0.43	64	57	72	2.20	1.69	0.49	70	62	79
0.52	-1.36	0.29	42	37	48	1.00	-0.21	0.33	53	47	59	2.00	1.31	0.44	67	59	75	2.40	2.04	0.49	74	65	82
0.57	-1.25	0.28	43	38	48	1.08	-0.06	0.33	54	48	60	2.17	1.60	0.45	70	61	78	2.60	2.38	0.49	77	68	86
0.61	-1.15	0.28	44	39	49	1.17	0.08	0.33	56	50	62	2.33	1.91	0.45	72	64	81	2.80	2.73	0.51	80	71	89
0.65	-1.06	0.28	45	40	50	1.25	0.21	0.33	57	51	63	2.50	2.21	0.46	75	67	83	3.00	2.99	0.54	82	73	92
0.70	-0.96	0.27	46	41	51	1.33	0.35	0.33	58	52	64	2.67	2.50	0.47	78	69	86						
0.74	-0.87	0.27	47	42	52	1.42	0.49	0.33	59	53	65	2.83	2.78	0.50	80	71	89						
0.78	-0.78	0.27	48	43	53	1.50	0.62	0.33	61	55	66	3.00	3.05	0.55	83	73	93						
0.83	-0.69	0.27	48	44	53	1.58	0.76	0.33	62	56	68												
0.87	-0.60	0.27	49	44	54	1.67	0.89	0.33	63	57	69												
0.91	-0.52	0.27	50	45	55	1.75	1.03	0.33	64	58	70												
0.96	-0.43	0.27	51	46	56	1.83	1.16	0.33	66	60	71												
1.00	-0.35	0.27	52	47	56	1.92	1.30	0.33	67	61	73												
1.04	-0.27	0.27	52	47	57	2.00	1.44	0.33	68	62	74												
1.09	-0.18	0.26	53	48	58	2.08	1.58	0.33	69	63	75												
1.13	-0.10	0.26	54	49	59	2.17	1.72	0.33	71	65	77												

1.17	-0.02	0.26	55	50	59	2.25	1.87	0.33	72	66	78
1.22	0.06	0.26	55	51	60	2.33	2.02	0.33	73	67	79
1.26	0.14	0.26	56	51	61	2.42	2.17	0.34	75	69	81
1.30	0.22	0.26	57	52	62	2.50	2.33	0.34	76	70	82
1.35	0.30	0.26	58	53	62	2.58	2.50	0.35	78	72	84
1.39	0.38	0.26	58	54	63	2.67	2.67	0.36	79	73	86
1.43	0.46	0.26	59	54	64	2.75	2.86	0.37	81	74	88
1.48	0.54	0.26	60	55	64	2.83	3.06	0.39	83	76	90
1.52	0.61	0.26	60	56	65	2.92	3.29	0.41	85	78	92
1.57	0.69	0.26	61	56	66	3.00	3.55	0.45	88	79	96
1.61	0.77	0.26	62	57	67						
1.65	0.85	0.26	63	58	67						
1.70	0.93	0.26	63	59	68						
1.74	1.01	0.26	64	59	69						
1.78	1.09	0.26	65	60	70						
1.83	1.17	0.26	66	61	70						
1.87	1.25	0.26	66	62	71						
1.91	1.33	0.27	67	62	72						
1.96	1.41	0.27	68	63	73						
2.00	1.49	0.27	69	64	73						
2.04	1.57	0.27	69	64	74						
2.09	1.66	0.27	70	65	75						
2.13	1.74	0.27	71	66	76						
2.17	1.83	0.27	72	67	77						
2.22	1.91	0.27	72	68	77						
2.26	2.00	0.27	73	68	78						
2.30	2.09	0.27	74	69	79						
2.35	2.18	0.28	75	70	80						
2.39	2.27	0.28	76	71	81						
2.43	2.37	0.28	77	72	82						
2.48	2.46	0.29	77	72	83						
2.52	2.56	0.29	78	73	84						
2.57	2.66	0.30	79	74	85						
2.61	2.77	0.30	80	75	86						

2.65	2.89	0.31	81	76	87
2.70	3.00	0.32	82	77	88
2.74	3.13	0.34	84	77	90
2.78	3.26	0.35	85	79	91
2.83	3.40	0.36	86	80	93
2.87	3.56	0.38	88	81	94
2.91	3.73	0.41	89	82	97
2.96	3.92	0.43	91	83	99
3.00	4.14	0.47	93	84	101

Notes. SE Theta = Standard Error of theta; T score = T values ($M = 50$, $SD = 10$); LL = Lower Limit of 95 % confidence; UL = Upper Limit of 95% confidence.

