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Between Normal and Abnormal Personality – Examining the Joint Structure of the IPIP-NEO-120 and the PID-5

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Abstract

Objective: The overlap of normal and abnormal personality and personality disorders was found on facet and domain level, but only a few studies assessed the higher order joint structure. In this study, the Personality Inventory for the DSM-5 (PID-5-100 item form) and the IPIP-NEO-120 are assessed in their internal consistency, convergent and discriminant validity and their joint structure, modelled as the overlap of the General Factor of Personality (GFP) and p-factor.

Method: The IPIP-NEO-120 and PID-5-100 are examined in their scale consistencies, and validity is assessed with Spearman ρ coefficients and confirmatory factor analyses (CFA). The overlap of both instruments was modelled with a Canonical Correlation (CCA) and in a Structural Equation Modelling (SEM) framework.

Results: The IPIP-NEO-120 showed high reliabilities and expected convergence with the Five Factor Model (FFM). The PID-5-100 showed moderate reliabilities and differentiated results for the facet structure. It converged well for most factors with the proposed structure, indicating a reliable and valid use of the 100 item form. The CCA indicated an overlap of 55%. On higher order level, the structure displayed high convergence ($\beta = -0.89$), although the factor Openness had no influence on the GFP. The results are pointing towards the existence of a mutual construct of normal and abnormal personality.

Conclusion: The PID-5-100 showed comparable results to the original long version. The high convergence of normal and abnormal personality is discussed as “Big Everything” of personality and psychopathology, or a methodological artefact, such as social desirability.

Keywords: PID-5, Five Factor Model, Big One, Structural Equation Modelling, General Factor of Personality

Between Normal and Abnormal Personality – Examining the Joint Structure of the IPIP-NEO-120 and the PID-5

The pursuit of comprehending human behavior, emotions, and the underlying causes of happiness or illness is a shared goal among diverse research fields, yet the definition of "normal" and "abnormal" remains a subject of disagreement for philosophers and scientists in most contexts, despite the growing population and the parallel increase in uniqueness and similarity. Abnormal personality is commonly defined as the extreme ends of normal personality traits (Costa & McCrae, 1990; Markon et al., 2005; O'Connor & Dyce, 2001) and is used to describe the dysfunction inherent in personality disorders (PD). Understanding these abnormal parts is important, as the prevalence for clinical disorders is high (Steel et al., 2014) and growing (Baxter et al., 2014; Richter et al., 2019), with 10-12% of the populations suffering from a personality-related disorder (Volkert et al., 2018; Widiger, 2012). Additionally, diagnoses methods faced various critique, as they tend to be heterogeneous, atheoretical, and display high comorbidity, making them inefficient to distinguish between what they intend to classify (Krueger & Markon, 2014; Widiger et al., 2009).

Particularly, the diagnosis of PDs has sparked a prominent debate about the nature of normal and abnormal personality since the American Psychological Association (APA) included a hybrid categorical/dimensional model in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013; a hybrid model is also incorporated in the ICD-11, First et al., 2015). Nevertheless, this hybrid approach is facing critique, as uncertainty about the overlap between Criterion A and B have been reported (Bender, 2019; Morey et al., 2022; Sleep et al., 2019), and a reliable structure of PDs is not yet agreed on (Ashton et al., 2009; Clark & Watson, 2022; Markon et al., 2005). Competing models of abnormal personality, differing in number and content of subordinate and higher order factors, as well as integrative models, such as the Hierarchical Taxonomy of Psychopathology (HiTOP, Kotov et al., 2017), are currently debated in their differentiated relationships to normal personality, PDs, treatment outcomes, and relationships with other higher order latent factors (Bucher et al., 2019; Griffin & Samuel, 2014; Saulsman & Page, 2004). While the former ideas have been widely assessed, the focus on higher order factors and their convergence has been poor (Littlefield et al., 2021; McCabe et al., 2022; Oltmanns et al., 2018). Studies criticized that "relations between general factors across these domains have been unclear" (Smith et al., 2020, p. 82), although understanding the common core of both normal and abnormal personality could build unison and consensus in many of the debates. Hence, understanding the instruments and their constructs on all levels is crucial to help clinicians finding a “human way” for diagnosis and treatment (Bender, 2019). Thorough evaluation of diagnostic tools and instruments, considering both facet, domain, and latent variable levels, while incorporating content- and methodological debates, play a pivotal role in achieving a comprehensive understanding of the construct as a whole and developing accurate models of psychopathology.

Normal and Abnormal Personality Constructs

Five Factors in Normal Personality

The Five Factor Model (FFM) is the most prominent construct in personality psychology, capturing the five domains neuroticism, extraversion, openness, agreeableness, and conscientiousness. It has been shown to predict a variety of life outcomes, such as life outcome satisfaction (Kajonius & Carlander, 2017), academic success (Komarraju et al., 2011), and clinical diagnoses (Bienvenu et al., 2004; Mullins-Sweatt & Widiger, 2010; Rosellini & Brown, 2011). The influence of the chosen level on the prediction performance has been debated. Some studies argued that predictions on facet (Paunonen & Ashton, 2001), nuance (Mõttus et al., 2017; Stewart et al., 2022) or even item (Revelle et al., 2021; Seeboth & Mõttus, 2018) level are superior for the prediction of behavior. The same was found for clinical use, highlighting the importance of facets in the diagnosing process (Reynolds & Clark, 2001). Therefore, the aim of understanding PDs is to balance searching overarching clusters in personality, while being concise on facet level to increase the prediction of different outcomes and disorders. As facets carry an undoubtedly important part of the variance it is necessary to define the nomological nets of their facet structure sufficiently, and hence, detangling the common core, explained by a trait, from the specific variance inherent in the trait (Ziegler & Bäckström, 2016). Only with clearly stated correlations between facets and definitions of facets loading on one or more domains claims can be comprehensible and explicit in both classic models of personality, as well as psychopathology.

Research subsequently demonstrated that personality traits are closely linked to emotional and behavioral disorders. It was shown that the FFM can effectively identify disorder categories (Butrus & Witenberg, 2015; Saulsman & Page, 2004) and inter-correlations with clinicians’ ratings were high when using the FFM as a base for diagnoses (Lawton et al., 2011; Lynam & Widiger, 2001), sometimes even outperforming traditional diagnosis methods (Few et al., 2015). This link has been explained by different conceptualizations. One association was proposed by Costa and McCrae (1990) who conceptualize PDs as the extreme ends of the spectra of normal personality. A facet counting method incorporated this idea, utilizing scores of facet combinations to approximate PDs

(Clark, 2007; Kajonius & Dåderman, 2017; Miller et al., 2005). The idea of extreme variants of normal personality was backed up by multiple studies examining the multivariate space of the FFM within both normal and psychiatric groups. One study indicated that both are overlapping in structure, meaning they were indeed in a comparable space, but clinically relevant subjects tended to be situated in the outer regions of the FFM (O'Connor & Dyce, 2001).

Related to this, but often overlooked, is the definition of polarity of the domains (Williams & Simms, 2018). Bipolarity means indicators correlate both positively and negatively with the dimension, while unipolarity only displays one direction. When looking at maladaptive traits, such an indicator can be a negative outcome or a dysfunction. The polarity of the domains should be specified during its construction, such as in the Five Factor Model of Personality Disorders (FFM-PD, Widiger & Mullins-Sweatt, 2009). The FFM-PD has bipolar domains, with "items reflecting maladaptive characteristics exist[ing] at all poles, though they are unevenly distributed (i.e., more maladaptive items at one pole)" (Williams & Simms, 2018, p. 889). Newer instruments, such as the PID-5, have yielded inconsistent evidence for polarity. The instrument was both found to converge with unipolar constructs (Fowler et al., 2015; Wright & Simms, 2014), as well as showing a bipolar structure with discrepancies on facet level (Williams & Simms, 2018). More research concerning the direction of maladaptive ends is needed to assess trait redundancy, practical importance and converge logically with factor structures.

Abnormal Personality and the DSM-5

With the newest edition of the DSM-5, the idea of maladaptive personality traits was incorporated into the definition of PDs. Disordered personality has been included in the DSM editions ever since (Oldham, 2018), but critique on its categorical classification system emerged, calling out the high comorbidity, heterogenous diagnoses and an atheoretical foundation, suggesting inefficiency in both theory and practice (Krueger & Markon, 2014; Tasman et al., 2011; Widiger & Trull, 2007). It was deemed outdated, as "diagnostic criteria cannot render the variety and complexity of personality, whether normal or abnormal" (Crocq, 2013, p. 148). This has led the APA to incorporate a hybrid model in the DSM-5, which consists of seven criteria, A - G. Criterion A is capturing a generic impairment of dysfunctional personality, and B is describing pathological personality traits, determining the specific PD(s) (Criteria C-G are not further explained due to irrelevance for the present study, see American Psychiatric Association, 2013; Morey et al., 2011). Criterion A is assessed with the Level of Personality Functioning Scale (LPFS) and scored in four categories. The dimensional addition, Criterion B, contains personality traits that resemble the FFM and are captured by the Personality Inventory for the DSM-5 (PID-5, Krueger et al., 2012).

Although both scales found acceptance in the research community, the overlap of A and B has been discussed, as correlations between the two criteria emerged, questioning the independence and meaning of the constructs the criteria sought to represent (Morey et al., 2022; Sharp & Wall, 2021). Theories of a higher order factor or even a common core that represents both normal and abnormal personality were proposed. They rooted in both the statistical overlap of many personality constructs, as well as content-based interpretations of the overlap, such as a general impairment, social desirability, or simply "positive versus negative aspects of personality" (Musek, 2007, p. 1228; see Smith et al., 2020 for a review; Widiger & Oltmanns, 2017).

Different models of normal and abnormal personality constructs and their overlaps on facet, factor and higher order factor levels have been assessed. The overlap of Criterion A and B has been tested recently and yielded promising, yet incongruent results, pointing towards more research needed (Martí Valls et al., 2023). Criterion A was assumed to represent a general higher order factor, such as the p-factor, which can be derived from models of abnormal personality (Morey et al., 2022). Kajonius (2017) has found a substantial overlap between the General Factor of Personality (GFP) and the p-factor leading to the assumption the two instruments "may be interchangeable, given their mutual structure" (Pešić et al., 2023, p. 2). Nevertheless, in the 2017 study both the mini-IPIP and the PID-5 short form (25 items) were used, suggesting that these findings should be replicated with longer instruments.

On domain level, studies also found an overlap between normal and abnormal models of personality by up to 77% (García et al., 2022; Hengartner et al., 2014), as well as relations between the facets of both constructs (Griffin & Samuel, 2014; Samuel & Widiger, 2008). This overlap has been assessed with varying instruments, such as the NEO-PI-R (see Al-Dajani et al., 2016 for a review; García et al., 2022; Quilty et al., 2013), resulting in acceptable to high convergences on domain level, although discriminant validity among the facets showed mixed results.

The present study

The present study aims at assessing the FFM and abnormal personality both individually and in a joint structure. The IPIP-NEO-120 (Johnson, 2014) and the PID-5-100 (Krueger et al., 2012; Maples et al., 2015) are two instruments that have not yet been explored together in this form.

Aim 1

The first aim is testing both instruments respectively. Their internal consistency, convergent and discriminant validity, and convergence with the proposed underlying construct will be assessed. While the IPIP-NEO-120 is a much-validated instrument, the version of the PID-5 in this study consists of a reduced 100-item scale. This version has not been examined in the public domain yet. Moreover, recent critique pointed out the poor incorporation of facet structures in many papers, not assessing instruments at all levels equally. Hence, both instruments will be examined on both their facet structure alone, as well as modelled from facet to domain in a confirmatory approach.

Aim 2

The second aim assesses the joint structure of the IPIP-NEO-120 and PID-5 100 on facet, domain, and latent level. Normal and abnormal models of personality have been brought together in various models, but no consensus was found yet about the number, content, and level of both respective and convergent factors, and especially their convergence on higher order levels has been neglected in past research (Oltmanns et al., 2018). Examining the overlap of the two constructs with these measures appends the ongoing debate, replicates findings in a new context in a public domain sample, and yields discussions from the perspectives of various currently debated theories, such as the HiTOP consortium and the "Big Everything" (Littlefield et al., 2021).

Method

Procedure

The data in this study was collected via an online survey among Swedish citizens on a website driving traffic from participants who are interested in personality profiling, making this a highly motivated sample. Informed consent was required to proceed. As the data was collected anonymously and voluntarily, and no traceable or personal information about ethnicity, socio-economic status, more specific demographics, or sensitive personal data was asked, no ethical review was required for this study. The data and analysis, both the results of this study as well as supplementary findings, are available on Open Science Framework (OSF)[1].

Participants and Research Design

The sample consisted of 549 participants, with 170 being excluded due to missing

[1] Link: https://osf.io/x75g2/ or contact the author.

data (n = 146) or being younger than 17 (n = 34), leading to a sample of 379 valid participants. Of the sample, 57% identified as male, 44% as female and 0% did not identify in this dichotomy. The age of the sample ranged from 17 to 65, with the inner 50% between 29 and 49 (M = 39.16, SD = 12.05), making this a representative sample for a psychometric study.

Measures

International Personality Item Pool

The FFM was operationalized with the IPIP-NEO-120, a shorter version of the IPIP-NEO scales developed by Johnson (2014). The instrument assesses each of the five FFM traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) using four correlated items for each facet, while minimizing repetition and balancing positively and negatively keyed items. Participants rate each item from 0 (*very inaccurate*) to 4 (*very accurate*), and scores for each facet are then averaged to create trait scores. To derive domain scores, six facets are averaged to create each of the five trait factors. Overall, the IPIP-NEO-120 is a reliable and valid measure of the FFM that provides an efficient and comprehensive assessment of personality traits.

Personality Inventory for the DSM-5

The related abnormal personality traits are operationalized with the PID-5, a scale proposed by Krueger and colleagues (2012). The PID-5 consists of 25 facets, that are loading onto five domains, namely negative affect, detachment, antagonism, disinhibition and psychoticism. The facets are displayed in Table 3. Originally, these facets are captured by a total of 220 items with 4-14 items per facet. For ecological validity and user-friendliness, a shortened version of the PID-5 with four items per facet was used in this study. Items were reduced by minimizing redundancy with Item Response Theory, resulting in a concise PID-5-100 (procedure following Maples et al., 2015). The official Swedish translation was used, and all items are available at pilgrimpress.se. Each item is scaled on a Likert scale ranging from 0 (*Mycket falskt eller Ofta falskt*) to 3 (*Mycket sant eller Ofta sant*) and item scores are summed up facet-wise and the sums averaged domain-wise. The manual states that although each domain receives loadings from a differing number of facets (between three and seven; Krueger et al., 2012), each domain has three primary facets contributing to the domain, henceforth called core facets. This specifically allows the remaining facets to load onto more than one domain and being situated "in between" factors (Krueger et al., 2012; Maples et al., 2015; Markon et al., 2005). For the domain computations, solely the core facets were used. This eases interpretation and enhances comparability, but it is to be noted, that this might take away much of the crucial variance in the data.

