# Five Factor Model of Personality and Structure of Psychopathological Symptoms in Adolescents

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**Abstract**

This study aims to explore the factorial structure of the most prevalent psychopathological symptoms in adolescence, and to explore the associations between the resulting psychopathological factors with both the Five-Factor Model of personality and the General Factor of Personality (GFP). A sample of 835 adolescents ($M$ = 14.35, $SD$ = 1.58; 49% girls) completed personality and psychopathology self-reports. The confirmatory factor analyses showed that a bifactor model of psychopathology, which included a general psychopathological factor (p factor) and specific factors (i.e., internalizing, externalizing, and hyperactivity and attention problems), better fitted the data than other competing models. The main associations found in the regression analyses were: neuroticism and introversion with the internalizing factor; low agreeableness with the externalizing factor; low conscientiousness with the hyperactivity and attention problems score; high neuroticism, low conscientiousness and low agreeableness with the p factor. Last, the GFP and p factor were substantially related, with $\beta$ coefficients between .42 and .49 ($p$<.001). This study suggests that a bifactor model adequately depicts the psychopathology structure in adolescence. This structure was supported by differential associations of personality traits with each resulting factor.

**Keywords*:*** personality, psychopathology, adolescents, internalizing, externalizing; big five; general factor.

## 1. Introduction

Mental disorders are one of the major causes of disability in youths aged 10-19 years (WHO, 2012) with a strong impact on society due to high socio-economic and health costs (Trautmann, Rehm, & Wittchen, 2016). For these reasons, a better understanding of the etiology of the most prevalent mental disorders during this life period could have important implications for developing prevention/intervention programs.

### 1.1 Psychopathology structure

Clinical disorders co-occur more often than expected by chance (Krueger & Markon, 2006). This comorbidity could be due to common underlying spectra (South, Eaton, & Krueger, 2010). Accordingly, studies about the structure of common mental disorders have found two correlated high-order latent factors of psychopathology: internalizing, characterized by anxiety and mood symptoms; externalizing, characterized by antisocial behavior and conduct problems in both children and adults (Cosgrove et al., 2011; Krueger 1999). This structure remains stable over the time, and between age and gender groups, when employing clinical vs. community samples, and when using symptom scales, symptom counts of psychiatric diagnostic categories or categorical diagnoses (Mezquita et al., 2015). In addition, a growing body of contemporary research suggests that the psychopathology structure could be better accounted for by a *bifactor model*, in which a common general factor, called the p factor, emerges with externalizing and internalizing factors (Caspi et al., 2014; Carragher et al., 2015; Lahey et al., 2012; Murray et al., 2016; Tackett et al., 2013).

Although the overall psychopathology structure is well-established when conduct-related disorders, anxiety and depression are included, the location of the Attention Deficit and Hyperactivity Disorder (ADHD) in the structure is less clear. Studies tend to consider

ADHD or inattention and hyperactivity-impulsivity symptoms in the externalizing factor (Carragher et al., 2014; Cosgrove et al., 2011; Laceulle et al., 2015; Tackett et al., 2013). However, ADHD symptoms usually present the lowest factor loadings in most studies (Lahey et al., 2017; Snyder et al., 2017), or even negative factor loadings in the externalizing factor when testing bi-factor models (Castellanos-Ryan et al., 2016). ADHD have also been associated with internalizing problems (Greenbaum & Dedrick, 1998; Sellbom, Carragher, Sunderland, Calear & Batterham, 2019), with some studies proposing them to be a separate factor from internalizing and externalizing (Achenbach, Dumenci, & Rescorla, 2001; Sánchez-Sánchez et al, 2016). These data generally suggest that the location of ADHD symptoms within the psychopathology structure needs further examination.

**1.2 Psychopathology and personality**

In past decades, evidence has highlighted the close association between personality and psychopathology. Studies on specific disorders show that neuroticism is the most related trait to psychopathology (Tackett & Lahey, 2017; Widiger et al., 2019), mainly to anxiety and depression disorders (Kotov, Gamez, Schmidt, & Watson, 2010). Low agreeableness/antagonism and low conscientiousness/disinhibition have shown robust associations with oppositional defiant and conduct disorders in children (Herzhoff, Smack, Reardon, Martel, & Tackett, 2017), and with antisocial behavior, aggression (Jones, Miller, & Lynam, 2011) and substance use (Kotov et al., 2010) in adults.