Table S9

Model-based norms for the detachment domain scale of different versions of the PID-5

PID-5						PID-5-SF						PID5BF+						PID-5-BF					
Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL
0.00	-2.55	0.51	25	14	35	0.00	-1.83	0.56	32	20	44	0.00	-1.61	0.60	35	22	47	0.00	-1.50	0.61	36	23	49
0.04	-2.20	0.44	28	19	38	0.08	-1.41	0.47	37	27	47	0.17	-1.09	0.52	40	29	51	0.20	-0.95	0.51	42	31	52
0.08	-1.94	0.40	31	23	39	0.17	-1.13	0.43	40	31	49	0.33	-0.70	0.48	44	34	54	0.40	-0.56	0.48	46	36	56
0.12	-1.72	0.37	33	26	41	0.25	-0.89	0.40	42	34	51	0.50	-0.37	0.46	48	38	58	0.60	-0.25	0.46	49	40	59
0.17	-1.54	0.35	35	28	43	0.33	-0.69	0.37	45	37	52	0.67	-0.07	0.45	51	42	61	0.80	0.04	0.44	52	43	62
0.21	-1.39	0.33	37	30	44	0.42	-0.50	0.35	46	39	54	0.83	0.21	0.44	54	45	63	1.00	0.31	0.43	55	46	64
0.25	-1.24	0.31	39	32	45	0.50	-0.33	0.34	48	41	55	1.00	0.48	0.44	57	48	66	1.20	0.57	0.42	58	49	67
0.29	-1.11	0.30	40	34	46	0.58	-0.18	0.33	50	43	57	1.17	0.74	0.44	60	51	69	1.40	0.82	0.41	61	52	69
0.33	-1.00	0.29	41	35	47	0.67	-0.03	0.32	52	45	58	1.33	1.00	0.44	63	53	72	1.60	1.06	0.41	63	55	72
0.38	-0.88	0.28	42	37	48	0.75	0.11	0.32	53	46	60	1.50	1.26	0.45	65	56	75	1.80	1.30	0.41	66	57	74
0.42	-0.78	0.27	44	38	49	0.83	0.25	0.31	55	48	61	1.67	1.51	0.45	68	59	77	2.00	1.54	0.41	68	60	77
0.46	-0.68	0.26	45	39	50	0.92	0.38	0.31	56	49	62	1.83	1.76	0.45	71	61	80	2.20	1.79	0.41	71	62	80
0.50	-0.59	0.26	46	40	51	1.00	0.51	0.31	57	51	64	2.00	2.01	0.45	73	64	83	2.40	2.06	0.42	74	65	83
0.54	-0.50	0.25	47	41	52	1.08	0.64	0.31	59	52	65	2.17	2.27	0.45	76	67	86	2.60	2.34	0.43	77	68	86
0.58	-0.41	0.25	47	42	53	1.17	0.76	0.31	60	53	67	2.33	2.54	0.45	79	70	89	2.80	2.65	0.44	80	71	89
0.62	-0.33	0.24	48	43	53	1.25	0.89	0.31	61	55	68	2.50	2.81	0.45	82	73	91	3.00	3.04	0.49	84	74	95
0.67	-0.24	0.24	49	44	54	1.33	1.01	0.31	63	56	69	2.67	3.10	0.45	85	76	95						
0.71	-0.16	0.24	50	45	55	1.42	1.14	0.31	64	58	71	2.83	3.39	0.46	88	79	98						
0.75	-0.09	0.24	51	46	56	1.50	1.26	0.30	65	59	72	3.00	3.70	0.49	92	81	102						
0.79	-0.01	0.24	52	47	57	1.58	1.38	0.30	67	60	73												
0.83	0.07	0.24	53	48	58	1.67	1.51	0.30	68	62	74												
0.88	0.14	0.23	53	49	58	1.75	1.63	0.30	69	63	76												
0.92	0.21	0.23	54	49	59	1.83	1.75	0.30	71	64	77												
0.96	0.29	0.23	55	50	60	1.92	1.87	0.30	72	66	78												