Data Analysis

Analysis of Aim 1

The first aim was to assess the instruments. Both the IPIP-NEO-120 and PID-5-100 respectively were examined on scale, facet, and factor level. After scale distributions, internal consistencies were reported as both Cronbach's α as well as McDonald's ω for reliability, as the former index was criticized when used in psychometrics, suggesting the use of ω for more complex models (Deng & Chan, 2017; Dunn et al., 2014; McDonald, 2013; Ziegler & Bäckström, 2016).

Further, both measures were assessed in their internal structure. First, Spearman's rank correlation coefficients (ρ) on facet-level of each instrument were assessed to explore convergent and discriminant validity. Correlations in this study were interpreted following Schober and colleagues (2018), with $\rho = .1 - .39$ as weak, $\rho = .4 - .69$ as moderate and $\rho = .7 - .89$ as strong correlations. Moreover, an exploratory factor analysis (EFA) was performed to extract factor loadings of the facets on all factors and plotted using RStudio (R Core Team, 2020; RStudio Team, 2020) and the lavaan package (Rosseel, 2012). Five factors were forced, and Minimal Residuals was used as an extraction method with oblimin rotation to allow for correlated factors. Minimal residuals is an unweighted least squares solution, hence not based on a Maximum Likelihood (ML) method, which was avoided throughout this study due to non-normality and ordinal data.

Both the IPIP-NEO-120 and the PID-5-100 were tested in a confirmatory approach, using confirmatory factor analysis (CFA) in a Structural Equation Modelling (SEM) framework in jamovi (The jamovi project, 2022; using the SEMlj package, Gallucci & Jentschke, 2021). Each of the five factors was modelled respectively, and the items for each facet were used as indicators for the respective facet, and the second order factor is extracted from the facets. The CFAs were conducted using Diagonally Weighted Least Squares (DWLS), a robust estimation method proposed for ordinal data, and preferred in this study, as ML, the most common estimation method in psychometrics, requires normally distributed and continuous data (Beauducel & Herzberg, 2006; Finney & DiStefano, 2006; Schumacker & Beyerlein, 2000). DWLS was shown to be less distorted and less sensitive to sample size than Weighted Least Squares (Flora & Curran, 2004). Fit indices were used as described under Aim 2 to avoid repetition. The marker method was used, fixing the first indicator to 1 to ensure that the model could be identified. No more constraints or parameter changes were done due to no theoretical foundation to do so. For the CFAs of the IPIP-NEO-120, standard errors were computed with the standard method instead of robust, as robust methods led to distorted information matrices, which could be explained by the poor definition of the model. For the PID-5-100, robust standard errors were used to account for the high skewness of the data towards 0. No transformations were considered to account for this skewness as a) the skewness is theoretically correct as it is a public domain sample, hence, low scores on the abnormal personality items are expected, and b) with complicated statistical transformations comparability with past and future findings as well as accessibility of science for both researchers as well as a broader audience decreases.

Analysis of Aim 2

To assess the overlap of both constructs and model their shared variance, a canonical correlation analysis (CCA) was conducted using IBM SPSS Statistics (Version 29, 2022). CCA is based on Principal Component Analysis and is a multivariate method to model two datasets with multiple variables without inflating Type 1 error, and taking the ecological reality into account that all variables can interact with each other (Thompson, 2005). This procedure followed Hengartner and colleagues (2014) who performed a similar analysis, thus yielding comparable results.

Further, a SEM framework was used to model the relation to higher order factors for each construct. Their convergence was examined with the standardized β coefficient, being equivalent to a correlation due to the univariate modelling of the relationship. DWLS is used as an extraction method. For this calculation, the factor Neuroticism was reversed to key all scales in the same direction. The model was specified with each factor of the IPIP-NEO-120 as indicator for the GFP as exogenous factor, and each factor of the PID-5-100 as indicator for the p-factor as endogenous factor. The latent variable relationship was modelled in the endogenous model. To compare both scales in one model, observed variables were standardized before estimation, and first indicators fixed to 1, leading to 21 free parameters.

Model fit indices for both the CFA in Aim 1 and the SEM structure of both constructs were selected to be comparable to past and future findings but also up-to-date and accurate. As the use of fit indices in SEM is still debated, some model fits were solely reported for coherence but not considered in this study. This lays ground for further exploration and discussion of differences between fit indices while maintaining comparability to other research (Beauducel & Wittmann, 2005; Byrne, 1998; Daire Hooper et al., 2007; Hu & Bentler, 1999; Kline, 2005; McIntosh, 2007; Mulaik et al., 1989). The analyses entailed the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI, Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA, Steiger, 2007), and Standardized Root Mean

Square Residual (SRMR), as well as classical χ2 tests. The CFI is an incremental fit index, not building on the raw χ2, but compares the user to the baseline model. The χ2 as well as RMSEA are absolute fit indices, not comparing the model to another, but assessing the fit in relation to no model at all. The SRMR uses the covariance matrix as baseline and compares it to the hypothesized covariance model, making it the most independent of free parameters and ML methods (Shi & Maydeu-Olivares, 2020).

Cut-off criteria for the fit indices were selected as following: Both the CFI and TLI should be $\geq .95$ (Hu & Bentler, 1999), RMSEA $\leq .10$ indicates a poor model fit, $.05 \leq x < .08$ indicates a good to moderate model fit, SRMR $\leq .05$ indicates a good model fit, values $\leq .08$ indicate an acceptable fit (Hu & Bentler, 1999; Kline, 2005; McQuitty, 2004). The fit of the χ2 statistic was solely used for the CFA to compare the models. For the SEM, the relative χ2 (χ2/*df*) was used, with thresholds between 2:1 and 3:1 indicating good fit (Wheaton et al., 1977). Recently, there has been a debate among SEM practitioners about the distortion of the χ2 statistics and classical fit indices when using any weighted least squares method as an estimation method instead of ML (DiStefano & Morgan, 2014; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019). Test statistics and fit indices tend to overestimate model fit when assessing models using SEM with DWLS, as most fit indices are based on the χ2-statistic nevertheless (see Xia & Yang, 2019 for a mathematical analysis). Hence, cut-off criteria as introduced before were interpreted carefully. Additionally, Shi and Maydeu-Olivares (2020) report the SRMR as a robust fit index when using DWLS, making it the most reliable index in this study. Moreover, reporting and comparing the performance of the fit indices can add to this debate, assessing their difference in a finite, non-simulated sample with ordinal data.

Results

Aim 1

Both the IPIP-NEO-120 and the PID-5-100 distributions were highly skewed and the Shapiro-Wilk test for normality was significant for all facets and factors except FFM Openness. Scale distributions and descriptives are displayed in the appendix. PID-5-100 facets and domain means were manually compared with normative data (Krueger et al., 2012) and a community sample (Miller et al., 2022), which showed no elevated values for the scores, confirming the sample as healthy and normative.

Results of the IPIP-NEO-120

The reliability analysis of the scale is displayed in Table 1 and was done using both Cronbach’s α, as well as McDonald’s ω. To explore the relationships between the facets, a correlational plot can be found in the appendix. To examine the convergence of the measure with the FFM, an EFA was done, and loadings were saved and plotted in Figure 1. The five-factor solution explained 48% of variance altogether and displayed factor correlations between r = .01 (Agreeableness and Neuroticism) and r = .4 (Conscientiousness and Extraversion).

To confirm the FFM structure in the IPIP-NEO-120, five CFAs were built with facet items as indicators, modelling each domain on two levels. Model fit indices can be found in Table 2. As an example, the path diagram of Agreeableness can be found in the appendix, along with the loadings for each item on its facet and facet loadings on the respective domain.

Table 1

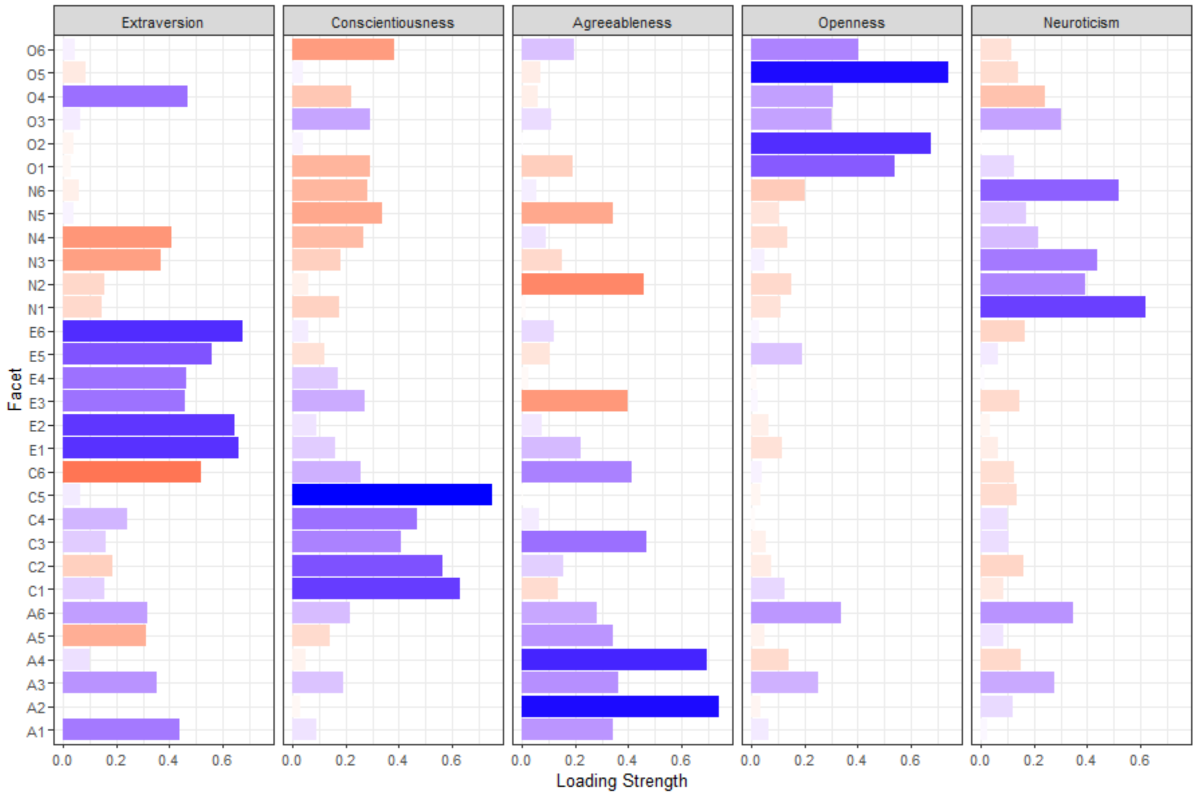
Reliability indices of the IPIP-NEO-120

Trait domain Facet domain	Cronbach's α	McDonald's ω	Range of item-rest correlations
N_Neuroticism	**.87**	**.89**	**(.22 - .63)**
N1_Anxiety	.79	.79	(.51 - .70)
N2_Anger	.75	.81	(.34 - .68)
N3_Depression	.83	.84	(.55 - .76)
N4_Self-Consciousness	.49	.58	(.11 - .46)
N5_Immoderation	.53	.57	(.21 - .46)
N6_Vulnerability	.58	.62	(.33 - .47)
E_Extraversion	**.88**	**.89**	**(.10 - .62)**
E1_Friendliness	.73	.74	(.48 - .61)
E2_Gregariousness	.71	.71	(.43 - .57)
E3_Assertiveness	.75	.77	(.34 - .66)
E4_Activity Level	.54	.60	(.2 - .52)
E5_Excitement-Seeking	.78	.79	(.47 - .66)
E6_Cheerfulness	.79	.80	(.52 - .69)
O_Openness to experience	**.79**	**.79**	**(.10 - .57)**
O1_Imagination	.81	.81	(.59 - .66)
O2_Artistic Interests	.70	.70	(.39 - .60)
O3_Emotionality	.59	.59	(.34 - .41)
O4_Adventouresness	.72	.72	(.47 - .55)
O5_Intellect	.66	.68	(.34 - .54)
O6_Liberalism	.49	.53	(.21 - .39)
A_Agreeableness	**.82**	**.84**	**(.06 - .52)**
A1_Trust	.84	.84	(.52 - .75)
A2_Morality	.66	.68	(.38 - .54)
A3_Altruism	.62	.63	(.34 - .48)
A4_Cooperation	.44	.52	(.13 - .42)
A5_Modesty	.69	.71	(.29 - .63)
A6_Sympathy	.79	.79	(.47 - .60)
C_Conscientiousness	**.86**	**.88**	**(.00 - .66)**
C1_Self-Efficacy	.82	.82	(.56 - .69)
C2_Orderliness	.83	.83	(.45 - .76)
C3_Dutifulness	.68	.72	(.37 - .57)
C4_Achievement	.64	.65	(.36 - .49)
C5_Self-Discipline	.71	.73	(.36 - .57)
C6_Cautiousness	.60	.62	(.31 - .46)
All items in one-factor-solution (GFP)	.93	.94	(-.22 - .61)

Note. NX indicates item codes that are used henceforth. For the computation of the GFP solution, all Neuroticism items were reversed.

Figure 1

Factor loadings of the IPIP-NEO-120 facets on the five factors



Note. Label abbreviations can be found in Table 1. Oblimin rotation was used with minimum residuals as extraction method; red = negative loadings, blue = positive loadings.

Table 2

Model fit indices for the IPIP-NEO-120

Factor	χ^2 (*df*)	TLI	CFI	RMSEA	SRMR	90% CI
N	455 (*246*)	.99	.99	.05	.06	(.04 - .05)
E	790 (*246*)	.97	.97	.08	.07	(.07 - .08)
O	810 (*246*)	.93	.94	.08	.08	(.07 - .08)
A	957 (*246*)	.94	.95	.09	.10	(.08 - .09)
C	966 (*246*)	.96	.96	.09	.09	(.08 - .09)

Note. All χ^2 tests were significant. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.

Results of the PID-5-100

The reliability analysis of the scales can be found in table 3 and was done using both Cronbach's α, as well as McDonald's ω. The structure of the facets loading onto one factor was done following past literature (Clercq et al., 2014; Fowler et al., 2017; Krueger et al., 2012), although it should be noted, that the intended computation of PID-5 scores is done solely with three facets per factor, indicated with a number in the code (e.g., as in NA1, NA2, NA3, named "core scales").

A Spearman correlation was done to assess convergent and discriminant validity and displayed in the appendix. To examine the convergence of the measure with the model of abnormal personality as proposed by Krueger and colleagues (2012), an EFA was done, and loadings were saved and plotted in Figure 2. The five-factor solution explained 52% of variance altogether, and displayed factor correlations between $r = -.03$ (Negative Affect and Antagonism) and $r = .42$ (Disinhibition and Detachment).

To confirm the proposed factor structure for the PID-5-100 by Krueger and colleagues (2012), five CFAs were conducted with all facet items following the structure indicated under each factor in Table 3 and modelled in two levels. Model fit indices can be found in Table 4. As an example, the path diagram of Antagonism can be found in the appendix, along with the loadings.