Although personality has been postulated as a vulnerability factor that can account for comorbidity between the most prevalent mental disorders (Krueger & Tackett, 2003), research into the association between the Five-Factor Model (FFM) and the suprafactors of psychopathology is limited. When a correlated psychopathology model (i.e. two correlated

high-order latent factors of internalizing and externalizing without the p factor) has been specified in youths (De Bolle et al., 2012) and adults (Mezquita et al., 2015), neuroticism has shown strong associations with the internalizing factor, and low agreeableness and low conscientiousness with the externalizing factor. Exploring the FFM broad traits and the bifactor model of psychopathology is even scarcer. Caspi et al. (2014) found that the p factor in adults was related mainly to neuroticism, followed by low conscientiousness and low agreeableness, while the externalizing factor was related to low conscientiousness, low agreeableness and, to a lesser extent, to extraversion. Last, the internalizing factor showed weak associations with neuroticism, introversion, agreeableness and conscientiousness.

As far as we know, there is only one previous study that has addressed the association of the FFM with the bi-factor model of psychopathology in adolescents (Castellanos-Ryan et al, 2016). This study showed the same associations of the FFM traits with the p factor found in the study by Caspi et al. (2014). However, a different pattern of associations emerged with internalizing and externalizing factors. Specifically, neuroticism presented strong associations with the internalizing factor, and extraversion displayed a weak, but significant, association with the externalizing factor (Castellanos-Ryan et al., 2016). These differences could suggest subtle, yet distinct, developmental trends in personality-psychopathology associations, as well as differences in factors content. Overall, the association between the p factor and FFM traits deserves much more research attention.

Last, and in parallel to the general psychopathology factor, a general factor of personality (GFP) has also been proposed in the personality literature. The GFP has been interpreted as a tendency toward better emotional adjustment and increased social effectiveness (van der Linden et al, 2017). Studying the overlap between the p factor and the GFP may help to elucidate the nature of these constructs (Oltmanns et al., 2018). In line

with this, Oltmanns et al. (2018) found a correlation between the GFP and the p factor of 0.72 and 0.90 with the general factor of personality disorders (GFPD), while the correlation between the p factor and the GFPD was .92. These data indicate that three general factors share a considerable amount of variance, and may reflect the extent of impairment or dysfunction within the respective persons' lives, irrespectively of whether that impairment is attributed to psychopathological symptoms, personality disorders or a certain personality configuration. Similarly, Rosenstrom et al. (2019) found a common general factor for normal personality traits and its maladaptative variants based on personality disorders. This factor showed a correlation of .49 with the p factor, which is slightly lower than those found by Oltmanns et al. (2018). As far as we know, the association between the p factor and the GFP remains to be explored in adolescents.

### 1.3 The present study

There is evidence for the replicability of the bifactor structure of common mental disorders and psychopathological symptoms in both youths and adults. However, certain issues require further examination. Specifically, the present research aims to explore: a) the psychopathology structure in adolescents, assessed with symptoms scales related to the most prevalent mental disorders (correlated vs. bi-factor models; see Figure 1: Models 2 and 3 vs. 4 and 5); b) the location of hyperactivity and attention problems in correlated and bifactor models (i.e., externalizing or specific factor; see Figure 1 Models 2 and 4 vs. 3 and 5); c) the associations of the FFM personality broad traits with the resulting factors of psychopathology; d) the convergence between the p factor and the GFP in a sample of adolescents.

## 2. Method

### 2.1 Sample

A sample of 835 adolescents, aged between 12 and 18 years (mean age = 14.35, *SD* = 1.58; 49% girls), participated in this study. All the participants were high school students. Their age distribution was: 12 to 13 years (34.87%); 14 to 16 years (55.42%); 17 to 18 years (9.71%). Most (83.21%) were Spanish, and the rest were from: 7.82% Romania; 3.81% Latin America; 2.04% Morocco; 1.42% Asia; 0.60% the Middle East; 1.13% other European countries.

### 2.2 Procedure

The participants were evaluated in class after receiving informed consent from their parents/guardians and school. The study was approved by the Deontological Committee of the authors' university. Participation was voluntary, questionnaires were filled out on paper and safeguarding their data confidentiality was ensured.