1.00	0.36	0.23	56	51	61	2.00	2.00	0.30	73	67	80
1.04	0.43	0.23	56	52	61	2.08	2.12	0.30	75	68	81
1.08	0.50	0.23	57	52	62	2.17	2.25	0.30	76	70	82
1.12	0.57	0.23	58	53	63	2.25	2.38	0.30	77	71	84
1.17	0.64	0.23	59	54	64	2.33	2.51	0.31	79	72	85
1.21	0.71	0.23	59	55	64	2.42	2.64	0.31	80	74	87
1.25	0.78	0.23	60	55	65	2.50	2.78	0.32	82	75	88
1.29	0.85	0.23	61	56	66	2.58	2.93	0.32	83	77	90
1.33	0.91	0.23	62	57	66	2.67	3.08	0.33	85	78	92
1.38	0.98	0.23	62	58	67	2.75	3.25	0.35	87	79	94
1.42	1.05	0.23	63	58	68	2.83	3.44	0.37	89	81	96
1.46	1.12	0.23	64	59	69	2.92	3.65	0.39	91	83	99
1.50	1.19	0.23	65	60	69	3.00	3.92	0.43	94	85	103
1.54	1.25	0.23	65	60	70						
1.58	1.32	0.23	66	61	71						
1.62	1.39	0.23	67	62	72						
1.67	1.46	0.23	67	63	72						
1.71	1.53	0.23	68	63	73						
1.75	1.59	0.23	69	64	74						
1.79	1.66	0.23	70	65	74						
1.83	1.73	0.23	70	66	75						
1.88	1.80	0.23	71	66	76						
1.92	1.87	0.23	72	67	77						
1.96	1.93	0.23	73	68	77						
2.00	2.00	0.23	73	68	78						
2.04	2.07	0.23	74	69	79						
2.08	2.14	0.23	75	70	80						
2.12	2.21	0.23	76	71	80						
2.17	2.28	0.23	76	71	81						
2.21	2.35	0.23	77	72	82						
2.25	2.43	0.23	78	73	83						
2.29	2.50	0.23	79	74	83						
2.33	2.57	0.23	79	75	84						
2.38	2.65	0.24	80	75	85						

2.42	2.72	0.24	81	76	86
2.46	2.80	0.24	82	77	87
2.50	2.88	0.24	83	78	88
2.54	2.97	0.25	84	78	89
2.58	3.05	0.25	85	79	90
2.62	3.14	0.26	86	80	91
2.67	3.23	0.26	87	81	92
2.71	3.33	0.27	88	82	93
2.75	3.44	0.28	89	83	95
2.79	3.55	0.29	90	84	96
2.83	3.68	0.30	91	85	98
2.88	3.81	0.32	93	86	99
2.92	3.96	0.34	94	87	101
2.96	4.14	0.37	96	88	104
3.00	4.36	0.41	99	90	107

Note. SE Theta = Standard Error of theta; T score = T values ($M = 50$, $SD = 10$); LL = Lower Limit of 95 % confidence; UL = Upper Limit of 95% confidence.