Table 3

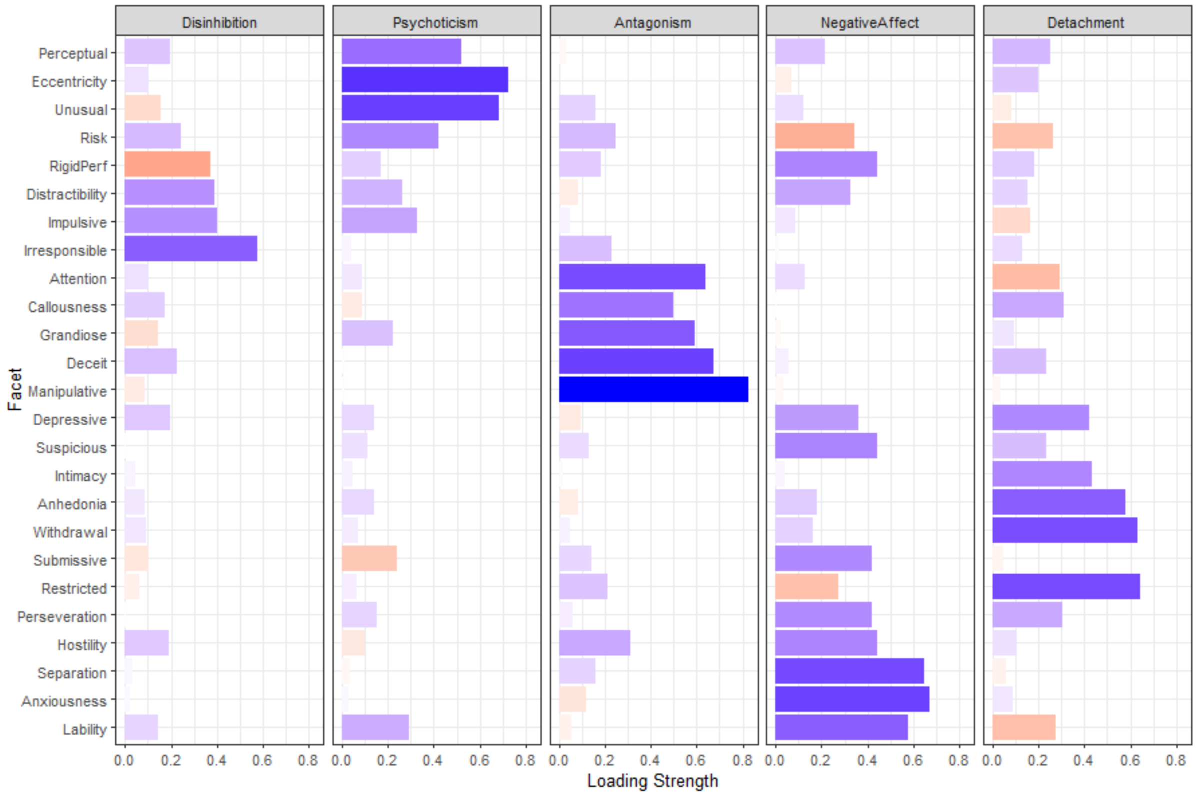
Reliability indices of the PID-5-100

Trait domain Facet domain	Cronbach's α	McDonald's ω	Range of item-rest correlations
NA_Negative Affect	**.82**	**.83**	**(.32 - .60)**
NA1_Emotional Lability	.73	.73	(.42 - .50)
NA2_Anxiousness	.75	.77	(.37 - .65)
NA3_Separation Insecurity	.73	.76	(.41 - .62)
HOS_Hostility	.65	.69	(.29 - .60)
PER_Perserverations	.54	.58	(.23 - .43)
REA_Restricted Affectivity	.67	.67	(.38 - .50)
SUB_Submissiveness	.79	.79	(.51 - .64)
DE_Detachment	**.84**	**.87**	**(.30 - .55)**
DE1_Withdrawal	.73	.74	(.46 - .64)
DE2_Anhedonia	.68	.71	(.45 - .50)
DE3_Intimacy Avoidance	.59	.63	(.35 - .46)
SUS_Suspiciousness	.51	.58	(.21 - .40)
DEPY_Depressivity	.73	.77	(.40 - .71)
AN_Antagonism	**.86**	**.88**	**(.43 - .57)**
AN1_Manipulativeness	.72	.74	(.45 - .60)
AN2_Deceitfulness	.71	.74	(.47 - .61)
AN3_Grandiosity	.66	.69	(.37 - .56)
CAL_Callousness	.53	.64	(.22 - .54)
ATT_Attention Seeking	.68	.70	(.29 - .63)
DI_Disinhibition	**.71**	**.74**	**(.12 - .51)**
DI1_Irresponsibility	.46	.50	(.12 - .41)
DI2_Impulsivity	.63	.65	(.34 - .52)
DI3_Distractability	.66	.67	(.39 - .50)
RIP_Rigid Perfectionism	.59	.59	(.29 - .43)
RIS_Risk Taking	.65	.67	(.14 - .60)
PY_Psychoticism	**.84**	**.85**	**(.33 - .69)**
PY1_Unusual Beliefs & Experiences	.66	.69	(.38 - .49)
PY2_Eccentricity	.80	.81	(.60 - .66)
PY3_Perceptual Dysregulation	.64	.65	(.37 - .49)
Core scales (NA, DE, AN, DI, PY items)	**.91**	**.92**	**(.05 - .58)**
All items in one-factor-solution (p-factor)	**.93**	**.94**	**(.01 - .55)**

Note. NNX or NNN indicates item codes used henceforth. Scales are computed with four items for each facet. Factor scales are computed solely with core items.

Figure 2

Factor loadings of the PID-5 facets on the five factors



Note. Oblimin rotation was used with minimum residuals as extraction method; red = negative loadings, blue = positive loadings.

Table 4

Model fit indices for the PID-5-100

Factor	χ^2 (*df*)	TLI	CFI	RMSEA	SRMR	90% CI
NA	347 (*246*)	.99	.99	.03	.07	(.02 - .04)
DE	239 (*165*)	.99	.99	.03	.07	(.02 - .04)
AN	418 (*165*)	.97	.98	.06	.08	(.06 - .07)
DI	609 (*165*)	.87	.89	.08	.13	(.08 - .09)
PY	95 (*51*)	.99	.99	.05	.07	(.03 - .06)

Note. All χ^2 tests are significant. NA = Negative Affect, DE = Detachment, AN = Antagonism, DI = Disinhibition, PY = Psychoticism.

Aim 2

Joint structure of the FFM and abnormal personality

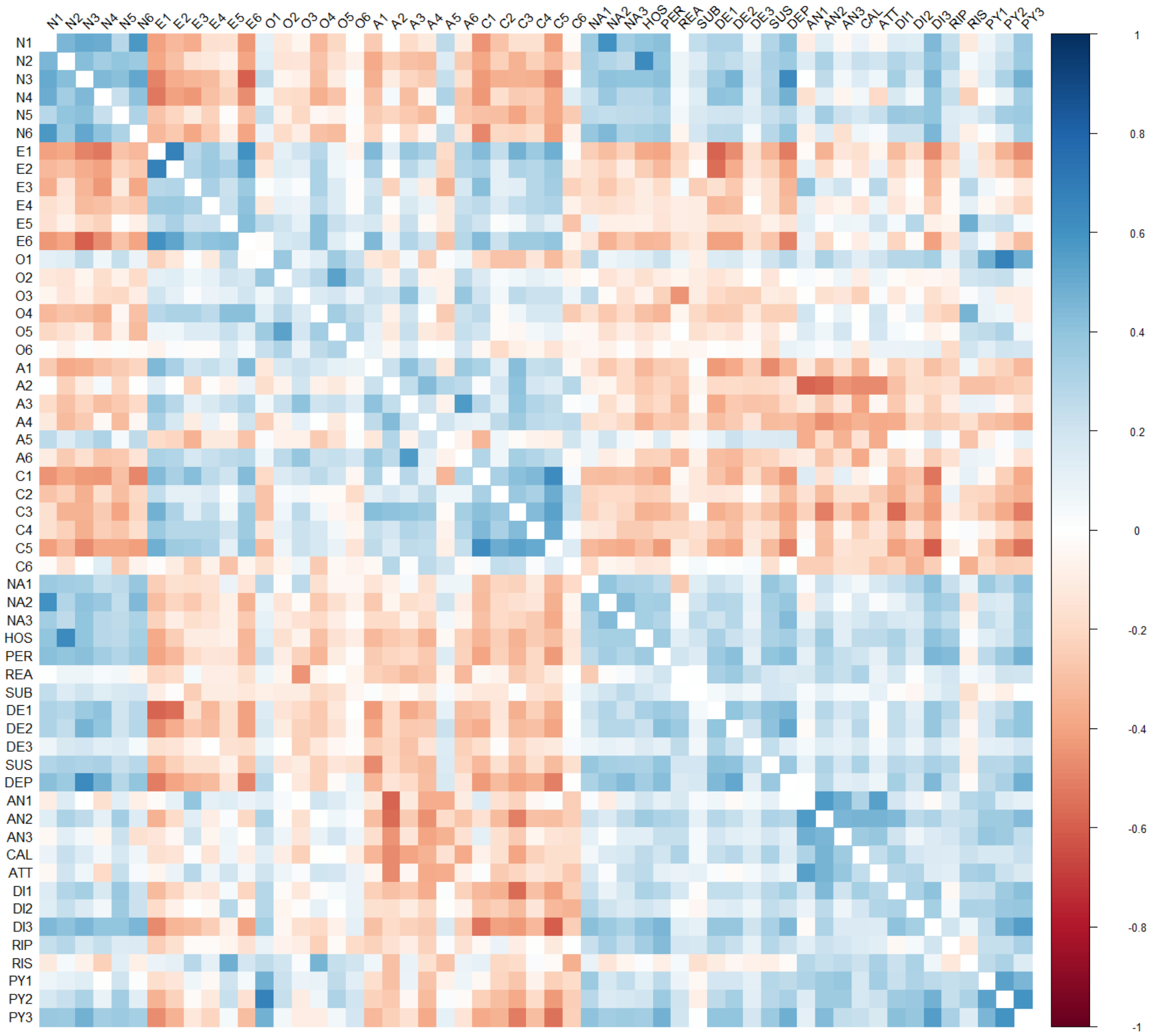
To examine the overlap of both instruments, an extensive correlational table of the facets was designed to examine relationships on facet level. The correlational heatmap can be found in Figure 3, and the respective coefficients are displayed on OSF. Moreover, domain correlations were plotted and displayed in Figure 4.

To assess the general overlap between the two instruments, a CCA was computed and indicated shared variance of the five facets of 55%. The root statistics can be found on in the appendix. The next analysis step consisted of the SEM framework. It was used to extract the GFP from the FFM and the p-factor from the five PID-5-100 domains and then modelled the joint structure between these two superfactors.

The model displayed 21 free parameters and fit indicated a superior fit over the baseline model (χ^2 (44, N = 379) = 239, $p < .001$, vs. χ^2 (45, N = 379) = 1599, $p < .001$, difference in χ^2 = 210 (11) > 26.76 for significance), with a χ^2/df-ratio of 5. Model comparison indices were not in the range of an acceptable fit (CFI = .87, TLI = .87). SRMR ranked at .13, and RMSEA at .11 (95% CI [.10, .12] at $p < .001$). Explained variance of the model by the different parameters was highest for Conscientiousness (67 %) and Disinhibition (58%) and lowest for Openness (0%) and Antagonism (13%). All estimates were significant on a $p < .001$ level and are displayed in Table 5. The path model is displayed in Figure 5.

Figure 3

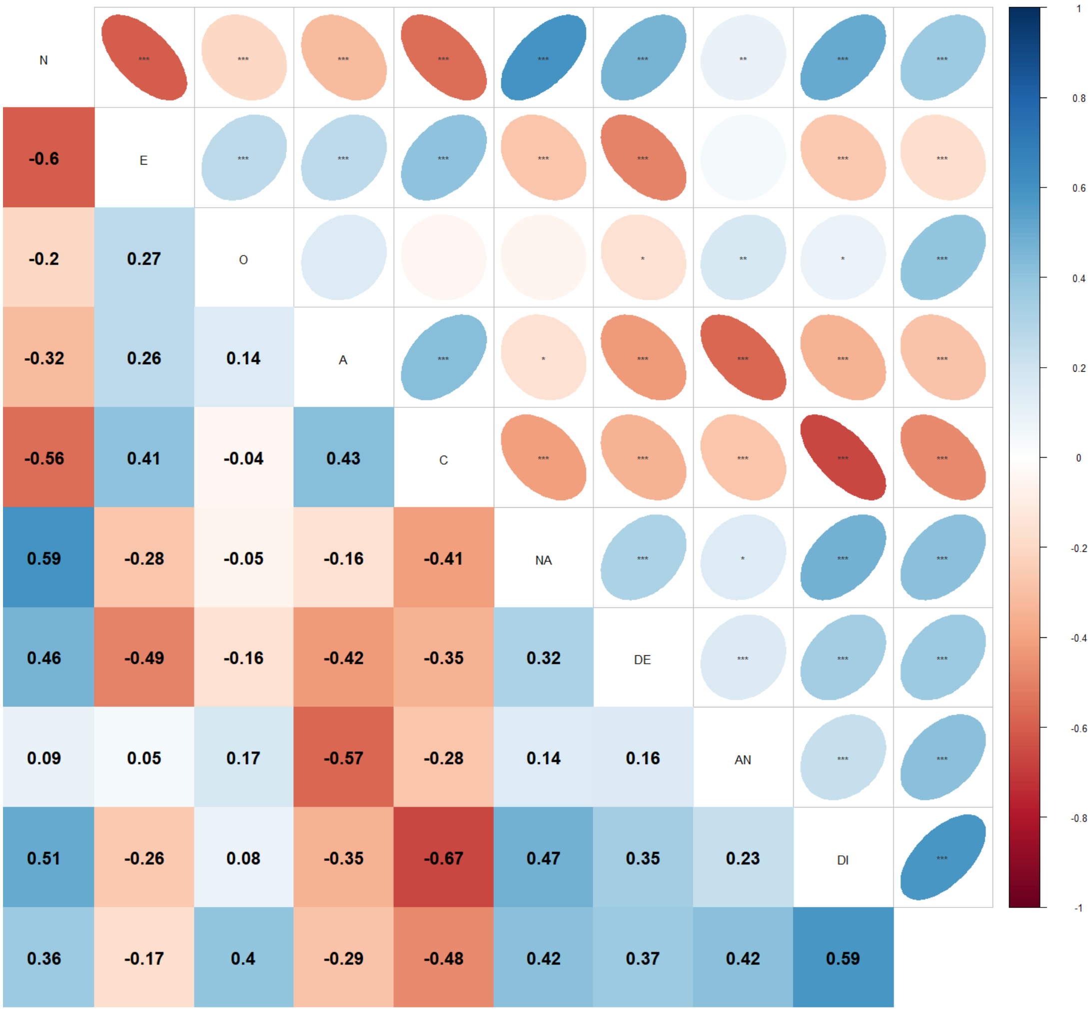
Heatmap indicating correlations between all facets of the IPIP-NEO-120 and PID-5



Note. Abbreviations are indicated in Table 1 and 3.