### 2.3 Measures

#### 2.3.1 Psychopathological symptoms

The SENA (Fernández-Pinto et al., 2015) is a self-report that assesses adolescents aged 12-18 years. We used the scales most related to the internalizing and externalizing factors: depression, anxiety, social anxiety, post-traumatic symptomatology, somatic complaints, hyperactivity/impulsivity, attention problems, aggression, antisocial behavior and defiant behavior. The participants answered a 5-point Likert-type scale that went from 0 (never/almost never) to 4 (always/almost always). The scores of the SENA scales were obtained by summing the items of each scale. There were no inverse items.

#### 2.3.2 Personality traits

The short form (JS NEO-S; Ortet et al., 2010) of the Junior version of the Spanish NEO-PI-R (Ortet et al., 2012) is a 150-item inventory that assesses: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. The participants

answered on a 5-point Likert-type scale that ranged from 0 (strongly disagree) to 4 (strongly agree).

The Cronbach's alphas of all the herein employed scales are presented in the Supplementary Material (SM1).

**3. Analysis**

Confirmatory factor analyses (CFA) were performed to test the fit of the different hypothesized models (see Figure 1) using Mplus 7.4. Fit was assessed using the Tucker-Lewis Index (TLI) > 0.95, the Comparative Fit Index (CFI) > 0.95, Standardized Root Mean Square Residual (SRMR) < .06, Root Mean Square Error of Approximation (RMSEA) < .08 (Hu & Bentler, 1999) and AIC (Akaike, 1987; Gignac, 2016), for which the lower the value, the better the fit. CFI and RMSEA differences were used to compare the model fit of the competing models. The ΔCFI should be ≤.010 and the ΔRMSEA ought to be ≤ .015 to consider two models to be equivalents (Chen, 2007). The effects of age and gender were controlled for by covarying both with the other variables in the model.

Three methods were followed to extract the GFP. First, the first unrotated factor scores were saved when an EFA was applied to the 30 facets using SPSS 24; second, a one-factor CFA was performed with the five broad traits using Mplus 7.4. (see van der Linden et al., 2017); third, a bi-factor Exploratory Structural Equation Model was performed with the 30 facets (Arias, Jenaro & Ponce, 2018). The results of the GFP extractions can be consulted in SM2.

SPSS 24 was also used to conduct descriptive analyses, Cronbach's alpha, and to explore the associations of the FFM and the GFP with the psychopathological factors (i.e., regression analysis). Cohen's d was performed to compare the mean scores of the

personality traits and psychopathological scales across sex groups using the online calculator at http://www.polyu.edu.hk/mm/effectsizefaqs/calculator/calculator.html.

## 4. Results

### 4.1 Descriptive data

The descriptive results are presented in SM1. The only medium differences across gender groups were found in openness, anxiety and somatic complaints (girls > boys).

### 4.2 Confirmatory Factor Analyses

First, a one-factor model of general psychopathology (Model 1, Figure 1) was specified, which showed poor fit indices (see Table 1). The two-factor correlated model of the internalizing and externalizing problems (Model 2, Figure 1) indicated better fit indices (see Table 1), but were still under the recommended cut-offs. Of the correlated models, the three-factor solution (Model 3, Figure 1), in which the externalizing and hyperactivity and attention problems were differentiated, gave the best fit indices. Next the bi-factor models based on Model 2 (named Model 4 in Figure 1) and Model 3 (named Model 5 in Figure 1) were specified. Both models had fit indices above the recommended cut-offs. However, the factor loadings of the hyperactivity and attention problems on the externalizing factor in Model 4 were -.07 ($p > .05$) and -.22 ($p > .01$), respectively, which suggests that they were not well conceptualized in the externalizing factor. For this reason, Model 5 was chosen as the final model (see Figure 2). This model includes a general factor of psychopathology (p factor), an internalizing factor composed of depression, posttraumatic, anxiety and social anxiety symptoms and somatic complaints, and an externalizing factor comprising aggression and antisocial and defiant behaviors. Although we could not specify a second-order factor of hyperactivity and attention problems in Model 5 because we needed more observed variables to do so, we included a correlation between both variables, which

resulted in an equivalent model in fit index terms. This model showed that attention problems and hyperactivity shared variance to one another ($r$ = .29, $p$ < .001), which was not shared with the other observed variables once the p factor was controlled for.

