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DSM-5 Alternative Personality Disorder Model Traits as Extreme Variants of Five Factor Model Traits in Adolescents

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Abstract

The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) recognizes a developmental perspective on personality pathology due to its proposal to conceptualize personality pathology in terms of maladaptive personality traits. Previous research has found that the DSM-5 maladaptive traits and the Five Factor Model (FFM) for normative personality traits share common underlying dimensions. Although the DSM-5 generally assumes DSM-5 traits to be extreme versions of FFM traits, empirical evidence is scarce in adolescents. The present study therefore extended prior studies by comparing the Personality Inventory for DSM-5 (PID-5) and the Big Five Inventory-2 (BFI-2) in an adolescent sample (n = 353), using Item Response Theory (IRT). Results indicated an underlying dimension for all domain pairs except for FFM Openness and Psychoticism. Consistent with the general assumption, IRT results demonstrated that PID-5 scales generally provided more information than the BFI-2 scales at the upper levels of the latent dimension. The BFI-2 scales provided more information at the lower levels. For FFM Conscientiousness and Disinhibition, however, the BFI-2 scale provided more information for almost the entire range of the latent dimension. The findings indicate similarities in the DSM-5 conceptualization of personality pathology between adults and adolescents, while at the same time identify important differences that need to be considered.

Keywords

DSM-5 alternative personality disorder model; Five Factor Model; personality; personality pathology; adolescents

Diagnosing personality psychopathology in young people has traditionally been controversial. One of the main reasons for this is the absence of a developmentally appropriate model (Newton-Howes, Clark, & Chanen, 2015). The *Diagnostic and Statistical Manual for Mental Disorders* (4th Edition; DSM-IV; American Psychiatric Association [APA], 2013) employs a categorical approach in which personality pathology is conceptualized as personality disorders that are qualitatively different from normative personality (Hyman, 2010). This approach allows little consideration of a developmental perspective on personality pathology (De Fruyt & De Clercq, 2014). A marked increase

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of research, however, acknowledges the importance of understanding emerging personality pathology in adolescents (De Fruyt & De Clercq, 2014). Scientific progress in the field of personality pathology has led to a proposed revision by the APA of the DSM-IV PD criteria in which maladaptive personality is dimensionally conceptualized as maladaptive traits that underlie personality pathology (APA, 2013). This personality trait model is indicated in Section III of the DSM-5 to prompt further research. Importantly, the current paradigm shift to a dimensional approach permits for detection of early signs of personality pathology and for fluent continuity of personality pathology into adulthood.

Frameworks for Maladaptive and Normative Personality Traits

The Personality Inventory for DSM-5 (PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012) was developed to assess the 25 maladaptive lower-order traits in the DSM-5 personality disorder model. These traits are divided under five higher-order domains, on which individuals can range from low to high: Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism. Indeed, extensive research on the PID-5 in (young) adults has replicated the five-factor structure of the PID-5 and has validated it as an appropriate substitute measure for personality disorders (Krueger & Markon, 2014; Watters & Bagby, 2018; Wright & Simms, 2014; De Clercq et al., 2014; Krueger et al., 2012; Al-Dajani, Gralnick, & Bagby, 2016).

The dimensional model of the DSM-5 bridges the categorical approach to personality pathology and the Five Factor Model (FFM), the predominant model for normative personality (Costa & McCrae, 1990; Lynam, 2013; Widiger, 2018). The FFM structures normative personality traits into five higher-order domains (Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness) and several lower-order facets (McCrae & Costa, 2008). Numerous correlational studies and joint factor analyses of the PID-5 and multiple measures of the FFM have found that the PID-5 traits and FFM traits can be sorted into five domains that are dimensional. That is, Negative Affectivity aligns with FFM Neuroticism, Detachment with (low) FFM Extraversion, Antagonism with (low) FFM Agreeableness and Disinhibition with (low) FFM Conscientiousness (e.g., Gore and Widiger, 2013; De Fruyt et al., 2013; Pocnet, Antonietti, Handschin, Massoudi, & Rossier, 2018; Thomas et al., 2013; Watson, Stasik, Ro, & Clark, 2013; De Caluwé, Verbeke, Van Aken, Van Der Heijden, & De Clercq, 2019). The findings regarding the relationship between Psychoticism and FFM Openness are somewhat inconsistent. Specifically, some studies find associations between Openness and maladaptive traits linking to Psychoticism such as schizotypy (Cicero & Kerns, 2010), whereas others find no association (Watson, Clark, & Chmielewksi, 2008). In adolescents, Verbeke and De Clercq (2014) found results similar to correlational and joint factor analyses in adults. Findings, however, differed from those in adults in that the PID-5 Disinhibition domain did not load on Conscientiousness, but on (low) Agreeableness.

Evidently, research shows that the PID-5 traits lie on the same dimensions as FFM traits in both adults and adolescents. Moreover, the DSM-5 proposes that the PID-5 domains represent maladaptive variants of the FFM (Krueger & Markon, 2014). While this is the general assumption in theories of personality pathology, traditional factor-analytic and

correlational methods do not enable thorough testing of this assumption. That is, such methods do not indicate *where* on the latent dimension FFM and PID-5 traits lie. Given the conceptualization of personality pathology as lying on the extreme end of the common dimension, instruments assessing maladaptive personality traits might contain items that capture more extreme levels than instruments of normative personality traits. Indeed, some experts argue that the normative FFM framework might not be extensive enough as it may not entirely capture the higher end of traits (Lynam, 2013; Nestadt et al., 2008). Accordingly, several scales used the framework of the FFM but were adapted to better assess personality pathology, such as Dimensional Personality Symptom Item Pool for children and adolescents (De Clercq et al., 2009). However, much remains unknown on whether the PID-5 can better capture personality pathology than an FFM measure in children and adolescents.