Figure 4

Correlations of the five factors of both the IPIP-NEO-120 and the PID-5-100



Note. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, NA = Negative Affect, DE = Detachment, AN = Antagonism, DI = Disinhibition, PY = Psychoticism.

Table 5

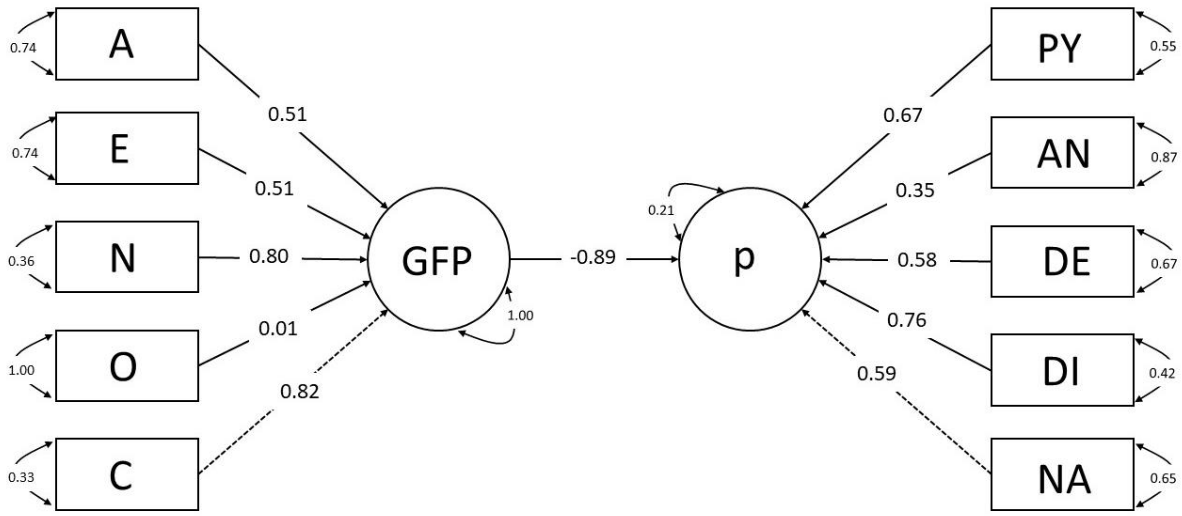
Estimates for the IPIP-NEO-120 and PID-5 SEM of the conjoint structure

Latent	Factor	Estimate	95% CI	Variance of factor (SE)	β	R2
GFP	C*	0.82		0.19 (0.03)	.82	.67
	O	0.01	[-0.06, 0.08]	1.00 (0.06)	.01	.00
	N	0.98	[0.83, 1.13]	0.37 (0.11)	.80	.64
	E	0.63	[0.51, 0.74]	0.74 (0.10)	.51	.26
	A	0.62	[0.51, 0.76]	0.74 (0.13)	.52	.26
p- factor	NA*	0.59		0.65 (0.11)	.60	.35
	DI	1.30	[1.06, 1.50]	0.42 (0.12)	.76	.58
	DE	0.97	[0.79, 1.15]	0.67 (0.13)	.58	.33
	AN	0.60	[0.47, 0.73]	0.87 (0.09)	.36	.13
	PY	1.13	[0.93, 0.67]	0.55 (0.09)	.67	.45
GFP				0.67 (0.07)		
p-factor				0.08 (0.03)		
GFP -> p-factor		-0.65	[-0.78, -0.52]		-.89	

Note. All paths are significant on p < .001. * numbers are not interpretable, as they were fixed to 1. The scale N = Neuroticism is reversed to key all scales in the same direction, now representing emotional stability.

Figure 5

Path diagram of the conjoint structure of the IPIP-NEO-120 and the PID-5-100



Note. Numbers indicate β coefficients, double arrows indicate variance. GFP = General Factor of Personality, p = p-factor, A = Agreeableness, E = Extraversion, N = reversed Neuroticism, O = Openness, C = Conscientiousness, PY = Psychoticism, AN = Antagonism, DE = Detachment, DI = Disinhibition, NA = Negative Affect.

Discussion

In this study, the overlap of normal and abnormal personality was explored. This was conceptualized with the FFM instrument IPIP-NEO-120 (Johnson, 2014) and a reduced 100 item version of the PID-5 (Krueger et al., 2012), proposed to capture abnormal personality traits. The first aim was to assess both measurements respectively, reporting their internal consistency, convergent and discriminant validity, and their convergence with their respective construct, namely the FFM and the DSM-5 model of abnormal personality. The results showed good reliabilities and convergence with the FFM for the IPIP-NEO-120, and acceptable convergence of the PID-5-100. The second aim was to assess both instruments in their joint structure, both on facet and domain level as well as higher order factor level. For the latent variable structures, the IPIP-NEO-120 was modelled as GFP and the PID-5-100 as p-factor and overlap assessed in a SEM framework with promising results, showing a great overlap between the two higher-order factors.

The FFM and the IPIP-NEO-120

The first aim of this study was to assess the IPIP-NEO-120 in the present public domain sample. The internal consistency of the instrument was varying for different facets, from moderate to poor. The Agreeableness facet Cooperation showed the lowest alpha and omega values, while Trust had the highest consistency. Reliability indices for the factor scales were higher, nevertheless it should be noted that item count increases consistency indices (Ponterotto & Ruckdeschel, 2007). The moderate facet reliabilities are in line with past findings (Johnson, 2014), although overall lower than the reported values. Moreover, a one-factor-solution was tested to mimic a GFP. The very high alpha and omega values can be assumed to be heavily distorted by the number of items, but although all Neuroticism items were reversed to key in the same direction as the other factors, the negative and positive item-rest correlations indicated a wide spread of converging and opposing items. This is questioning the applicability of collapsing all factors onto one GFP, as done for the second aim of the study.

Correlations indicated first strengths in convergent validity, as inter-facet correlations were high. The facets of Neuroticism showed the expected direction, correlating negatively with most other facets except for Agreeableness facet Modesty. Nevertheless, some moderate correlations with unrelated facets, both positive and negative, pointed towards poor discriminant validity. Especially Neuroticism, Extraversion and Conscientiousness displayed moderate correlations. This is not entirely unexpected, given that the higher order factors Alpha and Beta are grouped in exactly this arrangement (Musek, 2007).

The EFA was used for the two reasons of 1) extracting factor loadings of each facet onto *all* factors and 2) illustrate the structure of the FFM graphically. The plot displayed good convergence of the facets with their respective factor, and high loadings indicated good convergent validity. Divergent validity was approximated by the low loadings on the unrelated facets. Only the factors Openness and Neuroticism were freestanding constructs with few loadings from other facets. Other factors received cross-loadings, such as Openness facet Adventurousness on Extraversion. Neuroticism facets Immoderation and Anger, and Extraversion facet Assertiveness loaded negatively on the factor Agreeableness. This structure confirms past findings criticizing the far from perfect discriminant validity of the IPIP-NEO-120 and precursor NEO-PI-R (Furnham et al., 2013; Kajonius & Johnson, 2019), as indicated by the overall scattered loadings of single facets on another domain, stating that "facet traits should help define the broader trait domains, not confuse them" (Kajonius & Johnson, 2019, p. 270). These unsystematic cross-loadings do not indicate a possible higher order factor, hidden in the shared variance, such as the Alpha/Beta factors, but show the need to assess the instrument on item level to understand the drivers behind the loadings of a facet.

As these findings gave first hints towards strengths and weaknesses of the construct with the underlying data, a confirmatory approach was used to force the facets to load onto their respective factor and assess the convergence of the IPIP-NEO-120 structure given the data in this study. Five CFAs were conducted for each factor respectively with items for each facet as indicators. Neuroticism and Openness were the only models with a good model fit as indicated by the SRMR, and confirmed by RMSEA, TLI, and CFI. The other three constructs had at best acceptable model fits. This finding is in line with the patterns described before when examining the correlation matrix and EFA and leads to the conclusion that the IPIP-NEO-120 can be reliably used in this study, although the cross-loadings and non-convergence with the FFM could hint towards a revision of the instrument with clearer definition of the facets. Another possible explanation for the rather poor convergences could be the choice of estimation and extraction method. As Minimum Residuals and DWLS was used instead of classical ML, differences in numbers could be a methodological artefact. On the other hand, the results could be closer to their true value, as the critiquing of classical ML approaches for ordinal, non-normal data persists. Simulation studies and clear guides in psychometric research (such as Hoyle & Isherwood, 2013) are needed to assess this relationship in more detail.

Abnormal Personality and the PID-5-100

The PID-5-100 showed poor reliabilities with almost all facet scales being below or around .7 for both the Cronbach's α as well as McDonald's ω. Low indices were found for Negative Affect facet Perseveration, Detachment facet Suspiciousness, Antagonism facet Callousness, and Disinhibition facets Irresponsibility and Rigid Perfectionism. The factor reliabilities are acceptable for all domains, ranging around .85, except for the factor Disinhibition. Additionally, the internal consistency of a one-scale-solution was tested to mimic a higher order factor model with one factor. Again, the high reliability indices are likely to be distorted by the number of items, but the non-negative item-rest correlations suggest a more coherent one-factor model than the FFM and GFP. This is also in line with the suggested unipolarity of the scales, with only the higher scores suggesting a substantive meaning (Williams & Simms, 2018). Another explanation could be the high skew in the data towards low values, creating a floor effect for some items. As this is a healthy sample it is questionable to even expect negative correlations with anything, meaning that somewhere must be a differentiated pattern of agreement and disagreement. The facet distributions however indicate a rather coherent disagreement with the majority of the facet items. The correlations of the facets supported this idea pattern, with mostly positive correlations, except for Risk Taking and Restricted Affectivity. However, these correlations were weak, and not in the strength one would expect a differently keyed facet. This could again be explained by the overall healthy, skewed sample, and dampening the correlations in the dataset in general.

As aforementioned, an EFA was conducted to assess factor loadings of facets on all factors. A structure of five factors was forced and yielded seemingly good fits for the factor Antagonism with high loadings on all five respective facets, and low to no loadings on and from any other facets, making it an independent construct with Manipulativeness as a very high driver. The factor Psychoticism loaded highly on the three respective facets, but also moderately on Risk Taking. The facet Disinhibition loaded moderately to highly on the respective core facets Irresponsibility, Impulsivity and Distractibility, and moderately on Risk Taking, and as proposed negatively on Rigid Perfectionism, confirming the "lack of" structure of this facet. The factor Negative Affect displayed high loadings for the three core facets Separation Anxiety, Anxiousness and Emotional Lability. Restricted Affectivity displayed high negative loadings on the factor Negative Affect, again confirming the "lack of" structure. The factor Detachment displayed disorganized loadings, loading highly on the facets Intimacy Avoidance, Anhedonia, Withdrawal, and Depressivity, but also highly on the Negative Affect facet Restricted Affectivity. Negative loadings were found with Risk Taking, Attention Seeking and Emotional Lability.

The poor performance of the domain Disinhibition could be driven by the aforementioned bad performance of two of its subscales, especially facet Rigid Perfectionism. This facet is described as "lack of" Rigid Perfectionism in the initial construction of the PID-5 and moreover, the only specifically bipolar dimension loading opposingly on Disinhibition facets (Williams & Simms, 2018). A meta-analysis has accumulated the aforementioned critique and is suggesting a clearer definition of the facets and their respective loadings (Watters & Bagby, 2018). The original paper is stating only Restrictive Affectivity and Rigid Perfectionism as two poles of the same domain (Krueger et al., 2012), but different studies found not only these two, but differing non-converging facets. As much as the freeing of the proposed loading on only one factor make facets more data-driven, they also complicate replication and interpretation of the findings, which is especially in an applied setting, such as clinical assessment with the PID-5, a reason to reconsider.

The structure convergence of the PID-5-100 with the proposed factor solution by Krueger and colleagues (2012) was tested with five CFAs in a SEM framework. The path diagrams confirmed the irregularities in the facets and the results indicated a great model fit for the facets Negative Affect, Detachment and Psychoticism, a moderate fit for Antagonism and a poor model fit for Disinhibition. The latter could either be due to the aforementioned noise in the scale, making it an unsystematic construct without clear boundaries, or be biased by the facet Rigid Perfectionism that needs revision and re-keying of either the items or the facet. Studies concerning psychometric properties of the PID-5 have found similar disorganized structures, rooting the cause of that in the saturation with a common confounding variable, such as associated distress, or explaining the cross-loadings facet- and domain specific with analogies to the FFM (Quilty et al., 2013). Overall, these results are promising for a further use of the PID-5-100 short scale, although additional in-depth evaluation of the role of the different facets and their influence on all domains should be realized to detangle theoretically correct double loadings from methodological and statistical issues due to missing discriminant power.

Overlap of the FFM and abnormal personality

Facets and Factors of Normal and Abnormal Personality

The second aim was to examine the joint structure of the IPIP-NEO-120 and PID-5-100 instruments on facet-, factor-, and higher order level. The first two were assessed graphically with correlation heatmaps, the latter made use of a SEM framework and modelled the GFP and p-factor and their overlap.

The overlaps of the facets of both instruments confirmed the facet structure of each factor, illustrated in emerging squares of the same correlation direction in Figure 3 and 4. They confirmed both the high convergent and poor discriminant validity. In general, the correlations of all facets, as well as factors, of each matching factor pair displayed moderate to high overlaps between the IPIP-NEO-120 and the PID-5-100. It demonstrated that the core facets of the PID-5-100 did show the highest correlations with facets of the matching FFM domain, giving weight to the validity of their outstanding, independent position in relation to the other facets of a domain. However, discriminant validity was low, as moderate to high correlations emerged between facets and factors of seemingly unrelated domains as well. Moreover, the facets of the domains Antagonism and Disinhibition displayed noisy directions with the FFM factors Extraversion and Openness, correlating unsystematically both negatively and positively.

The factor correlations between the other factors confirmed all preceding findings and critique. Although the overlap between the factors has been agreed on, the definition of the facet structures and their cross-loadings were found to distort loadings (Monaghan & Bizumic, 2023; Suzuki et al., 2015; Watters et al., 2019). Especially Disinhibition and FFM Conscientiousness, as well as Antagonism and FFM Agreeableness, and Detachment and FFM Extraversion displayed moderate negative correlation coefficients, and Negative Affect and FFM Neuroticism converged moderately positive. This is in the expected range for the conjoint structure implied by past literature of correlations between $r = .3$ and $r = .75$ (Fowler et al., 2017; Thomas et al., 2013).

The factor Openness related only moderately to Psychoticism, and weak to no correlations were found for the other factors, making this the only self-sufficient domain. This repeats past correlational patterns with other FFM factor correlations (Kajonius & Johnson, 2019), as well as past findings suggesting a relative independence of Openness from other Big Traits (Markon et al., 2005). Moreover, that the factor Openness might be less convergent with its abnormal counterpart than other factors (Al-Dajani et al., 2016; Clark & Watson, 2022; Fowler et al., 2017; Quilty et al., 2013). Openness, as well as its PID-5 counterpart, have been the focus of debate in past findings, repeatedly reporting low convergence of the domain (see Gutiérrez et al., 2014; Suzuki et al., 2015 for a review) and, hence, also the initial construction of the PID-5 debated this domain. The workgroup included Psychoticism as "a domain of peculiar or odd traits that provides coverage of features corresponding with some key components of Schizotypal PD" (Krueger et al., 2012, p. 1880) and added it onto the domains proposed by earlier work that did not include an openness equivalent, or included it as "oddity" or "unconventionality" (Chmielewski &

Watson, 2008; Harkness et al., 1995; Widiger & Simonsen, 2005; Widiger et al., 2005).