Table S10

Model-based norms for the antagonism domain scale of different versions of the PID-5

PID-5						PID-5-SF						PID5BF+						PID-5-BF					
Observed Score	Theta	SE	T	LL	UL	Observed Score	Theta	SE	T	LL	UL	Observed Score	Theta	SE	T	LL	UL	Observed Score	Theta	SE	T	LL	UL
		Theta	score					Theta	score					Theta	score					Theta	score		
0.00	-2.64	0.63	30	19	41	0.00	-1.76	0.64	38	27	49	0.00	-1.38	0.67	41	30	53	0.00	-0.92	0.71	45	33	57
0.05	-2.36	0.60	33	22	43	0.08	-1.40	0.57	41	31	51	0.17	-0.88	0.59	46	35	56	0.20	-0.36	0.64	50	39	61
0.10	-2.10	0.57	35	25	45	0.17	-1.07	0.52	44	35	53	0.33	-0.48	0.55	49	40	58	0.40	0.11	0.60	54	44	64
0.14	-1.87	0.54	37	28	46	0.25	-0.76	0.46	47	39	54	0.50	-0.12	0.52	52	43	61	0.60	0.52	0.57	58	48	68
0.19	-1.66	0.52	39	30	48	0.33	-0.50	0.42	49	42	56	0.67	0.20	0.50	55	46	64	0.80	0.86	0.54	61	51	70
0.24	-1.45	0.49	40	32	49	0.42	-0.28	0.39	51	44	57	0.83	0.50	0.49	58	49	66	1.00	1.17	0.53	63	54	73
0.29	-1.26	0.47	42	34	50	0.50	-0.08	0.37	53	46	59	1.00	0.79	0.48	60	52	68	1.20	1.46	0.53	66	57	75
0.33	-1.08	0.44	44	36	51	0.58	0.11	0.36	54	48	60	1.17	1.06	0.48	63	54	71	1.40	1.76	0.53	69	60	78
0.38	-0.91	0.42	45	38	52	0.67	0.28	0.35	56	50	62	1.33	1.33	0.48	65	57	73	1.60	2.05	0.52	71	62	80
0.43	-0.75	0.40	47	40	54	0.75	0.45	0.34	57	51	63	1.50	1.59	0.49	67	59	76	1.80	2.33	0.51	74	65	82
0.48	-0.60	0.38	48	41	54	0.83	0.61	0.34	59	53	64	1.67	1.86	0.49	70	61	78	2.00	2.61	0.50	76	68	85
0.52	-0.45	0.36	49	43	55	0.92	0.77	0.34	60	54	66	1.83	2.14	0.48	72	64	80	2.20	2.88	0.50	79	70	87
0.57	-0.32	0.35	50	44	56	1.00	0.92	0.34	61	55	67	2.00	2.40	0.48	74	66	83	2.40	3.16	0.50	81	72	90
0.62	-0.19	0.34	52	46	57	1.08	1.07	0.34	63	57	68	2.17	2.67	0.48	77	68	85	2.60	3.43	0.50	83	75	92
0.67	-0.07	0.33	53	47	58	1.17	1.22	0.34	64	58	70	2.33	2.94	0.48	79	71	87	2.80	3.69	0.52	86	77	95
0.71	0.04	0.32	54	48	59	1.25	1.37	0.34	65	59	71	2.50	3.22	0.48	81	73	90	3.00	3.96	0.55	88	78	97
0.76	0.16	0.32	55	49	60	1.33	1.53	0.34	67	61	72	2.67	3.50	0.49	84	75	92						
0.81	0.27	0.31	56	50	61	1.42	1.68	0.34	68	62	74	2.83	3.79	0.50	86	78	95						
0.86	0.37	0.31	56	51	62	1.50	1.83	0.33	69	64	75	3.00	4.08	0.52	89	80	98						
0.90	0.48	0.31	57	52	63	1.58	1.98	0.33	71	65	76												
0.95	0.58	0.31	58	53	64	1.67	2.12	0.33	72	66	77												
1.00	0.68	0.30	59	54	64	1.75	2.27	0.33	73	67	79												
1.05	0.78	0.30	60	55	65	1.83	2.42	0.33	74	69	80												
1.10	0.88	0.30	61	56	66	1.92	2.56	0.33	76	70	81												
1.14	0.98	0.30	62	57	67	2.00	2.71	0.33	77	71	83												