Comparing Maladaptive and Normative Personality Traits using Item Response Theory

Do maladaptive traits tap more extreme ranges of personality than normative traits? Item Response Theory (IRT) can help answer this question by providing information regarding the region of a latent dimension assessed by a measure, in this case a measure of FFM traits and the PID-5 (Balsis, Ruchensky, & Busch, 2017). IRT can be utilized to determine whether one measure provides more psychometric information than the other measure at certain levels (e.g., more extreme levels) of the latent dimension. The more psychometric information a measure provides, the more precisely the levels of the latent dimension can be estimated (DeMars, 2010). Thus, IRT builds on factor analytic and correlational studies by indicating where on the common dimension normative and maladaptive personality traits lie.

Although IRT provides valuable information beyond traditional factor analytic and correlational studies, only a few studies have used IRT to investigate whether measures of maladaptive traits are informative beyond FFM measures. Results of this handful of studies seem to suggest that in adults, maladaptive traits provide more information at the higher, maladaptive levels of the latent dimension (i.e., personality), whereas normative personality traits provide more information at the lower and average levels (Stepp et al., 2012; Samuel, Simms, Clark, Livesley, & Widiger, 2010; Samuel, Carroll, Rounsaville, & Ball, 2013). However, findings are not fully consistent. One study concluded that a measure of psychopathy was not more informative at the maladaptive levels than a normative personality measure (Walton, Roberts, Krueger, Blonigen, & Hicks, 2008). Regarding the PID-5, Suzuki, Samuel, Pahlen, and Krueger (2015) found in adults that the PID-5 provided more information at the higher, extreme levels of personality, whereas an FFM measure, the International Personality Item Pool – NEO, provided more information at the lower levels. For Agreeableness-Antagonism and Conscientiousness-Disinhibition, the IPIP-NEO provided slightly more information than the PID-5 at the lowest and highest levels. Psychoticism provided much more information than Openness, and it defined the common dimension much more strongly than Openness. The authors argue that the link between Psychoticism and Openness is complex and these findings might be a result of the focus of the IPIP-NEO on adaptive ranges of Openness, while the content of Psychoticism is

primarily maladaptive. In general, these results show therefore that the PID-5 and IPIP-NEO are more similar than different measures.

Similar as to in adults, there is a scarcity of IRT studies in adolescents. We were unable to find IRT studies using the PID-5 in adolescents. From a developmental perspective, it is important to explore the relationship between normative and maladaptive personality traits in adolescents. Results from adult studies are not necessarily generalizable to adolescents, as both personality and personality pathology are dynamic constructs. That is, the same underlying trait may manifest differently across ages (Cicchetti & Crick, 2009). For example, adolescents are generally more impulsive and have worse emotional regulation than adults (Steinberg, 2007). Hence, there is work to be done on investigating the relationship between normative and maladaptive personality traits in adolescents.

The Current Study

In sum, over the last years there has been an increasing interest in research comparing normative and maladaptive personality traits using IRT in addition to traditional factor analytic and correlational approaches. So far, however, IRT has only been used in adult samples to study overlap between normative and pathological personality traits. However, despite the growing consensus that personality and personality pathology develops continuously across the lifespan (Newton-Howes, Clark, & Chanen, 2015), differences between adults and adolescents might be present because personality and personality pathology are dynamic over the course of development (Shiner, 2005). While the Five Factor Model applies to adults as well as to adolescents at a structural level, research also indicates developmental differences in personality. For example, adolescents appear to be less conscientious than adults (Denissen, Van Aken, Penke, & Wood, 2013), possibly because self-regulation mechanisms are still developing in adolescence. But in addition to these mean-level changes, recent findings by for example Mõttus and colleagues (2017; 2019), indicate that also individual differences in most personality traits increase considerably across childhood and adolescence. For example, the standard deviation of conscientiousness increases from about 1.3 to about 2.1 across childhood and adolescence (Mõttus et al., 2017). One possible mechanism for the age differences in variance might be the gradual expansion of new cognitive, emotional and self-regulatory capacities in childhood and adolescence, as a result of biological maturation and learning processes. These new capacities may provide older adolescents with more ways to express their personality (Mõttus et al., 2017). Because of these findings, it is important to have a developmental perspective on personality and pathological personality traits. Accordingly, in this study, we will use IRT in an adolescent sample.

The first aim of the present study is to replicate prior findings in adolescents and adults of common underlying dimensions for the PID-5 and FFM domains. To do so, using a factor-analytic approach, we sought to compare the PID-5-Faceted Brief Form (Maples et al., 2013) to the relatively new Big Five Inventory-2 (BFI-2; Soto & John, 2017) in an adolescent sample. Based on earlier work (e.g., Krueger & Markon, 2014), it is expected that the PID-5 and BFI-2 lower-order traits could be organized into five dimensional domains. Specifically, we expect the five following domains:

Negative Affectivity-Neuroticism, Detachment-Extraversion, Antagonism-Agreeableness, Disinhibition-Conscientiousness, and Psychoticism-Openness. However, for Psychoticism and Openness a clear underlying dimension might not be found, as previous research on this relationship has been inconsistent.

The second aim is to use IRT to investigate whether the maladaptive traits (i.e., PID-5 traits) could better capture the extreme levels of the latent dimension than the FFM traits (i.e., BFI-2 traits). We expected that the PID-5 would provide more information at the upper extreme levels, whereas the BFI traits would provide more information at the lower, adaptive levels. Together these findings will contribute to a better understanding of the conceptualization and measurement of adolescents' emerging personality pathology.