The factor Neuroticism however loaded consistently moderate on all other factors (negatively on FFM factor, positively on the PID-5-100), while the other factors FFM Extraversion, Agreeableness and Conscientiousness displayed a weak to moderate negative correlations with the factors of the PID-5-100. The debate about different abstraction levels of factors has been examined in the literature regarding FFM factor Neuroticism, stating it to be more abstract than other FFM traits, making the entire Big Five hierarchy unbalanced (Markon et al., 2005). This imbalance could also be displayed in the independent factor Openness, especially as Openness displayed different facet correlations within its facets, indicating it might be more useful on facet- than on domain- or framework level, and should be transformed entirely, e.g., into experiential permeability (Piedmont et al., 2012). Moreover, the factor Neuroticism and its high correlations with other factors could distort the often used approach to hierarchy modelling, namely factor analysis, which is why other algorithms, such as clusters (Bacon, 2001) might be more suitable to detangle the constructs, or changing the direction of the proposed construct by using Goldberg's Bass-Ackwards method (2006).

The Joint Structure of Normal and Abnormal Personality

The overlap between the two instruments was confirmed with the CCA, proposing an overlap of 55%. This procedure was inspired by another study, which reported an overlap of 77% between the FFM and the DSM-IV PDs (Hengartner et al., 2014). The rather large difference in this overlap might be explained by the different conceptualizations that were compared, as abnormal personality traits are different from PDs. However, its is unexpected to find less convergence between two personality traits than between traits and PDs, and additional research is needed to understand the relationships of the three concepts.

While CCA is based on similar principles like principal component analysis and simply uses linear models and dimensionality reduction, the modelling of the higher order factors was done in a SEM framework and modelled the latent one-factor-solutions for both constructs respectively, and their convergence. It was assumed that there is a high convergence on this higher order level, given that the constructs are intended to be from the same dimensional planes, but from different extremities. Model fit indices showed a very poor model fit for the entire model, but given the complexity of the statistical model, this was expected (Hopwood & Donnellan, 2010). No modification indices were used, as not the model fit per se was from interest, but the loadings of the GFP on p-factor, as well as the contributions to the respective factors. The standardized βs for the conjoint structure of GFP and p showed a very high (but negative) association. The factors for the PID-5-100 showed the proposed direction in their associations with Disinhibition and Psychoticism being the highest contributors to the p-factor. The factors of the IPIP-NEO-120 did show the expected structure for all factors except Openness, which had zero loading on the GFP. This could be explained by the aforementioned independence of the domain in this sample, indicating that facets of the domain are loading in different directions, scattering or averaging out the construct.

This has been reported and debated in past research, pointing out the problems this factor causes by forcing a five factor structure although the data suggest only four (Markon et al., 2005). No coherent solution has been found so far, as an exclusion of Openness would simply merge its variance into the other domains, but including it tends to result in non-convergence with the other domains. Therefore, these results were not unexpected, as Openness contributed lower to the GFP in the paper by Musek (2007). A general factor is often modelled by the factors Alpha and Beta or Stability and Plasticity. In literature examining these two, openness also tends to load the lowest of all constructs (Erdle et al., 2010; Musek, 2007; Rushton & Irwing, 2008).

The zero loading could be a by-product of the different estimation method in comparison to past studies. In psychometric SEM analysis, Maximum Likelihood (ML) is the most common estimation method. Nevertheless, this can be criticized heavily, as ML assumes normal, continuous data. The latter argument can be downweighed for some psychometric studies by findings indicating that a number of levels above five are acceptable and above seven can be treated as continuous (Beauducel & Herzberg, 2006; Rhemtulla et al., 2012). Nevertheless, ML is not robust against heavier violations of normality and robust ML methods simply decrease the importance of the non-normal ends of the data, not taking into account that this also cuts out the important information in the data when looking at abnormal personality traits in a public sample, as skewness towards lower scores is a truthful picture of the sample, indicating it is indeed a healthy sample of a thought-to-be healthy population. As this was deemed valuable information, no ML approach was considered, but DWLS.

This outstandingly high convergence between the GFP and p-factor leads to questions about its interpretability. Although the study by Kajonius (2017) also found a great convergence (loadings of -.65) between the two constructs using the same approach, the statistic in this study ($\beta = .89$) seems unexpectedly high and might be a by-product of the estimation method. Another explanation could be the use of only the core facets for the computation of the PID-5-100 factors. Oltmanns and colleagues (2018) on the other hand found similarly high relations between the GFP, the p-factor and a general factor of personality disorder when modelling the respective models as bifactor SEM. Irrespective of the exact size of the overlap, its existence is in the data and proposes that the two constructs might even indicate a mutual construct (Pešić et al., 2023). Such a “Big One” or “Big Everything” has been proposed in literature, rooting in exactly this convergence on higher-order level (Littlefield et al., 2021; Oltmanns et al., 2018). The exact interpretation has been debated, closely related to the same question when regarding the respective general factors on their own. The p-factor has been proposed as general impairment (closely resembling Criterion A of the AMPD), even suggesting a genetic basis to it (Smith et al., 2020), while the GFP is described by Musek (2007) as a super-factor, that represents the dimensions of social desirability, emotionality, motivation, well-being, life satisfaction and self-esteem, and is also assumed to have a genetic component (Veselka et al., 2012). Critique of these two factors can be summarized to it having no substantive meaning to the personality domain inherit in the factors and being a statistical artefact, namely it simply representing social desirability of the rating scale, or simpler put, a scale evaluated from “good” to “bad” (Revelle & Wilt, 2013; van Bork et al., 2017). This critique also roots in statistical critique of the factor analysis per se (Gjerde et al., 2017), and the mere meaning of a correlation between two laten variables (such as Alpha and Beta, see Muncer, 2011). With the emergence of bifactor models, at least this latter critique can be owned up to, as the estimation of the unique variance that is not explained by the specific domain can be estimated more accurately. The present study is adding more evidence to a great overlap between normal and abnormal personality, but more research with bifactor models is needed to understand the full meaning of this conjoint structure.

Limitations

Several issues limit the results of this study. The sample in this study is a community sample, consisting of healthy adults, which leads to and explains the skew in the PID-5-100 scales. Nevertheless, this skew is theoretically correct, but as it is not accounted for by transformations, it might lead to floor effects, dampening correlation coefficients. Furthermore, the CCA that was performed to assess the overlap of both variable sets was performed following Hengartner and colleagues (2014). But as it is based on principal component analysis it assumes normality of the data, hence, has to be interpreted with caution. It was included nevertheless to compare the result and give one indicator of the overlap of all variables. Another critique is the choice to collapse the five factors simply into one general factor. This can be seen as outdated and not elegant, as models with either another level, consisting of Alpha and Beta, or a bifactor model is more common. Although this does limit the interpretability of the strength of the results, the study does point in the same direction as previous literature did.

Conclusion

The two instruments, IPIP-NEO-120 (Johnson, 2014) and PID-5-100 (Krueger et al., 2012; Maples et al., 2015) were tested for internal structure and showed sufficient convergence with their proposed latent construct, although minor differences on facet level should be examined further to ensure an interpretable and easy use in clinical settings. The high overlap between the GFP and p-factor adds to current research proposing a "Big Everything" as common underlying construct of both normal and abnormal personality. Other explanations could be found in differences in SEM application, or methodological artefacts, such as social desirability. Findings such a common core of the GFP, p and psychopathology would yield a promising outlook to a unifying framework of normal and abnormal personality.

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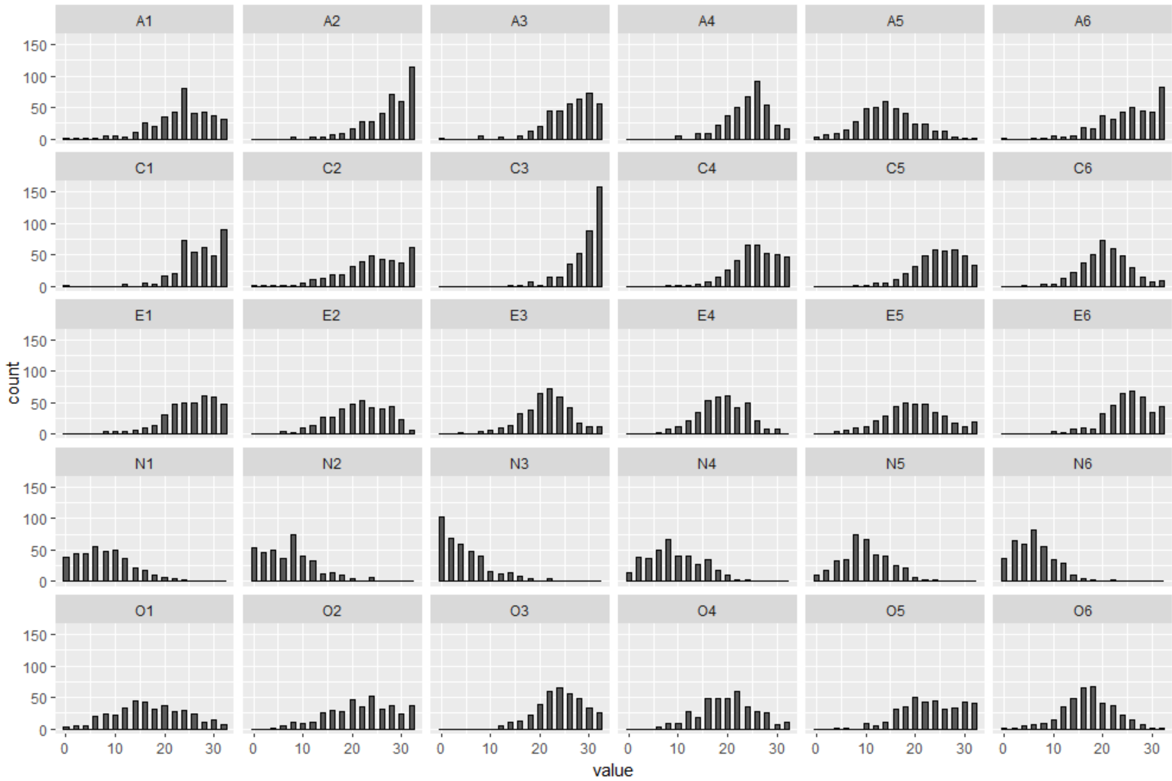
Appendix

Results of scale distributions and scale descriptives

Figure A1

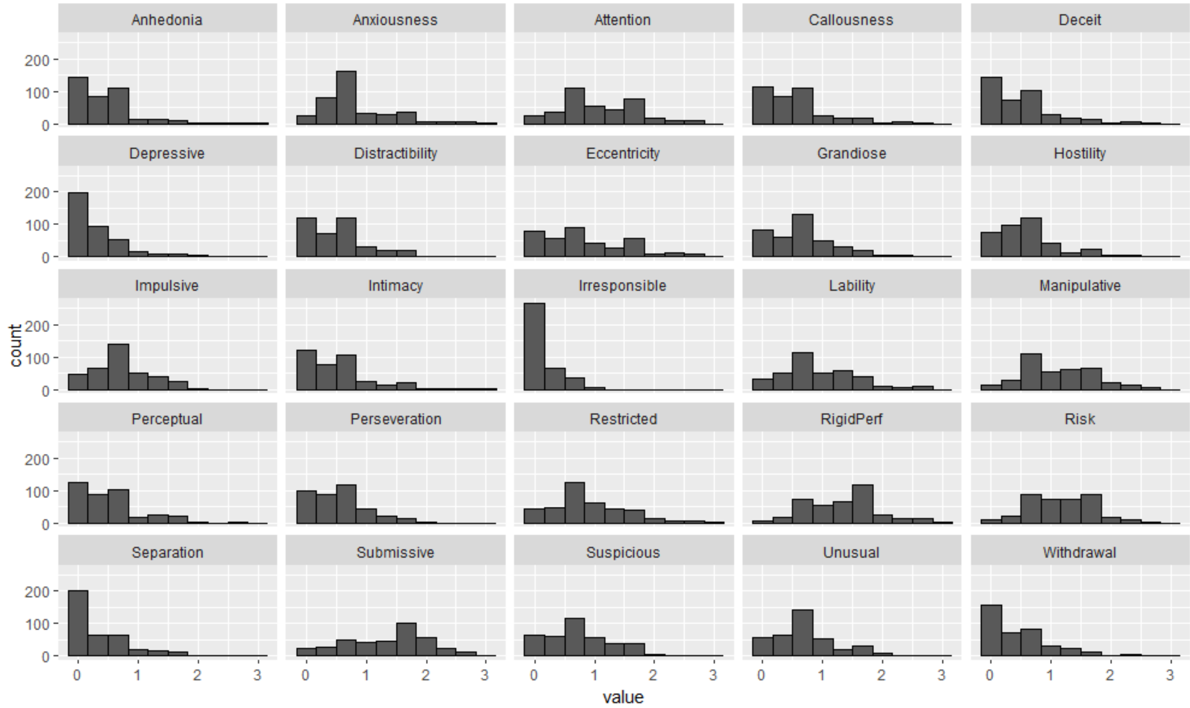
Distributions of IPIP-NEO-120 facets



Note. Facet codes can be found in Table 1.

Figure A2

Distributions of PID-5 facets



Note. All facets were measured with the shortened 100 item form of the PID-5.

Table A1

Descriptives of IPIP-NEO-120 facets

Facet	M (*SD*)	Mdn	Skewness	Kurtosis
N1	7.92 (*5.64*)	8	0.77	0.74
N2	7.20 (*5.53*)	8	0.90	1.14
N3	4.85 (*5.03*)	4	1.37	1.93
N4	9.26 (*5.40*)	8	0.40	-0.40
N5	10.02 (*4.96*)	10	0.40	0.33
N6	6.02 (*4.06*)	6	0.68	0.58
E1	25.38 (*5.06*)	26	-0.84	0.64
E2	21.32 (*5.78*)	22	-0.44	-0.15
E3	21.40 (*4.92*)	22	-0.33	0.55
E4	18.92 (*4.98*)	18	-0.18	0.14
E5	19.71 (*6.24*)	20	-0.10	-0.17
E6	25.12 (*4.76*)	26	-0.92	2.02
O1	16.97 (*7.07*)	16	0.04	-0.58
O2	22.06 (*6.51*)	22	-0.36	-0.48
O3	24.08 (*4.64*)	24	-0.33	-0.30
O4	19.97 (*5.61*)	20	-0.07	-0.34
O5	23.24 (*5.87*)	24	-0.27	-0.53
O6	17.10 (*5.23*)	18	-0.20	0.57
A1	23.53 (*5.71*)	24	-0.84	1.12
A2	27.50 (*4.73*)	28	-1.27	1.58
A3	26.26 (*4.77*)	28	-1.33	3.40
A4	24.17 (*4.23*)	24	-0.64	0.63
A5	14.47 (*5.66*)	14	0.20	-0.04
A6	25.45 (*5.68*)	26	-0.86	0.78
C1	27.00 (*4.34*)	28	-1.20	3.82
C2	23.99 (*6.49*)	24	-0.84	0.56
C3	29.18 (*3.59*)	30	-1.69	2.95
C4	25.59 (*4.47*)	26	-0.61	0.39
C5	24.87 (*4.90*)	26	-0.58	0.10
C6	20.51 (*4.90*)	20	-0.11	0.42
N	7.54 (*3.66*)	7.00	0.72	0.75
E	21.98 (*3.77*)	22.33	-0.53	1.23
O	20.57 (*12.33*)	20.33	0.11	-0.43
A	23.56 (*7.00*)	24.00	-1.15	3.57
C	25.19 (*13.33*)	25.67	-0.74	0.79

Note. The Shapiro-Wilk test was significant at $p < .001$ for all facets and factors except Openness. IPIP-NEO-120 items are Likert-scaled from 0-4 and facets are summed, and factors computed as averages of facets; facets can take values from 0 to 32, with interval steps of 2, and factors range between 0 to 32, with interval steps o 0.33.