1.19	1.08	0.30	63	58	68	2.08	2.86	0.33	78	73	84
1.24	1.18	0.30	64	58	69	2.17	3.01	0.33	80	74	85
1.29	1.28	0.30	64	59	70	2.25	3.16	0.33	81	75	87
1.33	1.38	0.30	65	60	70	2.33	3.32	0.34	82	76	88
1.38	1.48	0.30	66	61	71	2.42	3.48	0.34	84	78	90
1.43	1.58	0.30	67	62	72	2.50	3.64	0.35	85	79	91
1.48	1.67	0.30	68	63	73	2.58	3.81	0.36	87	80	93
1.52	1.77	0.30	69	64	74	2.67	3.99	0.37	88	82	95
1.57	1.87	0.30	70	64	75	2.75	4.19	0.39	90	83	97
1.62	1.97	0.30	71	65	76	2.83	4.40	0.40	92	85	99
1.67	2.07	0.30	71	66	77	2.92	4.63	0.42	94	87	101
1.71	2.17	0.30	72	67	77	3.00	4.89	0.45	96	88	104
1.76	2.27	0.30	73	68	78						
1.81	2.37	0.30	74	69	79						
1.86	2.46	0.30	75	70	80						
1.90	2.56	0.30	76	71	81						
1.95	2.66	0.30	77	71	82						
2.00	2.76	0.30	77	72	83						
2.05	2.86	0.30	78	73	83						
2.10	2.97	0.30	79	74	84						
2.14	3.07	0.30	80	75	85						
2.19	3.17	0.30	81	76	86						
2.24	3.28	0.31	82	77	87						
2.29	3.38	0.31	83	78	88						
2.33	3.49	0.31	84	78	89						
2.38	3.60	0.32	85	79	90						
2.43	3.71	0.33	86	80	91						
2.48	3.83	0.33	87	81	92						
2.52	3.95	0.34	88	82	94						
2.57	4.07	0.35	89	83	95						
2.62	4.20	0.36	90	84	96						
2.67	4.33	0.37	91	85	98						
2.71	4.47	0.39	92	86	99						
2.76	4.61	0.40	94	87	101						

2.81	4.76	0.41	95	88	102
2.86	4.91	0.42	96	89	104
2.90	5.07	0.43	98	90	105
2.95	5.22	0.44	99	91	107
3.00	5.37	0.46	100	92	108

Note. SE Theta = Standard Error of theta; T score = T values ($M = 50$, $SD = 10$); LL = Lower Limit of 95 % confidence; UL = Upper Limit of 95% confidence.