Method

Participants and Procedure

The sample consisted of 353 adolescents (56.9% female) with a mean age of 13.75 years (*SD* = 1.43, range = 11 – 17 years). In general the sample consisted of primarily early adolescents (57.5% 11-13 year olds). Participants were recruited through three high schools across The Netherlands: One school was located in a large city and two schools were located in smaller municipalities. Participants were in their first (23.8%), second (44.2%) or fourth year (32.0%) of high school and had varying educational levels. Almost all participants were born in The Netherlands (97.7%). Prior to the start of the study, active informed consent was obtained from the adolescents, and passive informed consent was obtained from the parents. Subsequently, participants were asked to fill in printed questionnaires in the classroom during school hours. Research assistants were present in order to answer questions following a standardized procedure. After the data collection, the adolescents were thanked for their participation by giving them a small present. All data were collected during a single session. The study was approved by the Faculty Ethical Review Board (FETC17-091).

Measures

Big Five Inventory-2.—Normative personality traits as defined by the Five Factor Model were assessed by the Dutch translation of the Big Five Inventory-2 (BFI-2; Soto & John, 2017; Denissen, Geenen, Soto, John, & Van Aken, 2019). The BFI-2 is a self-report questionnaire that contains 60 items and includes five broad domains: Negative Emotionality (or 'Neuroticism'), Extraversion, Agreeableness, Conscientiousness, and Open-mindedness (or 'Openness'). Each domain consists of three lower-order facets and twelve items. Each item starts with the statement "I see myself as someone who…", followed by a series of phrases. Responses are made on a five-point Likert scale, ranging from 1 = *disagree strongly* to 5 = *agree strongly*. Existing research shows that the psychometric qualities of the BFI-2-NL are good (Denissen et al., 2019). In the current study, Cronbach's alpha and mean inter-item correlations (IIC) of facets ranged from α = 0.44 and mean IIC = 0.17 (Intellectual Curiosity) to α = 0.84 and IIC = 0.56 (Organization) (see Table S1).

Personality Inventory for DSM-5.—Maladaptive personality traits as defined in the DSM-5 were assessed by the Dutch translation of the 100-item self-report Personality

Inventory for DSM-5 Faceted Brief Form (PID-5-FBF; Maples et al., 2013; Koster et al., 2019). The measure contains a series of statements, to be rated on a four-point Likert scale, ranging from 0 = *very false or often false* to 3 = *very true or often true*. The PID-5 contains 25 lower-order facets that are combined to form the five higher-order scales. Each facet of the PID-5-FBF consists of four items. The psychometric qualities of the PID-5 are good and the PID-5 can be used in adolescents (Al-Dajani et al., 2016; De Clercq et al., 2014). In the current study, Cronbach's alpha of facets ranged from α = 0.50 and IIC = 0.19 (Impulsivity) to α = 0.88 and IIC = 65 (Distractibility) (see Table 1).

Data Analysis

Descriptive analyses and correlational analyses for PID-5 and BFI-2 facets were performed in IBM SPSS version 24.0.

Scoring.—Scores for the facets (i.e., traits) of each measure were computed and subsequently converted into integers (a prerequisite for IRT). We followed the same procedure as Suzuki and colleagues (2015). A metric with equal intervals was made, because standard rounding procedures would create unequal intervals (i.e., a score on the PID-5 could only result in 1 and 4 if the raw score was in a range of 0.50, while the range was 1.00 for a score of 2 and 4). For the PID-5, the final facet scores for each individual were computed with intervals of 0.75. That is, when the average score was between 1 and 1.74, it equaled 1, when it was between 1.75 and 2.49 it equaled 2, when it was between 2.5 and 3.24 it equaled 3, and when it was between 3.25 and 4 it equaled 4. For the BFI-2, an interval of 0.80 instead of 0.75 was used given the 5-point Likert scale. Additionally, the BFI-2 facets were scored in the same direction as the PID-5 facets (e.g., BFI-2 Agreeableness facets were scored the other way around to match the direction of PID-5 Antagonism).

Dimensionality.—Unidimensional IRT models assume that a broad, general factor underlies all items of a scale. Therefore, the presence of a single underlying dimension for PID-5 and BFI-2 facets must first be checked before proceeding with IRT. This makes meaningful comparison of PID-5 and BFI-2 domains possible. To do this, a three-step approach was used. First, we assigned the PID-5 and BFI-2 lower-order facets to each of their domains, consistent with Maples and colleagues (2015) and Soto and John (2017). Second, we combined the facets of the PID-5 and BFI-2 as was demonstrated in previous joint factor analyses (e.g., facets of Negative Affect and facets of Neuroticism; Krueger & Markon, 2013). Third, a confirmatory factor analysis (CFA) was performed in using the package *lavaan* in R (Rosseel, 2012) to verify the dimensionality of each pair of domains. The estimator weighted least square mean and variance adjusted (WLSMV) was used as it provides the best option for ordered data (Brown, 2006). The CFA was guided by three different measures of model fit (MacCallum, Browne, & Sugawara, 1996; Hu & Bentler, 1999): the RMSEA (good fit when < .08; sufficient fit when 0.08-0.10), and the TLI and the CFI (good fit when > .95; sufficient fit when > .90). When the model did not have an overall sufficient model fit, non-significant factor loadings were removed to improve model fit.

Item response theory.—Unidimensional IRT models show the relationship between a latent dimension (theta; θ) measured by an instrument and an item response (DeMars, 2010). In this study, facets of the BFI-2 and PID-5 were used as the 'items'. BFI-2 domains were compared to the respective PID-5 domains (e.g., Neuroticism to Negative Affect). IRT analyses were performed in R using the package *mirt* (Chalmers, 2012). The Graded Response Model (GRM; Samejina, 1970) was fit because responses on the PID-5 consisted of multiple ordinal categories. In the GRM, the mean of the latent dimension is set to zero, with a standard deviation of one.