Table A2

Descriptives of PID-5-100 facets

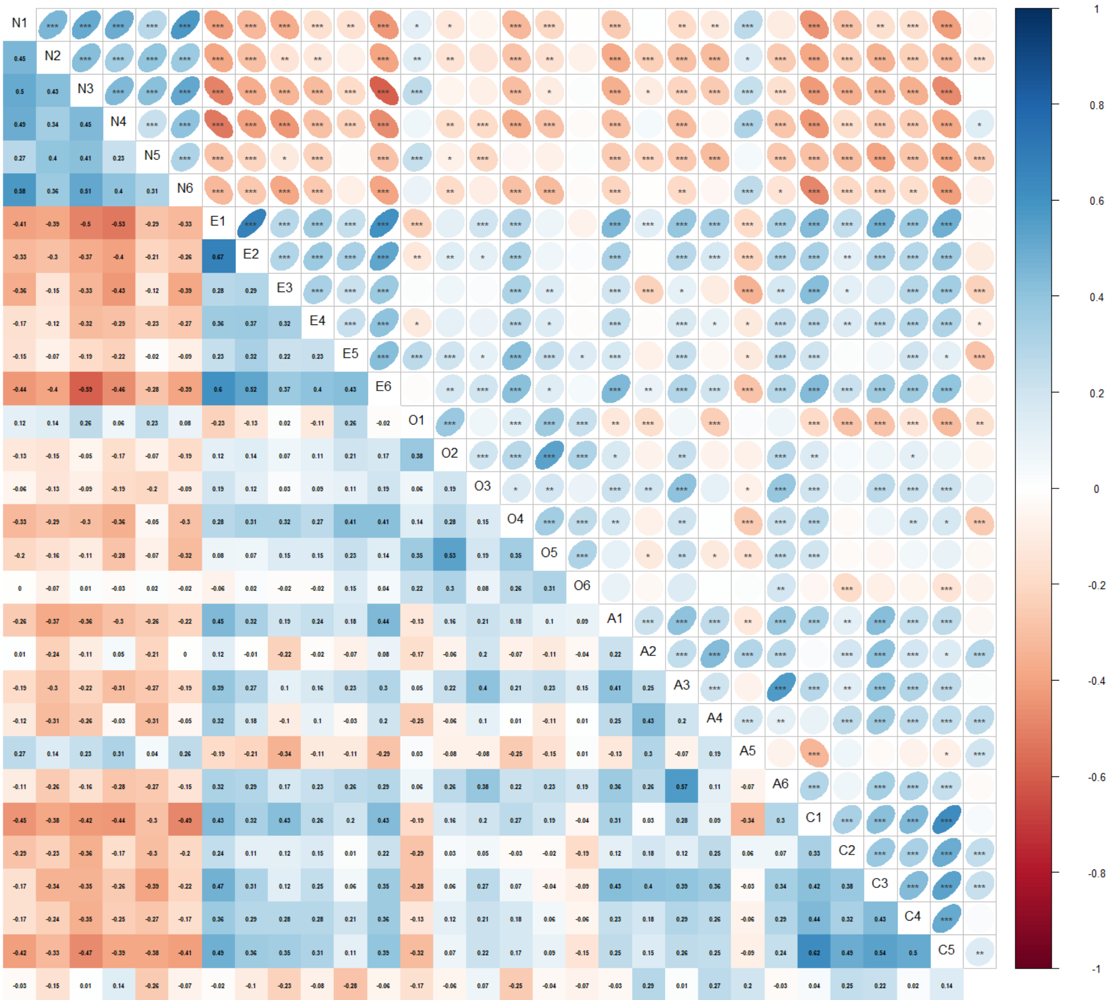
Facet	M (*SD*)	Mdn	Skewness	Kurtosis
Lability	0.90 (*0.63*)	0.75	0.70	0.15
Anxiousness	0.75 (*0.56*)	0.75	1.28	1.92
Separation	0.32 (*0.48*)	0.00	1.89	3.85
Hostility	0.56 (*0.50*)	0.50	1.15	1.34
Perseveration	0.48 (*0.44*)	0.50	0.81	0.02
Restricted	0.83 (*0.59*)	0.75	0.74	0.49
Submissive	1.31 (*0.68*)	1.50	-0.26	-0.73
Withdrawal	0.41 (*0.50*)	0.25	1.45	2.30
Anhedonia	0.38 (*0.46*)	0.25	1.83	4.81
Intimacy	0.51 (*0.58*)	0.25	1.60	3.00
Suspicious	0.71 (*0.53*)	0.75	0.47	-0.41
Depressive	0.28 (*0.43*)	0.00	2.14	4.86
Manipulative	1.08 (*0.60*)	1.00	0.41	-0.31
Deceit	0.42 (*0.49*)	0.25	1.46	2.27
Grandiose	0.59 (*0.52*)	0.50	0.90	0.62
Callousness	0.48 (*0.51*)	0.25	1.36	1.93
Attention	1.03 (*0.63*)	1.00	0.35	-0.49
Irresponsible	0.13 (*0.24*)	0.00	2.18	4.60
Impulsive	0.69 (*0.48*)	0.75	0.56	0.00
Distractibility	0.48 (*0.49*)	0.50	1.15	1.22
Rigid Perfectionism	1.28 (*0.57*)	1.25	0.16	-0.09
Risk Taking	1.12 (*0.51*)	1.25	0.06	-0.16
Unusual Beliefs and Experiences	0.68 (*0.54*)	0.50	0.88	0.59
Eccentricity	0.80 (*0.70*)	0.75	0.72	-0.25
Perceptual Dysregulation	0.45 (*0.49*)	0.25	1.23	1.14
Negative	0.66 (*0.44*)	0.58	1.14	1.28
Detachment	0.44 (*0.40*)	0.33	1.69	3.97
Antagonism	0.70 (*0.45*)	0.58	0.92	0.65
Disinhibition	0.43 (*0.32*)	0.33	1.17	1.81
Psychoticism	0.64 (*0.48*)	0.50	0.75	0.02

Note. The Shapiro-Wilk test was significant at $p < .001$ for all facets and factors. PID-5-100 items are Likert-scaled from 0-4. Facets and factors are computed as averages, both facets and factors can take values from 0 to 3, with interval steps of 0.167.

Facet Correlations

Figure A3

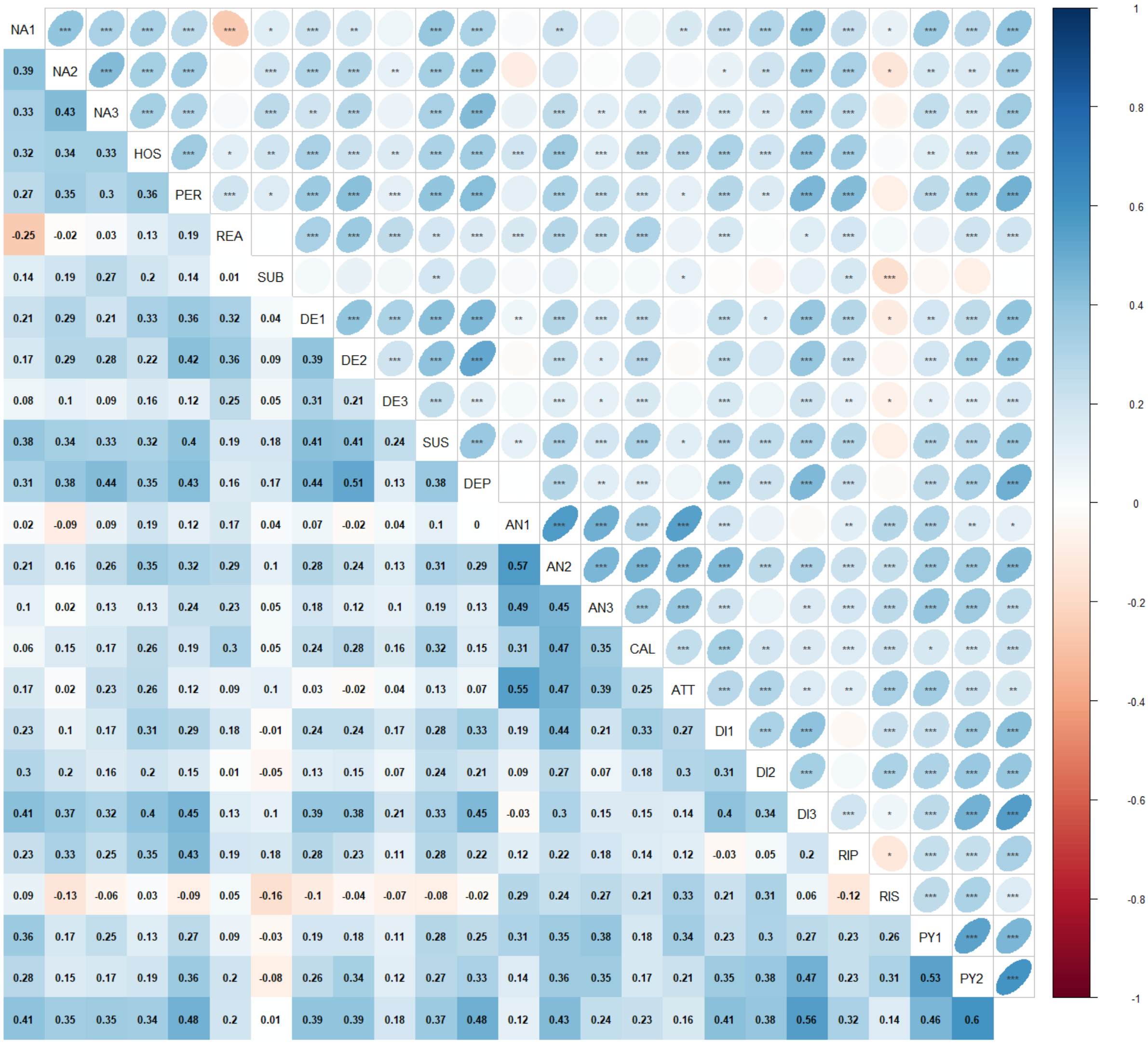
Correlations of the IPIP-NEO-120 facets



Note. Label abbreviations can be found in Table 1. Correlations are calculated with spearman rho, as facets consisted of ordinal data. * indicates significancy, with * < .05, ** <.01, and *** < .001.

Figure A4

Correlations of the IPIP-NEO-120 facets



Note. Label abbreviations can be found in Table 1. Correlations are calculated with spearman rho, as facets consisted of ordinal data. * indicates significancy, with * < .05, ** <.01, and *** < .001.

Exploratory Factor Analysis

Table A3

Factor loadings of the exploratory factor analysis of the IPIP-NEO-120 facets

Facet	Extraversion	Conscientiousness	Agreeableness	Openness	Neuroticism
N1	-0.15	-0.18	-0.01	-0.11	**0.62**
N2	-0.15	-0.06	*-0.46*	-0.15	**0.39**
N3	*-0.37*	-0.18	-0.15	0.05	**0.44**
N4	*-0.41*	-0.27	0.09	-0.14	**0.22**
N5	0.04	*-0.34*	*-0.34*	-0.10	**0.17**
N6	-0.06	-0.28	0.05	-0.20	**0.52**
E1	**0.66**	0.16	0.22	-0.11	-0.07
E2	**0.65**	0.09	0.08	-0.06	-0.04
E3	**0.46**	0.27	*-0.40*	0.02	-0.15
E4	**0.46**	0.17	-0.02	-0.02	0.01
E5	**0.56**	-0.12	-0.10	0.19	0.07
E6	**0.67**	0.06	0.12	0.03	-0.17
O1	-0.03	-0.29	-0.19	**0.54**	0.13
O2	-0.04	0.04	0.00	**0.67**	-0.00
O3	0.06	0.29	0.11	**0.30**	*0.30*
O4	*0.47*	-0.22	-0.06	**0.31**	-0.24
O5	-0.08	0.04	-0.07	**0.74**	-0.14
O6	0.05	*-0.38*	0.20	**0.40**	-0.12
A1	*0.44*	0.09	**0.34**	0.07	0.02
A2	0.00	-0.03	**0.74**	-0.04	0.12
A3	*0.35*	0.19	**0.36**	0.25	0.28
A4	0.10	-0.05	**0.70**	-0.14	-0.15
A5	*-0.31*	-0.14	**0.34**	-0.05	0.09
A6	*0.32*	0.22	**0.28**	*0.34*	*0.35*
C1	0.15	**0.63**	-0.14	0.13	-0.09
C2	-0.19	**0.57**	0.16	-0.08	-0.16
C3	0.16	**0.41**	*0.47*	-0.05	0.10
C4	0.24	**0.47**	0.06	-0.01	0.10
C5	0.07	**0.75**	-0.01	-0.04	-0.14
C6	*-0.52*	**0.26**	*0.41*	0.04	-0.13

Note. Abbreviations can be found in Table 1. Exploratory factor analysis was done using minimal residuals and oblimin rotation; bold indicates the matching domain, italic indicates non-convergent facets.