PID-5						PID-5-SF						PID5BF+						PID-5-BF					
Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL	Observed Score	Theta	SE Theta	T score	LL	UL
0.00	-2.84	0.53	30	20	39	0.00	-2.45	0.54	33	24	43	0.00	-2.18	0.58	36	25	46	0.00	-1.62	0.67	40	29	52
0.05	-2.56	0.49	32	24	41	0.08	-2.11	0.50	36	27	45	0.17	-1.66	0.55	40	31	50	0.20	-1.09	0.64	45	34	56
0.09	-2.32	0.46	34	26	42	0.17	-1.80	0.46	39	31	47	0.33	-1.22	0.54	44	35	54	0.40	-0.63	0.62	49	38	60
0.14	-2.10	0.43	36	29	44	0.25	-1.52	0.43	41	34	49	0.50	-0.82	0.54	48	38	57	0.60	-0.24	0.61	53	42	64
0.18	-1.90	0.41	38	31	45	0.33	-1.27	0.42	44	36	51	0.67	-0.46	0.53	51	42	60	0.80	0.10	0.60	56	45	66
0.23	-1.72	0.39	40	33	46	0.42	-1.04	0.40	46	39	53	0.83	-0.11	0.53	54	45	63	1.00	0.43	0.60	59	48	69
0.27	-1.55	0.38	41	34	48	0.50	-0.82	0.40	48	41	55	1.00	0.22	0.53	57	48	66	1.20	0.75	0.59	62	51	72
0.32	-1.39	0.37	43	36	49	0.58	-0.61	0.40	50	43	57	1.17	0.54	0.53	60	51	69	1.40	1.07	0.58	65	54	75
0.36	-1.24	0.36	44	38	50	0.67	-0.41	0.40	51	44	58	1.33	0.84	0.52	62	53	72	1.60	1.37	0.57	67	57	77
0.41	-1.10	0.35	45	39	51	0.75	-0.21	0.40	53	46	60	1.50	1.13	0.53	65	56	74	1.80	1.66	0.56	70	60	80
0.45	-0.97	0.34	46	40	52	0.83	-0.02	0.41	55	48	62	1.67	1.41	0.53	68	58	77	2.00	1.95	0.56	72	63	82
0.50	-0.84	0.34	48	42	53	0.92	0.17	0.41	56	49	64	1.83	1.69	0.53	70	61	79	2.20	2.25	0.56	75	65	85
0.55	-0.71	0.34	49	43	55	1.00	0.35	0.41	58	51	65	2.00	1.97	0.54	73	63	82	2.40	2.55	0.56	78	68	88
0.59	-0.59	0.33	50	44	55	1.08	0.53	0.41	60	53	67	2.17	2.24	0.54	75	66	84	2.60	2.87	0.56	81	71	90
0.64	-0.46	0.33	51	45	57	1.17	0.71	0.41	61	54	69	2.33	2.52	0.54	78	68	87	2.80	3.21	0.57	84	74	94
0.68	-0.35	0.33	52	46	58	1.25	0.88	0.40	63	56	70	2.50	2.80	0.54	80	71	89	3.00	3.57	0.58	87	77	97
0.73	-0.23	0.33	53	47	59	1.33	1.06	0.40	64	57	71	2.67	3.07	0.55	82	73	92						
0.77	-0.11	0.33	54	48	60	1.42	1.23	0.40	66	59	73	2.83	3.36	0.57	85	75	95						
0.82	0.00	0.33	55	49	61	1.50	1.40	0.40	67	60	74	3.00	3.67	0.59	88	77	98						
0.86	0.11	0.33	56	50	62	1.58	1.57	0.40	69	62	76												
0.91	0.22	0.33	57	51	63	1.67	1.74	0.40	71	64	78												
0.95	0.33	0.33	58	52	64	1.75	1.90	0.40	72	65	79												
1.00	0.44	0.33	59	53	65	1.83	2.07	0.40	73	66	80												
1.05	0.54	0.33	60	54	66	1.92	2.24	0.40	75	68	82												
1.09	0.65	0.33	61	55	67	2.00	2.41	0.40	76	70	84												

1.14	0.75	0.32	62	56	67	2.08	2.58	0.41	78	71	85
1.18	0.85	0.32	63	57	68	2.17	2.75	0.41	80	72	87
1.23	0.96	0.32	64	58	69	2.25	2.93	0.41	81	74	88
1.27	1.06	0.32	64	59	70	2.33	3.11	0.41	83	76	90
1.32	1.16	0.32	65	60	71	2.42	3.30	0.41	84	77	92
1.36	1.26	0.32	66	61	72	2.50	3.48	0.42	86	79	93
1.41	1.36	0.32	67	62	73	2.58	3.67	0.42	88	80	95
1.45	1.46	0.32	68	62	74	2.67	3.86	0.43	89	82	97
1.50	1.56	0.32	69	63	75	2.75	4.06	0.44	91	84	99
1.55	1.66	0.32	70	64	75	2.83	4.26	0.45	93	85	101
1.59	1.76	0.32	71	65	76	2.92	4.46	0.47	95	87	103
1.64	1.85	0.32	72	66	77	3.00	4.69	0.49	97	88	105
1.68	1.95	0.32	72	67	78						
1.73	2.05	0.32	73	68	79						
1.77	2.15	0.32	74	69	80						
1.82	2.25	0.32	75	69	81						
1.86	2.35	0.32	76	70	82						
1.91	2.45	0.32	77	71	82						
1.95	2.55	0.32	78	72	83						
2.00	2.65	0.32	79	73	84						
2.05	2.75	0.32	80	74	85						
2.09	2.85	0.32	80	75	86						
2.14	2.95	0.32	81	76	87						
2.18	3.06	0.32	82	77	88						
2.23	3.16	0.32	83	78	89						
2.27	3.26	0.32	84	79	90						
2.32	3.37	0.33	85	79	91						
2.36	3.47	0.33	86	80	92						
2.41	3.58	0.33	87	81	93						
2.45	3.69	0.33	88	82	94						
2.50	3.80	0.34	89	83	95						
2.55	3.92	0.34	90	84	96						
2.59	4.03	0.35	91	85	97						
2.64	4.15	0.36	92	86	98						