The GRM produces two types of parameters. The alpha (α) parameter captures how well an item can differentiate between individuals with different levels of the latent dimension (i.e., personality) being measured. Higher values indicate greater differentiation and greater contribution to psychometric information. The beta (β) parameters, often referred to as thresholds, describe the location along the latent dimension at which individuals have a 50% probability of responding above that particular response category. The number of beta parameters is always one fewer than there are response categories: when there are five response categories, the amount of beta parameters is four. Lower values of the beta parameters indicate that a lower level of the latent dimension is needed for that particular threshold.

Furthermore, IRT produces information functions that were primarily relevant for the current study. Test-information functions (TIFs) is a function of both the alpha and beta parameters and show the amount of psychometric information of a measure (or scale) across the latent dimension. The more information a measure provides at a certain level of the latent dimension, the smaller the standard error of measurement (SE) and the greater the reliability for estimating θ. The TIFs and SE's of each BFI-2 domain were compared to the TIFs and SE's of the respective PID-5 domain (e.g., Neuroticism to Negative Affect). The greater the distance between the two curves, the greater the difference in amount of information that each measure is providing at a particular level of the latent dimension.

Results

Descriptive Statistics

Descriptive statistics are reported in Table 1. Correlations between PID-5 and BFI-2 facets can be found in the Supplementary Materials Table S1.

Dimensionality

Confirmatory factor analyses of each pair of domains resulted in a final facet set, see Table 2. Removing the non-significant PID-5 facets (lack of) Restricted Affect (from the Negative Affect domain) and (lack of) Rigid Perfectionism (from the Disinhibition domain) led to an acceptable model fit for (RMSEA = 0.09; CFI = 0.98; TLI = 0.97) and Disinhibition-Conscientiousness domain (RMSEA = 0.12; CFI = 0.94; TLI = 0.91). Accordingly, these facets were dropped in subsequent IRT analyses. While for the domain pairs Detachment-Extraversion and Antagonism-Agreeableness the CFI and TLI indicated sufficient model fit (CFI = 0.94 and TLI = 0.91 for both domain pairs), the RMSEA did not reach the

threshold for sufficient model fit (RMSEA = 0.12 for both domain pairs), suggesting a weak underlying dimension. For the domain pair Psychoticism-Openness, no single underlying dimension was found as only one of the three fit statistics indicated sufficient model fit (RMSEA = 0.15; CFI = 0.91; TLI = 0.81). Based on these results, IRT analyses were conducted for all pairs of domains except Psychoticism-Openness.

Item Response Theory

Table 3 presents the alpha (i.e., differentiation) and beta (i.e., threshold) parameters for the PID-5 and BFI-2 facets and domains. The average alpha values for the domains were near 1.0 or larger than 1.0, indicating that they provided considerable information about the latent dimension. The beta parameters (thresholds) are well spread across the latent dimension. The distance between the lowest and highest beta parameter was 3.78-7.43 units for the BFI-2 and 4.03-5.00 units for the PID-5.

The test information functions (TIFs) of both measures (see Figure 1) integrate the alpha and beta parameters and represent the amount of psychometric information each measure provides at the levels of the latent dimension. Regarding the Neuroticism-Negative Affect domain, the TIFs indicate that the PID-5 provided more information (smaller standard error of measurement; *SE*) than the BFI-2 at the average levels and the higher levels (i.e., $\theta = 0$ and $\theta = 1$), but not at the very high levels (i.e., $\theta = 2$). At $SD = 0$ ($\theta = 1$), the *SE* was 0.59 for the PID-5 and 0.72 for the BFI-2. At $SD = 1$ ($\theta = 1$), the PID-5 had an *SE* of 0.57, while the BFI-2 had an *SE* of 0.69. At $SD = 2$ ($\theta = 2$), the *SE* was 0.58 for the PID-5 and 0.59 for the BFI-2. The BFI-2 provided slightly more information at the lower levels. Within the Extraversion-Detachment domain, the BFI-2 facets were hardly informative for the latent dimension (this is further confirmed by the low alpha parameters for two of the three BFI-2 facets). The PID-5 provided substantially more information (smaller *SE*) than the BFI-2 at the average and (very) high levels. At $SD = 0$, the *SE* was 0.61 for the PID-5 and 1.10 for the BFI-2. At $SD = 1$, the PID-5 had an *SE* of 0.43, and the BFI-2 had an *SE* of 1.08. At $SD = 2$, the *SE* was 0.42 for the PID-5 and 1.09 for the BFI-2. At the very low levels, however, the BFI-2 provided somewhat more information than the PID-5. However, the amount of information that both measures provide at these low levels is very small. Regarding the Agreeableness-Antagonism domain, the PID-5 provided slightly more information at both the average and higher levels than the BFI-2. At $SD = 0$, the *SE* was 0.67 for the PID-5 and 0.75 for the BFI-2. At $SD = 1$, the PID-5 had an *SE* of 0.56, and the BFI-2 had an *SE* of 0.73. At $SD = 2$, the *SE* was 0.54 for the PID-5 and 0.72 for the BFI-2. The BFI-2 provided more information at the lower levels. The BFI-2 also provided more information at the very high levels ($\theta > 4$) but this difference is relatively small. Finally, within the Conscientiousness-Disinhibition domain, the BFI-2 provided more information than the BFI-2 for almost the entire range of the latent dimension. At $SD = 0$, the SE was 0.75 for the PID-5 and 0.61 for the BFI-2. At $SD = 1$, the PID-5 had an *SE* of 0.75, and the BFI-2 had an *SE* of 0.60. At $SD = 2$, the *SE* was 0.84 for the PID-5 and 0.61 for the BFI-2.