Table A4

Factor loadings of the exploratory factor analysis of the PID-5 100 facets

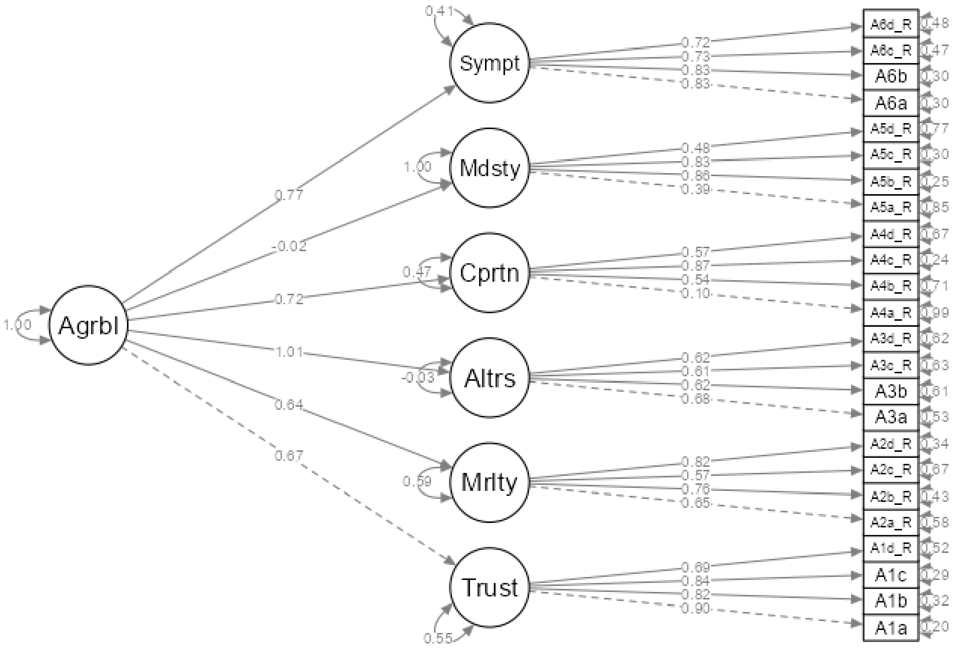
Facet	Negative Affect	Antagonism	Detachment	Psychoticism	Disinhibition
Emotional Lability	**0.58**	-0.06	-0.27	0.29	0.15
Anxiousness	**0.67**	-0.12	0.09	0.03	0.02
Separation Anxiety	**0.65**	0.16	-0.06	-0.03	0.03
Hostility	**0.44**	*0.31*	0.11	-0.10	0.19
Perseveration	**0.42**	0.06	*0.30*	0.15	-0.00
Restricted Affectivity	***-0.27***	0.21	*0.64*	0.06	-0.06
Submissiveness	**0.42**	0.14	-0.05	-0.24	-0.10
Withdrawal	0.16	0.05	**0.63**	0.07	0.09
Anhedonia	0.18	-0.08	**0.58**	0.14	0.08
Intimacy Avoidance	0.04	0.02	**0.43**	0.05	0.04
Suspiciousness	*0.44*	0.13	**0.23**	0.11	0.00
Depressivíty	0.36	-0.10	**0.42**	0.14	0.20
Manipulativeness	-0.03	**0.82**	-0.03	0.01	-0.09
Deceitfulness	0.06	**0.67**	0.23	-0.01	0.23
Grandiosity	-0.02	**0.59**	0.09	0.22	-0.14
Callousness	-0.01	**0.50**	*0.31*	-0.09	0.17
Attention Seeking	0.12	**0.64**	-0.29	0.09	0.10
Irresponsible	0.01	0.23	0.13	0.04	**0.58**
Impulsivity	0.09	0.05	-0.16	0.33	**0.40**
Distractibility	*0.32*	-0.08	0.15	0.27	**0.39**
Rigid Perfectionism	*0.44*	0.19	0.18	0.17	**-0.37**
Risk Taking	*-0.34*	0.25	-0.26	0.42	**0.24**
Unusual Beliefs & Experiences	0.12	0.16	-0.08	**0.69**	-0.16
Eccentricity	-0.07	-0.00	0.20	**0.72**	0.10
Perceptual Dysregulation	0.21	-0.03	0.25	**0.52**	0.20

Note. Exploratory factor analysis was done using minimal residuals and oblimin rotation. Lines indicate factor domains, bold indicates the matching domain, italic indicates non-convergent facets.

Confirmatory Factor Analysis of the IPIP-NEO-120

Figure A5

Example of a path diagram of the IPIP-NEO-120 factor Agreeableness



Note. Agrbl = Agreeableness, Sympt = Sympathy, Mdsty = Modesty, Cprtn = Cooperation, Altrs = Altruism, Mrlty = Morality.

Factor Loadings of the Confirmatory Factor Loadings of the IPIP-NEO-120

Table A5

Confirmatory Factor Analysis of the IPIP-NEO-120 factor Neuroticism

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Anxiety	N1a	0.39	0.03	0.33	0.46	0.79	0.62
	N1c	0.36	0.03	0.30	0.42	0.72	0.52
	N1b	0.38	0.03	0.32	0.45	0.77	0.59
	N1d	0.37	0.04	0.30	0.44	0.74	0.55
Anger	N2d_R	0.36	0.03	0.30	0.42	0.51	0.26
	N2c	0.61	0.03	0.54	0.67	0.86	0.73
	N2b	0.65	0.03	0.59	0.72	0.92	0.85
	N2a	0.58	0.03	0.52	0.65	0.82	0.68
Depression	N3d_R	0.40	0.03	0.33	0.46	0.67	0.44
	N3b	0.48	0.03	0.41	0.54	0.80	0.64
	N3c	0.55	0.04	0.48	0.62	0.93	0.86
	N3a	0.56	0.04	0.48	0.64	0.95	0.89
Self-Conscientiousness	N4d_R	0.18	0.03	0.12	0.24	0.31	0.09
	N4c	0.28	0.04	0.20	0.35	0.47	0.22
	N4b	0.45	0.04	0.37	0.54	0.77	0.59
	N4a	0.45	0.05	0.36	0.54	0.75	0.57
Immoderation	N5d_R	0.50	0.04	0.42	0.59	0.67	0.44
	N5b_R	0.28	0.04	0.19	0.36	0.36	0.13
	N5c_R	0.41	0.04	0.33	0.48	0.54	0.29
	N5a	0.47	0.05	0.37	0.57	0.62	0.39
Vulnerability	N6d_R	0.21	0.05	0.12	0.31	0.61	0.37
	N6b	0.14	0.03	0.07	0.20	0.40	0.16
	N6c	0.24	0.05	0.13	0.35	0.69	0.48
	N6a	0.29	0.06	0.16	0.41	0.83	0.68
Neuroticism	Anxiety	1.75	0.19	1.38	2.12	0.87	
	Anger	1.00	0.10	0.81	1.19	0.71	
	Depression	1.36	0.14	1.09	1.63	0.81	
	Self-Conscientiousness	1.36	0.18	1.02	1.70	0.81	
	Immoderation	0.86	0.10	0.66	1.06	0.65	
	Vulnerability	2.71	0.64	1.46	3.96	0.94	

Note. All paths were significant with $p < .001$.

Table A6

Confirmatory Factor Analysis of the IPIP-NEO-120 factor Extraversion

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R²
Friendliness	E1a	1.00	0.00	1.00	1.00	0.71	0.50
	E1b	0.98	0.03	0.92	1.05	0.70	0.49
	E1c_R	1.10	0.04	1.02	1.17	0.78	0.61
	E1d_R	0.92	0.03	0.85	0.98	0.65	0.42
Gregariousness	E2a	1.00	0.00	1.00	1.00	0.70	0.49
	E2b	1.06	0.04	0.98	1.13	0.74	0.54
	E2c_R	0.79	0.03	0.72	0.85	0.55	0.30
	E2d_R	0.91	0.04	0.84	0.98	0.63	0.40
Assertiveness	E3a	1.00	0.00	1.00	1.00	0.87	0.76
	E3b	0.87	0.04	0.80	0.95	0.76	0.58
	E3c	0.85	0.04	0.78	0.93	0.74	0.55
	E3d_R	0.61	0.03	0.54	0.68	0.53	0.28
Activity	E4a	1.00	0.00	1.00	1.00	0.16	0.02
	E4b	5.29	0.75	3.82	6.76	0.83	0.69
	E4c	4.42	0.63	3.19	5.65	0.70	0.48
	E4d_R	2.54	0.38	1.79	3.28	0.40	0.16
Excitement	E5a	1.00	0.00	1.00	1.00	0.83	0.69
	E5b	0.97	0.04	0.89	1.06	0.81	0.65
	E5c	0.80	0.04	0.73	0.87	0.67	0.45
	E5d	0.84	0.04	0.78	0.91	0.70	0.49
Cheerfulness	E6a	1.00	0.00	1.00	1.00	0.79	0.63
	E6b	0.93	0.03	0.87	0.99	0.74	0.54
	E6c	0.98	0.03	0.92	1.05	0.78	0.61
	E6d	1.00	0.03	0.94	1.07	0.80	0.63
Extraversion	Friendliness	1.00	0.00	1.00	1.00	0.92	
	Gregariousness	1.00	0.04	0.92	1.08	0.93	
	Assertiveness	0.72	0.03	0.65	0.78	0.54	
	Activity	0.19	0.03	0.14	0.24	0.78	
	Excitement	0.70	0.03	0.64	0.76	0.55	
	Cheerfulness	1.09	0.04	1.01	1.17	0.90	

Note. All paths were significant with p <.001.

Table A7

Confirmatory Factor Analysis of the IPIP-NEO-120 factor Openness

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Imagination	O1a	1.00	0.00	1.00	1.00	0.79	0.63
	O1b	1.04	0.05	0.95	1.14	0.83	0.68
	O1c	0.92	0.04	0.84	1.00	0.72	0.52
	O1d	1.00	0.04	0.92	1.08	0.79	0.62
Artistic	O2a	1.00	0.00	1.00	1.00	0.77	0.59
	O2b	0.94	0.05	0.85	1.03	0.72	0.52
	O2c_R	0.74	0.04	0.66	0.82	0.57	0.32
	O2d_R	0.81	0.04	0.72	0.89	0.62	0.38
Emotionality	O3a	1.00	0.00	1.00	1.00	0.72	0.52
	O3b	0.80	0.09	0.63	0.97	0.57	0.33
	O3c_R	0.70	0.08	0.55	0.85	0.50	0.25
	O3d_R	0.63	0.08	0.48	0.78	0.45	0.21
Adventurousness	O4a	1.00	0.00	1.00	1.00	0.70	0.49
	O4b_R	1.11	0.07	0.98	1.24	0.77	0.60
	O4c_R	0.87	0.06	0.76	0.99	0.61	0.37
	O4d_R	0.86	0.06	0.74	0.97	0.60	0.36
Intellect	O5a	1.00	0.00	1.00	1.00	0.76	0.58
	O5b_R	1.01	0.05	0.92	1.10	0.77	0.60
	O5c_R	0.83	0.04	0.74	0.91	0.63	0.40
	O5d_R	0.55	0.04	0.48	0.62	0.42	0.18
Liberalism	O6a	1.00	0.00	1.00	1.00	0.66	0.43
	O6b	0.66	0.06	0.53	0.78	0.43	0.19
	O6c_R	0.95	0.08	0.79	1.11	0.62	0.39
	O6d_R	0.41	0.06	0.29	0.52	0.27	0.07
Openness	Imagination	1.00	0.00	1.00	1.00	0.58	
	Artistic	1.47	0.08	1.30	1.63	0.88	
	Emotionality	0.55	0.05	0.45	0.65	0.35	
	Adventurousness	0.78	0.05	0.68	0.89	0.52	
	Intellect	1.51	0.08	1.34	1.67	0.91	
	Liberalism	0.83	0.06	0.71	0.95	0.59	

Note. All paths were significant with p <.001.

Table A8

Confirmatory Factor Analysis of the IPIP-NEO-120 factor Agreeableness

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Trust	A1a	1.00	0.00	1.00	1.00	0.90	0.80
	A1b	0.92	0.03	0.86	0.97	0.82	0.68
	A1c	0.94	0.03	0.88	1.00	0.84	0.71
	A1d_R	0.77	0.03	0.72	0.83	0.69	0.48
Morality	A2a_R	1.00	0.00	1.00	1.00	0.65	0.42
	A2b_R	1.17	0.08	1.01	1.33	0.76	0.57
	A2c_R	0.89	0.07	0.76	1.02	0.57	0.33
	A2d_R	1.26	0.09	1.09	1.43	0.82	0.66
Altruism	A3a	1.00	0.00	1.00	1.00	0.68	0.47
	A3b	0.91	0.04	0.82	0.99	0.62	0.39
	A3c_R	0.89	0.05	0.80	0.98	0.61	0.37
	A3d_R	0.91	0.05	0.82	1.00	0.62	0.38
Cooperation	A4a_R	1.00	0.00	1.00	1.00	0.10	0.01
	A4b_R	5.42	1.59	2.31	8.53	0.54	0.29
	A4c_R	8.74	2.54	3.77	13.71	0.87	0.76
	A4d_R	5.74	1.68	2.45	9.03	0.57	0.33
Modesty	A5a_R	1.00	0.00	1.00	1.00	0.39	0.15
	A5b_R	2.21	0.25	1.72	2.70	0.86	0.75
	A5c_R	2.13	0.25	1.64	2.63	0.83	0.70
	A5d_R	1.22	0.15	0.92	1.52	0.48	0.23
Sympathy	A6a	1.00	0.00	1.00	1.00	0.83	0.70
	A6b	1.00	0.04	0.92	1.08	0.83	0.70
	A6c_R	0.87	0.04	0.80	0.94	0.73	0.53
	A6d_R	0.86	0.04	0.79	0.93	0.72	0.52
Agreeableness	Trust	1.00	0.00	1.00	1.00	0.67	
	Morality	0.68	0.04	0.60	0.77	0.64	
	Altruism	1.15	0.06	1.04	1.26	**1.01**	
	Cooperation	0.12	0.03	0.05	0.19	0.72	
	Modesty	-0.01	0.01	-0.04	0.01	-0.02	
	Sympathy	1.06	0.05	0.96	1.16	0.77	

Note. All paths were significant with $p < .001$ except the path Modesty on the factor Agreeableness. The β > 1 in Altruism is correct and might be an indicator for multicollinearity and a Heywood case (see Jöreskog, 1999a, 1999b).