2.68	4.28	0.37	93	87	100
2.73	4.40	0.38	94	88	101
2.77	4.54	0.39	96	89	102
2.82	4.68	0.40	97	90	104
2.86	4.82	0.42	98	91	105
2.91	4.98	0.43	99	92	107
2.95	5.15	0.45	101	93	109
3.00	5.34	0.48	103	94	111

Note. SE Theta = Standard Error of theta; T score = T values ($M = 50$, $SD = 10$); LL = Lower Limit of 95 % confidence; UL = Upper Limit of 95% confidence.

Table S12

Model-based norms for the psychoticism domain scale of different versions of the PID-5

[illegible]

0.70	-0.42	0.24	51	47	55	1.92	1.96	0.34	73	67	79
0.73	-0.35	0.24	52	48	56	2.00	2.09	0.34	74	68	80
0.76	-0.29	0.24	52	48	57	2.08	2.23	0.35	75	69	81
0.79	-0.23	0.24	53	49	57	2.17	2.36	0.36	76	70	83
0.82	-0.16	0.24	53	49	58	2.25	2.50	0.37	77	71	84
0.85	-0.10	0.24	54	50	58	2.33	2.64	0.38	79	72	85
0.88	-0.04	0.24	55	50	59	2.42	2.79	0.39	80	73	87
0.91	0.02	0.23	55	51	59	2.50	2.95	0.40	82	74	89
0.94	0.08	0.23	56	52	60	2.58	3.11	0.42	83	76	90
0.97	0.14	0.23	56	52	60	2.67	3.29	0.44	85	77	92
1.00	0.19	0.23	57	53	61	2.75	3.48	0.46	86	78	94
1.03	0.25	0.23	57	53	61	2.83	3.65	0.49	88	79	97
1.06	0.31	0.23	58	54	62	2.92	3.78	0.50	89	80	98
1.09	0.37	0.23	58	54	62	3.00	3.85	0.50	90	81	99
1.12	0.42	0.23	59	55	63						
1.15	0.48	0.23	59	55	63						
1.18	0.54	0.23	60	56	64						
1.21	0.59	0.23	60	56	64						
1.24	0.65	0.23	61	57	65						
1.27	0.71	0.23	61	57	65						
1.30	0.76	0.23	62	58	66						
1.33	0.82	0.23	62	58	66						
1.36	0.87	0.23	63	59	67						
1.39	0.93	0.23	63	59	67						
1.42	0.98	0.23	64	60	68						
1.45	1.04	0.23	64	60	68						
1.48	1.09	0.23	65	61	69						
1.52	1.15	0.23	65	61	69						
1.55	1.20	0.23	66	62	70						
1.58	1.26	0.23	66	62	70						
1.61	1.31	0.23	67	63	71						
1.64	1.37	0.23	67	63	71						
1.67	1.42	0.23	68	64	72						
1.70	1.48	0.23	68	64	72						

1.73	1.54	0.23	69	65	73
1.76	1.59	0.23	69	65	73
1.79	1.65	0.23	70	66	74
1.82	1.70	0.23	70	66	74
1.85	1.76	0.23	71	67	75
1.88	1.82	0.24	71	67	76
1.91	1.87	0.24	72	68	76
1.94	1.93	0.24	72	68	77
1.97	1.99	0.24	73	69	77
2.00	2.05	0.24	73	69	78
2.03	2.11	0.24	74	70	78
2.06	2.17	0.24	74	70	79
2.09	2.23	0.25	75	71	79
2.12	2.29	0.25	76	71	80
2.15	2.35	0.25	76	72	81
2.18	2.41	0.26	77	72	81
2.21	2.48	0.26	77	73	82
2.24	2.54	0.26	78	73	82
2.27	2.61	0.27	78	74	83
2.30	2.68	0.27	79	74	84
2.33	2.75	0.27	80	75	85
2.36	2.82	0.28	80	75	85
2.39	2.89	0.28	81	76	86
2.42	2.97	0.29	82	77	87
2.45	3.04	0.29	82	77	87
2.48	3.12	0.30	83	78	88
2.52	3.21	0.30	84	79	89
2.55	3.29	0.31	85	79	90
2.58	3.38	0.32	85	80	91
2.61	3.47	0.33	86	80	92
2.64	3.57	0.34	87	81	93
2.67	3.67	0.35	88	82	94
2.70	3.77	0.36	89	83	95
2.73	3.88	0.37	90	83	96