In sum, although the BFI-2 generally captured the lower levels of the latent dimension slightly better than the PID-5, both measures were not very informative at these levels. The PID-5 generally provided more information at the average and higher levels for

Neuroticism-Negative Affect, Extraversion-Detachment, and Agreeableness-Antagonism. For Conscientiousness-Disinhibition, the BFI-2 provided more information than the PID-5 across almost all the levels of the latent dimension. Both measures were barely informative at the extremely high levels ($\theta > 3.5$). However, such extremely high levels were hardly represented in the sample.

Post-hoc analysis

The results show a particularly high alpha parameter (discrimination) of Depressivity within the Detachment-Extraversion domain. Considering the ongoing debate regarding the association of Depressivity with the Detachment domain, an additional analysis of the Detachment-Extraversion domain, without Depressivity, was performed. It appeared that with removal of this facet, Detachment provided around three times less information (see Figure S1 in Supplementary Materials).

Discussion

Numerous factor-analytic and correlational studies have suggested that maladaptive personality traits lie on dimensional continua with normative personality traits (e.g., Krueger & Markon, 2014). Building upon the increasing scientific interest in early emerging personality pathology, the present study aimed to replicate this finding in adolescents. Importantly, by using Item Response Theory, this study also extended prior research by investigating whether maladaptive traits (measured with the PID-5) tap the extreme levels of personality better than Five Factor Model (FFM) personality traits (measured with the BFI-2).

Can Maladaptive Personality Traits be Conceptualized Within the FFM Framework?

With regard to the dimensionality of PID-5 and BFI-2 traits, we found differences in the extent to which a single underlying factor was present. Specifically, dimensionality existed for Neuroticism-Negative Affect and Conscientiousness-Disinhibition, and to some extent also for Extraversion-Detachment and Agreeableness-Antagonism. For Openness-Psychoticism no underlying dimension was found. This is partly consistent with the expectations based on earlier studies in both adults and adolescents demonstrating an underlying dimension for these domains (e.g., Gore and Widiger, 2013; De Fruyt et al., 2013; Pocnet et al., 2018; Thomas et al., 2013; Watson et al., 2013; De Caluwé et al., 2019; Verbeke & De Clercq, 2014), sometimes with the exception of Openness and Psychoticism (e.g., Watson et al., 2013; Chmielewski, Bagby, Markon, Ring, & Ryder, 2014). The findings of the current study indicate that although particularly Detachment and Antagonism are similar to their respective FFM traits, they also have important differences. These differences were larger than expected based on previous studies in adults. However, from a developmental perspective, during adolescence certain facets of Antagonism or Detachment may be reflective of FFM traits other than Agreeableness or Extraversion as during adulthood. For instance, De Clercq and colleagues (2014) suggested that during adolescence, hostility might be more reflective of impulsivity (i.e., Disinhibition) than of Antagonism as demonstrated in adult studies.

Particularly in the literature on adult personality, debate is ongoing on how to interpret the association between Openness and Psychoticism, and the suggested lack of dimensionality in particular. That is, sometimes the domains do not appear to align neatly. Firstly, it has been proposed that the hallucinations and delusions that make up the PID-5 Psychoticism domain might be conceptually different than FFM traits and might be best understood as part of a psychotic disorder (Gore & Widiger, 2013). Secondly, it has been suggested that Psychoticism might be a personality trait fundamentally distinct from other FFM traits and may therefore represent a sixth factor in a personality model (Chmielewski et al., 2014). Finally, the association between Openness and Psychoticism may possibly be affected by the way Openness is operationalized. Widiger and Crego (2019) state that for four of the five trait domains, the maladaptive DSM-5 traits are aligned with the largely maladaptive pole of FFM traits, which results in a considerable overlap between domains as showed in the aforementioned IRT study (Suzuki et al., 2015). For instance, Neuroticism is about as maladaptive as Negative Affectivity. However, Openness is largely adaptive, whereas Psychoticism is maladaptive. Psychoticism might therefore be related to Openness only when the content of Openness is changed to be more maladaptive (Haigler & Widiger, 2001) or solely to Openness' aspects of aesthetic sensitivity and creative imagination and not to the aspect of intellect (e.g., Chmielewski et al., 2014; Moorman & Samuel, 2018; Crego & Widiger, 2017). Similarly, a behavioral genetic study found that Psychoticism is differently related to the aspects of Openness (Wright, Pahlen & Krueger, 2017).This last explanation could be tested by assessing associations at the facet level, rather than for the broader domain. Although in the current study facets were assessed, because of the modest sample size we were very limited in number of (extra) tests we could do (correlations between the facets can be found in Supplementary Table S2). Future studies with larger sample sizes are needed to test the associations at the facet level, as well as examine the two alternative explanations, both in adult and in adolescent samples.

In sum, the findings of the present study indicate that four of the five DSM-5 maladaptive personality traits can be conceptualized within the FFM framework. Most importantly, this suggests that research on the FFM in adolescents is relevant to emerging personality pathology. Given that FFM traits in adolescence are related to many life outcomes such as academic problems (Soto & Tackett, 2015), DSM-5 traits may share this predictability as well. Interestingly, Suzuki, Griffin and Samuel (2015) reported that the DSM-5 traits and FFM traits are similarly related to meaningful individual, societal and interpersonal outcomes. Similarities in outcomes of FFM Openness and DSM-5 Psychoticism were evident when specific lower-order facets of FFM Openness were considered. These results indicate yet again that DSM-5 traits can be regarded as an instantiation of the FFM, in a way beyond traditional correlational and factor analyses.

Do Maladaptive Personality Traits Capture Extreme Levels of Personality Better Than Normative Personality Traits?