Table A9

Confirmatory Factor Analysis of the IPIP-NEO-120 factor Conscientiousness

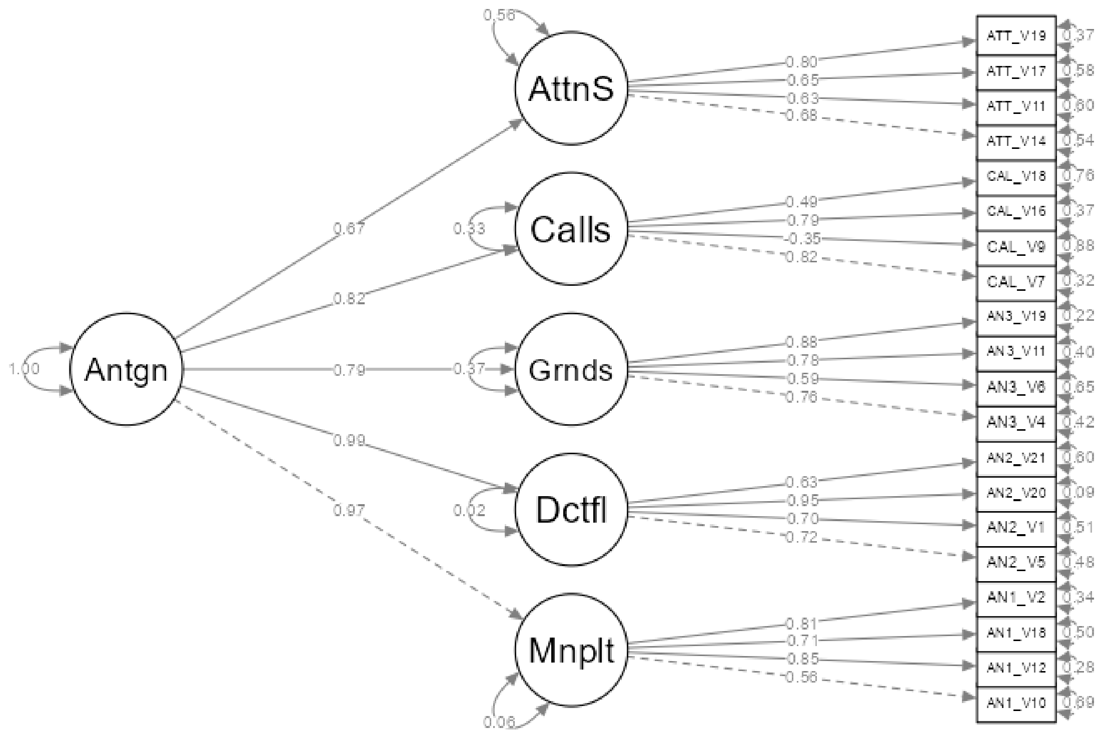
Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Self-Efficacy	C1a	1.00	0.00	1.00	1.00	0.91	0.84
	C1b	0.79	0.03	0.74	0.85	0.73	0.53
	C1c	0.93	0.03	0.87	0.99	0.85	0.73
	C1d	0.84	0.03	0.78	0.90	0.77	0.59
Orderliness	C2a	1.00	0.00	1.00	1.00	0.65	0.42
	C2b_R	1.28	0.05	1.18	1.37	0.83	0.69
	C2c_R	1.28	0.05	1.18	1.37	0.83	0.69
	C2d_R	1.38	0.05	1.28	1.48	0.90	0.81
Dutifulness	C3a	1.00	0.00	1.00	1.00	0.86	0.75
	C3b	0.75	0.03	0.68	0.81	0.65	0.42
	C3c_R	0.75	0.03	0.68	0.82	0.65	0.42
	C3d_R	1.01	0.04	0.92	1.09	0.87	0.76
Achievement	C4a	1.00	0.00	1.00	1.00	0.78	0.61
	C4b	0.81	0.04	0.74	0.88	0.63	0.40
	C4c_R	0.72	0.03	0.66	0.79	0.56	0.32
	C4d_R	0.88	0.04	0.80	0.95	0.68	0.47
Self-Discipline	C5a	1.00	0.00	1.00	1.00	0.57	0.33
	C5b	1.27	0.05	1.17	1.36	0.73	0.53
	C5c_R	1.38	0.05	1.29	1.48	0.80	0.63
	C5d_R	1.25	0.05	1.16	1.35	0.72	0.52
Cautiousness	C6a_R	1.00	0.00	1.00	1.00	0.55	0.30
	C6b_R	-0.02	0.05	-0.12	0.08	-0.01	0.00
	C6c_R	0.30	0.05	0.19	0.40	0.16	0.03
	C6d_R	2.01	0.15	1.71	2.32	**1.11**	
Conscientiousness	Self-Efficacy	1.00	0.00	1.00	1.00	0.76	
	Orderliness	0.60	0.03	0.55	0.65	0.64	
	Dutifulness	0.94	0.04	0.87	1.02	0.76	
	Achievement	0.85	0.03	0.79	0.92	0.76	
	Self-Discipline	0.84	0.04	0.77	0.91	**1.02**	
	Cautiousness	0.42	0.03	0.36	0.48	0.54	

Note. All paths were significant with $p < .001$ except item C6b_R. The β > 1 in of item C6d_R and facet Self-Discipline is correct and might be an indicator for multicollinearity and a Heywood case (see Jöreskog, 1999a, 1999b).

Confirmatory Factor Analysis of the PID-5

Figure A6

Example of a path diagram of the PID-5 factor Antagonism



Note. Antgn = Antagonism, AttnS = Attention Seeking, Calls = Callousness, Grnds = Grandiosity, Dctfl = Deceitfulness, Mnplt = Manipulativeness.

Factor Loadings of the Confirmatory Factor Loadings of the PID-5

Table A10

Confirmatory Factor Analysis of the PID-5 factor Negative Affect

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Emotional Lability	NA1_V62	1.00	0.00	1.00	1.00	0.64	0.41
	NA1_V102	0.97	0.09	0.79	1.15	0.62	0.39
	NA1_V122	1.42	0.12	1.19	1.65	0.91	0.83
	NA1_V181	0.98	0.11	0.77	1.19	0.63	0.39
Anxiousness	V96R	1.00	0.00	1.00	1.00	0.44	0.20
	NA2_V109	1.85	0.22	1.41	2.28	0.82	0.67
	NA2_V110	1.95	0.22	1.52	2.37	0.87	0.75
	NA2_V174	1.96	0.23	1.50	2.41	0.87	0.76
Separation Insecurity	NA3_V50	1.00	0.00	1.00	1.00	0.82	0.67
	NA3_V57	0.83	0.09	0.64	1.01	0.68	0.46
	NA3_V127	0.99	0.06	0.87	1.12	0.82	0.67
	NA3_V149	1.04	0.07	0.89	1.18	0.85	0.72
Hostility	HOS_V38	1.00	0.00	1.00	1.00	0.83	0.68
	HOS_V116	0.57	0.09	0.39	0.74	0.47	0.22
	HOS_V158	1.03	0.09	0.85	1.20	0.85	0.72
	HOS_V188	0.70	0.07	0.55	0.85	0.58	0.33
Submissiveness	SUB_V9	1.00	0.00	1.00	1.00	0.61	0.37
	SUB_V15	1.21	0.09	1.01	1.40	0.74	0.55
	SUB_V63	1.28	0.10	1.07	1.49	0.79	0.62
	SUB_V202	1.33	0.12	1.09	1.55	0.81	0.66
Perseveration	PER_V51	1.00	0.00	1.00	1.00	0.36	0.13
	PER_V60	1.50	0.33	0.84	2.15	0.54	0.29
	PER_V78	1.78	0.38	1.04	2.51	0.64	0.41
	PER_V128	2.55	0.52	1.53	3.56	0.93	0.83
Negative Affect	Emotional Lability	1.00	0.00	1.00	1.00	0.70	
	Anxiousness	0.83	0.13	0.57	1.09	0.84	
	Separation Insecurity	1.43	0.19	1.06	1.80	0.79	
	Hostility	1.23	0.17	0.90	1.56	0.67	
	Submissiveness	0.47	0.10	0.27	0.66	0.34	
	Perseveration	0.61	0.14	0.33	0.88	0.76	

Note. All paths were significant with $p < .001$.

Table A11

Confirmatory Factor Analysis of the PID-5 factor Detachment

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Withdrawal	DE1_V75	1.00	0.00	1.00	1.00	0.78	0.61
	DE1_V82	1.08	0.07	0.94	1.22	0.84	0.71
	DE1_V146	0.83	0.08	0.68	0.98	0.65	0.42
	DE1_V161	0.91	0.08	0.76	1.07	0.71	0.51
Anhedonia	DE2_V1	1.00	0.00	1.00	1.00	0.64	0.41
	DE2_23	1.15	0.10	0.96	1.34	0.73	0.54
	DE2_V157	1.53	0.12	1.30	1.76	0.98	0.95
	DE2_V189	0.97	0.08	0.81	1.13	0.62	0.38
Intimacy Avoidance	V97R	1.00	0.00	1.00	1.00	0.53	0.28
	DE3_V108	1.22	0.20	0.83	1.61	0.65	0.42
	DE3_V145	0.78	0.14	0.51	1.05	0.42	0.17
	DE3_V203	1.75	0.25	1.27	2.23	0.93	0.87
Suspicious	SUS_V103	1.00	0.00	1.00	1.00	0.71	0.51
	SUS_V117	0.86	0.10	0.67	1.05	0.61	0.37
	V177R	0.45	0.09	0.28	0.63	0.32	0.10
	SUS_V190	1.08	0.12	0.85	1.32	0.77	0.59
Depressivity	DEP_V163	1.00	0.00	1.00	1.00	0.96	0.91
	DEP_V119	0.70	0.06	0.58	0.83	0.67	0.45
	DEP_V104	0.72	0.05	0.63	0.81	0.69	0.47
	DEP_V27	0.92	0.04	0.84	1.01	0.88	0.78
Detachment	Withdrawal	1.00	0.00	1.00	1.00	0.86	
	Anhedonia	0.87	0.08	0.72	1.02	0.92	
	Intimacy Avoidance	0.52	0.08	0.37	0.68	0.66	
	Suspicious	0.83	0.09	0.65	1.01	0.79	
	Depressivity	1.29	0.09	1.11	1.46	0.91	

Note. All paths were significant with $p < .001$.

Table A12

Confirmatory Factor Analysis of the PID-5 factor Antagonism

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Manipulative	AN1_V107	1.00	0.00	1.00	1.00	0.56	0.31
	AN1_V125	1.52	0.12	1.28	1.75	0.85	0.72
	AN1_V180	1.27	0.10	1.07	1.46	0.71	0.50
	AN1_V219	1.45	0.13	1.19	1.71	0.81	0.66
Deceitfulness	AN2_V56	1.00	0.00	1.00	1.00	0.72	0.52
	AN2_V126	0.97	0.06	0.85	1.10	0.70	0.49
	AN2_V206	1.33	0.07	1.18	1.47	0.95	0.91
	AN2_V218	0.88	0.07	0.74	1.01	0.63	0.40
Grandiose	AN3_V40	1.00	0.00	1.00	1.00	0.76	0.58
	AN3_V65	0.78	0.08	0.63	0.94	0.59	0.35
	AN3_V114	1.02	0.08	0.86	1.19	0.78	0.61
	AN3_V197	1.16	0.10	0.96	1.36	0.88	0.78
Callousness	CAL_V73	1.00	0.00	1.00	1.00	0.82	0.68
	V90R	0.42	0.08	0.26	0.58	0.35	0.12
	CAL_V166	0.97	0.07	0.82	1.11	0.79	0.63
	CAL_V183	0.60	0.08	0.44	0.75	0.49	0.24
Attention Seeking	ATT_V14	1.00	0.00	1.00	1.00	0.68	0.47
	ATT_V113	0.92	0.11	0.72	1.13	0.63	0.40
	ATT_V173	0.95	0.09	0.77	1.13	0.65	0.42
	ATT_V191	1.17	0.10	0.96	1.37	0.80	0.64
Antagonism	Manipulative	1.00	0.00	1.00	1.00	0.97	
	Deceitfulness	1.31	0.13	1.05	1.58	0.99	
	Grandiose	1.11	0.13	0.87	1.36	0.80	
	Callousness	1.25	0.11	1.03	1.47	0.82	
	Attention Seeking	0.84	0.10	0.64	1.04	0.67	

Note. All paths were significant with $p < .001$.

Table A13

Confirmatory Factor Analysis of the PID-5 factor Disinhibition

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Irresponsible	DI1_V31	1.00	0.00	1.00	1.00	0.81	0.65
	DI1_V129	0.97	0.10	0.77	1.17	0.78	0.61
	DI1_V156	0.73	0.11	0.53	0.94	0.59	0.35
	DI1_V201	0.33	0.11	0.11	0.55	0.27	0.07
Impulsive	DI2_V4	1.00	0.00	1.00	1.00	0.70	0.49
	DI2_V17	1.09	0.10	0.89	1.29	0.77	0.59
	V58R	0.72	0.09	0.54	0.91	0.51	0.26
	DI2_V22	0.88	0.10	0.69	1.08	0.62	0.39
Distractibility	DI3_V6	1.00	0.00	1.00	1.00	0.66	0.43
	DI3_V47	1.02	0.11	0.81	1.23	0.67	0.45
	DI3_V118	1.12	0.10	0.92	1.33	0.74	0.55
	DI3_V144	1.03	0.12	0.81	1.26	0.68	0.46
Rigid Perfection	RIP_V49	1.00	0.00	1.00	1.00	0.65	0.42
	RIP_V135	0.88	0.12	0.64	1.12	0.57	0.32
	RIP_V140	1.05	0.14	0.77	1.33	0.68	0.46
	RIP_V176	0.52	0.11	0.31	0.72	0.34	0.11
Risk Taking	RIS_V3	1.00	0.00	1.00	1.00	0.91	0.83
	RIS_V67	0.82	0.09	0.64	0.99	0.75	0.56
	V98R	0.55	0.07	0.41	0.69	0.50	0.25
	RIS_V112	0.93	0.11	0.72	1.15	0.85	0.72
Disinhibition	Irresponsible	1.00	0.00	1.00	1.00	**1.03**	
	Impulsive	0.66	0.09	0.48	0.84	0.79	
	Distractibility	0.54	0.08	0.37	0.70	0.68	
	Rigid Perfection	0.11	0.06	-0.01	0.23	0.14	
	Risk Taking	0.58	0.10	0.40	0.77	0.53	

Note. All paths were significant with $p < .001$ except for DI1_V201 and path Rigid Perfectionism on the factor Disinhibition. The $\beta > 1$ in Irresponsible is correct and might be an indicator for multicollinearity and a Heywood case (see Jöreskog, 1999a, 1999b).

Table A14

Confirmatory Factor Analysis of the PID-5 factor Psychoticism

Latent	Observed	Estimate	SE	Lower CI	Upper CI	β	R^2
Unusual Belief	PY1_V94	1.00	0.00	1.00	1.00	0.59	0.35
	PY1_V106	1.32	0.13	1.06	1.58	0.78	0.61
	PY1_V139	1.35	0.14	1.07	1.63	0.80	0.64
	PY1_V194	1.26	0.14	0.99	1.54	0.75	0.56
Eccentricity	PY2_V5	1.00	0.00	1.00	1.00	0.69	0.47
	PY2_V33	1.14	0.06	1.02	1.26	0.78	0.61
	PY2_V52	1.16	0.07	1.02	1.30	0.80	0.63
	PY2_V205	1.27	0.07	1.14	1.41	0.87	0.76
Percept Dysregulation	PY3_V42	1.00	0.00	1.00	1.00	0.49	0.24
	PY3_V83	1.27	0.17	0.94	1.59	0.62	0.38
	PY3_V213	1.67	0.20	1.27	2.07	0.81	0.66
	PY3_V217	1.54	0.23	1.08	1.99	0.75	0.56
Psychoticism	Unusual Beliefs and Experiences	1.00	0.00	1.00	1.00	0.74	
	Eccentricity	1.48	0.17	1.14	1.82	0.95	
	Perceptual Dysregulation	1.05	0.18	0.70	1.40	0.95	

Note. All paths were significant with $p < .001$.

Canonical Correlations

The CCA was performed using IBM SPSS (Version 29) and only factors included in the analysis, resulting in five canonical roots, displayed in Table A15. All canonical roots were significant with $p < .001$.

Table A15

Canonical Roots and Correlations of the IPIP-NEO-120 and PID-5-100 factors

Root	Eigenvalue	Canonical Correlation	Percentage
1	2.30	.84	54.77
2	0.96	.70	22.75
3	0.64	.62	15.19
4	0.22	.42	5.17
5	0.09	.29	2.13