2.76	3.99	0.38	91	84	98
2.79	4.10	0.40	92	85	99
2.82	4.22	0.41	93	86	100
2.85	4.33	0.43	94	86	102
2.88	4.43	0.44	95	87	103
2.91	4.54	0.45	96	88	104
2.94	4.63	0.46	97	89	105
2.97	4.72	0.47	98	89	106
3.00	4.78	0.47	98	90	106

Note. SE Theta = Standard Error of theta; T score = T values ($M = 50$, $SD = 10$); LL = Lower Limit of 95 % confidence; UL = Upper Limit of 95% confidence.

Table S13

M2 based fit statistics of domain-specific multidimensional graded response models in the German validation sample*

	<i>n</i>	<i>M2*</i>	df ¹	CFI ¹	RMSEA ¹	SRMSR
Negative Affectivity	580	1112.582	202	.933	.088	.109
Detachment	583	1185.095	201	.952	.092	.091
Antagonism	584	898.606	163	.925	.088	.073
Disinhibition	593	673.951	162	.943	.073	.077
Psychoticism	570	1802.608	396	.945	.079	.111

Note. We computed model fit in the German validation sample by estimating single group models with fixed parameters. The fixed values corresponded to the estimates of the two-group multidimensional graded response models. df = degrees of freedom. CFI = comparative fit index. RMSEA = root mean square error of approximation. SRMSR = standardized root mean square residual.

¹ Because degrees of freedom are inflated in models with completely fixed parameters, we adjusted the degrees of freedom according to corresponding single group models with freely estimated parameters. This ensured appropriate derivation of the indices CFI and RMSEA.

Table S14

Sample sizes and standardized regression coefficients of multiple regression analyses for psychological variables

Psychological variables	N	PID5BF+ Subscale scores					
		Negative Affectivity	Detachment	Antagonism	Disinhibition	Psychoticism	Severity
PAN: Pos	4495	-.25**	-.31**	-.14**	-.27**	-.16**	-.27**
PAN: Neg	4494	.42**	.26**	.25**	.34**	.32**	.41**
PSS	4506	.46**	.30**	.22**	.35**	.31**	.42**
Well: aff	4557	-.46**	-.35**	-.21**	-.32**	-.31**	-.43**
Well: Hap	3911	-.30**	-.33**	-.15**	-.23**	-.24**	-.32**
Well: Sat	3823	-.31**	-.31**	-.15**	-.24**	-.24**	-.32**
NAR: Total	4567	.14**	.13**	.42**	.20**	.24**	.29**
NAR: Adm	4541	.01	-.05**	.30**	.07**	.14**	.12**
NAR: Riv	4567	.26**	.30**	.43**	.30**	.28**	.40**
RSES	4438	-.43**	-.41**	-.19**	-.37**	-.32**	-.45**
SCS	4490	-.49**	-.32**	-.23**	-.35**	-.27**	-.45**

Note. PID5BF+ = Personality Inventory for DSM-5 Brief Form Plus; PAN = Positive and Negative Affect; Pos = Positive Affectivity; Neg = Negative Affectivity; Well = Well-being; aff = affective; Hap = Happiness; Sat = Life Satisfaction; NAR = Narcissistic Admiration and Rivalry Questionnaire; Adm = Admiration; Riv = Rivalry; RSES = Rosenberg's Self-Esteem scale; SCS = Self-Compassion Scale; PSS = Perceived Stress Scale; * indicates $p < .01$. ** indicates $p < .001$.