Tapping into a more developmental perspective on personality pathology, the current study examined the assumption of the DSM-5 (2013) that DSM-5 personality traits capture the extreme levels of personality better than FFM traits. To this end, we conducted IRT analyses to investigate whether PID-5 traits could better capture the higher end of personality than

BFI-2 traits. The findings supported the assumption of the APA (2013) for the domains Neuroticism-Negative Affect, Extraversion-Detachment, and Agreeableness-Antagonism. For Conscientiousness-Disinhibition, however, the BFI-2 could better capture all levels of the latent dimension than the PID-5. Although the BFI-2 generally captured the lower levels slightly better than the PID-5, both instruments hardly captured the low levels of personality. The extremely high levels were also not captured adequately but this may be due to that such levels hardly occurred in the sample. Nonetheless, both the PID-5 and BFI-2 provided psychometric information at a broad range of the latent factor. The idea that the complexity of personality pathology may not be captured by a measure of normative personality traits therefore needs reconsideration. Although the measure of normative personality traits might adequately capture the complexity of personality pathology, results showed that the PID-5 generally offered substantially more psychometric information than the BFI-2 in a more specific range (i.e., higher levels).This may implicate that the PID-5 can predict closely matched criteria with greater accuracy than the BFI-2 (Paunonen & Ashton, 2001) and may therefore have greater value for assessing personality pathology.

While these findings are largely similar to previous IRT studies in adults, there were three major differences between the current study in adolescents and a prior IRT study in adults comparing the PID-5 and an FFM measure (the International Personality Item Pool Representation of the NEO-PI-R [IPIP-NEO]; Goldberg et al., 2006). First, compared to the study of Suzuki and colleagues (2015), in which PID-5 domains were informative mainly at the higher levels, in the present study, most of the PID-5 domains showed to be informative at the average levels as well. Second, different from Suzuki and colleagues (2015), BFI-2 Conscientiousness appeared to be more informative than PID-5 Disinhibition for the entire range of the latent dimension. Third, whereas Suzuki and colleagues (2015) found Extraversion to be informative for the latent dimension, in the current study, PID-5 Detachment defined the domain much more strongly than BFI-2 Extraversion.

These differences may be due to age-specific processes. That is, the same underlying trait may manifest across ages (Cichetti & Crick, 2009). For example, research suggests that the level of Neuroticism is higher in adolescents than in adults (Soto, John, Gosling, & Potter, 2011). The average levels of Neuroticism in adolescents may therefore reflect some degree of Negative Affect. Indeed, Costa and McCrae (1980) state that high levels of Neuroticism manifests in heightened emotional lability and a tendency to focus on negativity. In the current study, Neuroticism and Negative Affect may show more similarities than in adults, which might explain the finding that Negative Affect was informative at the average levels of personality. Similarly, adolescents appear to be less conscientious than adults, possibly because adolescents are limited in their ability for self-regulation (Denissen, Van Aken, Penke, & Wood, 2013). Accordingly, adolescents' levels of Conscientiousness might correspond more to Disinhibition than is the case in adults and as such may explain the finding that Disinhibition was mainly informative at the average levels of personality. Future IRT research may incorporate a longitudinal design in which the development of normative and maladaptive personality traits is captured from adolescence into adulthood to investigate these suggested explanations more closely.

Surprisingly, BFI-2 Conscientiousness was more informative than PID-5 Disinhibition at all levels. An explanation for this finding may be the possible irrelevance or difficult formulation of certain Disinhibition items for (young) adolescents (e.g., “I often forget to pay my bills”). Similarly, the Detachment facet Intimacy Avoidance appeared to be poorly related to the underlying factor of Detachment and Extraversion, perhaps because of its focus on romantic and sexual relationships that may not be relevant for especially young adolescents. Moreover, earlier studies have indicated that certain facets (e.g., Depressivity) might be misclassified as Detachment facets (Watson et al., 2013; Al-Dajani et al., 2016). The BFI-2 sorts the Depression facet into the Neuroticism domain instead of the Extraversion domain. Accordingly, Detachment of the PID-5 and Extraversion of the BFI-2 may have slightly different conceptualizations and subsequently, there may be only a weak association between Detachment and Extraversion. Both our main analyses and the additional post-hoc analysis indicate that, in our sample, the association between Detachment and Extraversion is largely driven by Depressivity. An explanation may be that low Extraversion might be linked to especially traits that consist of social anhedonia (Langvik & Borgen Austad, 2019). It could be that particularly in adolescents, depressivity is linked to a lack of motivation or desire to engage in pleasurable daily activities, making adolescents less likely to go out (Van Roekel et al., 2016). These notions should be taken into account when considering using the PID-5 in adolescents

Strengths and Limitations

The current study had two main strengths. First, this study is one of the few that examines the PID-5 and the BFI-2 in an adolescent sample. To our knowledge, no study before has used IRT to investigate the relationship between maladaptive and normative personality traits in adolescents. Using IRT, the current study could comprehensively indicate where on the common dimension FFM and PID-5 traits lie, an aspect that previous correlational and factor-analytic studies were unable to provide. Focusing on adolescents, the present study built on the increasing attention for emerging personality pathology in adolescents. This study also emphasized the importance of perceiving adolescents’ emerging personality pathology as a dimensional construct rather than as a state or condition that is qualitatively different from normative personality traits. Importantly, such a conceptualization enables early detection of personality pathology. Second, the study extended the current knowledge about the relationship between FFM and PID-5 traits by using a relatively new instrument, the (Dutch version of the) BFI-2 (Koster et al., 2019). Prior studies regarding this association have frequently used NEO inventories (Costa & McCrae, 1992). Despite many similarities between NEO inventories and the BFI-2, there are slight differences in operationalization (Rammstedt & John, 2007). For instance, in contrast to the BFI-2, IPIP-NEO (Goldberg et al., 2006) includes components related to immodesty and manipulativeness that allow for stronger relationships with psychopathic and narcissistic traits (Maples-Keller et al., 2017) and perhaps also with PID-5 Psychoticism as this domain represents these components as well. Hence, the differences between measures may be important because it might shed light on the differences in the extent to which the domain of either the BFI-2 or a NEO inventory is related to their respective domain of the PID-5. Nonetheless, the BFI-2 (like the IPIP-NEO) might not be the optimal instrument for testing the relationship between Openness and Psychoticism, as Openness in the BFI-2 is more focused on the adaptive range

of Openness rather than the maladaptive range. Similar work with an alternative instrument that includes maladaptive Openness but also includes more factors, such as the HEXACO (Lee & Ashton, 2004) may lead to different conclusions.

When interpreting the results, it is important to take into account the limitations of the current study. First, a methodological limitation is that results of the IRT analyses could have been influenced by varying characteristics of the PID-5 and BFI-2 measures. Specifically, the number of response categories and the number of items within each domain were not equal across measures. The amount of information generally increases with the number of response categories and the number of items (DeMars, 2010). Given the focus of the current study, it was most meaningful to evaluate the measures as they were. It should be kept in mind though, that conclusions of the findings are limited by the instruments and procedures used in the current study. Another methodological issue that may be considered is the use of confirmatory factor analyses to test for dimensionality. In the current study, we followed the procedure by Suzuki and colleagues (2015). Alternative statistical approaches, such as an exploratory factor analysis, may yield slightly different findings. Furthermore, our sample size is relatively modest for this type of analysis (DeMars, 2010). To limit power issues, we are particularly careful doing analyses on a facet-level. Therefore, although in the current study facets were assessed, because of the modest sample size we were very limited in number of (extra) tests we could do (correlations between the facets can be found in Supplementary Table S2). Second, the intended purpose of the PID-5 is to assess clinically relevant personality traits (Krueger et al., 2012). However, the current study consisted of a nonclinical sample in which clinical levels of personality traits might be less common than in a clinical sample. Although the PID-5 can also be used in normative adolescent populations (De Clercq et al., 2013), results may differ between a nonclinical and clinical population because the average level of personality is presumably different across populations. Replicating this study in a clinical sample is an important next step for future research. Third, the current study was limited to investigating the range of one particular end of FFM traits because the DSM-5 personality model is a unipolar model. That is, DSM-5 personality traits do not refer to maladaptive functioning at the opposite end of FFM traits, such as neediness at the high end of Agreeableness, while this opposite end is also related to psychopathology (Dunkley, Blankstein, Zuroff, Lecce, & Hui, 2006). It should therefore be remembered that extremity in this study only refers to a certain end of FFM traits.

Conclusion

The general assumption of the APA (2013) is that DSM-5 maladaptive personality traits represent extreme versions of FFM traits that cannot fully be captured by FFM measures. The current study confirms this notion and suggests similarities and continuity in the DSM-5 conceptualization of personality pathology between adolescents and adults for Neuroticism-Negative Affect, Extraversion-Detachment, and Agreeableness-Antagonism, but not for Conscientiousness-Disinhibition, and Openness-Psychoticism. However, there are also important differences between adults and adolescents that need to be considered when using the PID-5 in adolescents. In sum, our findings pave the way for research of the FFM to be applied to adolescents' emerging personality pathology. The next step is to adequately interweave the DSM-5 conceptualization into assessment and diagnosis

of personality pathology to acknowledge and detect adolescents' emerging personality pathology.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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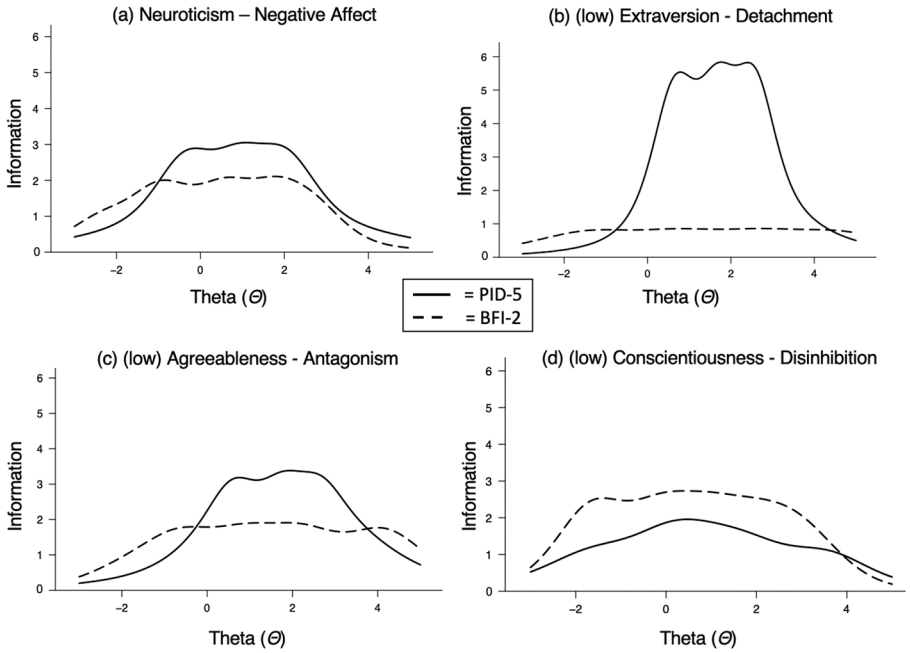

Figure 1.

Test information curves for BFI-2 traits (dashed line) and PID-5 traits (solid line). *Note*. PID-5 = Personality Inventory for DSM-5; BFI-2 = Big Five Inventory-2; Theta = latent dimension (i.e., personality).

Table 1

PID-5 and BFI-2 domains and facets used for item response theory analyses

Domains and facets	
PID-5	**BFI-2**
Negative affect	Neuroticism
Anxiousness	Anxiety
Emotional lability	Emotional volatility
Hostility	Depression
Perseverance	
Separation insecurity	
Submissiveness	
(low) Restricted affect	
Detachment	(low) Extraversion
Anhedonia	Energy level
Depressivity	Assertiveness
Intimacy avoidance	Sociability
Suspiciousness	
Withdrawal	
Antagonism	(low) Agreeableness
Attention seeking	Trust
Callousness	Respectfulness
Deceitfulness	Compassion
Grandiosity	
Manipulativeness	
Disinhibition	(low) Conscientiousness
Distractibility	Organization
Impulsivity	Productiveness
Irresponsibility	Responsibility
Risk taking	
(low) Rigid perfectionism	
Psychoticism	*Openness*
Eccentricity	*Intellectual curiosity*
Perceptual dysregulation	*Aesthetic sensitivity*
Unusual beliefs	*Creative imagination*

Note. Italicized facets were not used in the item response theory analyses; PID-5; Personality Inventory for DSM-5; BFI-2 = Big Five Inventory-2; (low) = Transformed into reverse direction.

Table 2

Parameter estimations for the facets of the PID-5 and BFI-2

Domains and facets	*α*	*β1*	*β2*	*β3*	*β4*
Negative affectivity/neuroticism					
PID Anxiousness	2.17	−0.27	0.88	1.93	NA
PID Emotional lability	1.95	−0.40	1.02	2.17	NA
PID Hostility	0.91	−1.72	1.05	3.38	NA
PID Perseverance	0.90	−1.12	1.54	3.58	NA
PID Separation insecurity	0.77	−2.07	1.19	3.76	NA
PID Submissiveness	0.51	−2.21	1.94	7.37	NA
BFI Anxiety	1.81	−2.33	−0.87	0.63	1.92
BFI Depression	1.97	−0.95	0.56	1.78	2.68
BFI Emotional volatility	2.23	−1.13	0.26	1.35	2.33
PID mean (SD)	1.20 (0.68)	−1.30 (0.84)	1.27 (0.40)	3.70 (1.95)	NA
BFI mean (SD)	2.00 (0.21)	−1.47 (0.75)	−0.02 (0.75)	1.25 (0.58)	2.31 (0.38)
Detachment/(low) Extraversion					
PID Anhedonia	3.06	0.59	1.76	2.61	NA
PID Depressivity	2.88	0.83	1.55	2.48	NA
PID Intimacy avoidance	0.43	0.95	2.94	7.18	NA
PID Suspiciousness	0.97	−0.24	1.98	4.65	NA
PID Withdrawal	1.66	0.40	2.19	3.52	NA
BFI Energy level	1.28	−1.36	0.75	2.71	−5.96
BFI Assertiveness	0.69	−2.51	0.27	3.40	−5.38
BFI Sociability	0.93	−1.48	0.72	2.67	−4.15
PID mean (SD)	1.80 (1.15)	0.13 (0.72)	2.08 (0.54)	4.09 (1.94)	NA
BFI mean (SD)	0.97 (0.30)	−1.78 (0.63)	0.58 (0.27)	2.93 (0.41)	5.65 (1.89)
Antagonism/(low) Agreeableness					
PID Attention-seeking	0.61	−1.90	1.44	4.77	NA
PID Callousness	2.54	0.63	1.79	2.64	NA
PID Deceitfulness	1.58	0.05	1.69	3.42	NA
PID Grandiosity	1.31	0.78	2.49	3.69	NA

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Domains and facets	*α*	*β1*	*β2*	*β3*	*β4*
PID Manipulativeness	0.93	−0.73	1.77	4.47	NA
BFI Trust	1.36	−1.82	0.32	2.22	4.49
BFI Respectfulness	1.34	−0.73	1.03	2.70	3.99
BFI Compassion	1.77	−0.64	0.97	2.15	4.13
PID mean (SD)	1.36 (0.75)	−0.23 (1.10)	1.84 (0.39)	3.80 (0.85)	NA
BFI mean (SD)	1.49 (0.24)	−1.06 (0.65)	0.77 (0.39)	2.35 (0.30)	4.20 (0.26)
Disinhibition/(low) Conscientiousness					
PID Distractibility	1.54	−1.53	−0.14	0.89	NA
PID Impulsivity	1.19	−1.86	0.50	2.69	NA
PID Irresponsibility	1.65	0.28	1.76	3.63	NA
PID Risk taking	0.60	−1.73	1.08	3.32	NA
BFI Organization	1.67	−1.30	−0.20	0.75	1.88
BFI Productivity	1.93	−1.76	−0.22	1.08	2.68
BFI Responsibility	1.79	−1.59	0.35	1.90	3.29
PID mean (SD)	1.25 (0.48)	−1.21 (1.00)	0.80 (0.81)	2.63 (1.23)	NA
BFI mean (SD)	1.80 (0.13)	−1.55 (0.23)	−0.02 (0.32)	1.24 (0.59)	2.62 (0.71)

Note. PID = Personality Inventory for DSM-5; BFI = Big Five Inventory-2; M = mean value for each scale; SE = mean standard error for each scale; NA = not applicable; (low) = Facets are transformed into reverse direction; *α* = discrimination parameter; *β1* = threshold for disagree response option; *β2* = threshold for agree (PID-5) or neutral (BFI-2) response option; *β3* = threshold for strongly agree (PID-5) or agree (BFI-2) response option; *β4* = threshold for strongly agree response option (BFI-2).

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