**4.3 Regression analyses**

In the regression analyses, the factor scores of the CFAs that showed acceptable or good fit indices (Models 3 to 5) were introduced as dependent variables. The personality traits or the GFPs were included as independent variables. As a factorial score of hyperactivity and attention problems could not be extracted in Model 5, we introduced the sum of the symptoms of hyperactivity and attention problems as a dependent variable after regressing out the age and gender effects. Before performing each regression analysis, the assumptions of linearity, homoscedasticity and absence of multicollinearity were confirmed.

The results revealed that the p factor was associated mainly with high neuroticism and low conscientiousness, followed by high extraversion and low agreeableness (Models 4 and 5, Table 2). The internalizing factor was related mainly to neuroticism in the three models. However when the p factor was specified, the internalizing factor also showed close associations with introversion. The externalizing factor was related mainly to low conscientiousness and low agreeableness (Model 3). However when the p factor was specified, the association with low conscientiousness was no longer significant (Model 4 and 5). The hyperactivity and attention factor (Model 3) / score (Model 5) showed the closest associations with low conscientiousness.

The GFPs were strongly associated with the p factor, but also showed similar associations with the HAP score (Model 5) and the internalizing factor (Model 3).

Associations were similar regardless of the extraction method employed to obtain the GFP score.

## 5. Discussion

The aims of the present research were to test the factorial structure of the most prevalent psychopathological symptoms in adolescents and to explore the associations of the factors obtained with the Big Five and the GFP.

When the psychopathology structure was explored, the bi-factor models of psychopathology (Model 4 and 5) better fitted the data than the correlated models, which falls in line with the most recent studies on the psychopathology structure (Gomez et al., 2018; Murray et al., 2016). The final model (Model 5) also showed that the hyperactivity and attention deficit scales had correlated variance, which was not shared with the externalizing factor. This result was similar to a previous study in which the SENA was employed (Sánchez-Sánchez et al., 2016). It also coincided with those studies that have employed other assessment tools, such as CBCL/6-18 and YSR (Achenbach, Dumenci, & Rescorla, 2001), in which attention deficit and hyperactivity symptoms are narrow-band syndromes that do not load on the broad-band syndrome of internalizing and externalizing symptomatology.

The regression analyses findings also supported this structural differentiation between ADHD symptoms and other externalizing symptoms as each psychopathology trait was related to specific personality traits: the p factor with high neuroticism, low agreeableness, low conscientiousness, and extraversion; the internalizing factor chiefly with neuroticism and introversion; the externalizing factor with low agreeableness and low neuroticism; hyperactivity and attention problems mainly with low conscientiousness (see Model 5, Table 2).

When comparing our findings to previous studies on the association of the FFM with the bi-factor psychopathology structure (Castellanos-Ryan et al., 2016; Caspi et al., 2014), we found similarities, but also discrepancies. The association of the p factor with high neuroticism, low agreeableness and low conscientiousness is robust across studies, independently of them being conducted in adolescents, like we did (Castellanos-Ryan et al., 2016), or in adults (Caspi et al., 2014). Neuroticism was the personality trait that was most closely associated with the internalizing factor in the three studies, although associations were usually more marked in youths than in adult populations. The associations of the FFM with the externalizing factor revealed some discrepancies among studies, which can be partly explained by the different symptom scales included in structural models. Hence in the present study, in which the externalizing factor comprised behavioral problems, low agreeableness and low neuroticism were the personality traits to show the closest association with this factor, similarly to the study of Caspi et al. (2014) conducted in adults. However, the externalizing factor in the work by Castellanos-Ryan et al. (2016) comprised mainly substance use disorder symptoms, which could explain why they found that externalizing was related only to extraversion.

Last, and in relation to the general factors, a substantial relation between the GFP and the p factor appeared in our study. Like previous studies, the found associations were similar regardless of the extraction method employed to obtain the GFP (van der Linden et al, 2017). The beta indices ranked from .42 to .47 ($p$<.001), were similar in magnitude to those reported by the study of Rosenstrom et al. (2019), and were somewhat lower than the .72 correlation reported by Oltmanns et al. (2018). Thus our findings partially support the notion that general factors of personality and psychopathology may represent the extent of impairment or dysfunction associated with a certain personality configuration and the

presence of psychopathological symptoms (Oltmanns et al., 2018), but also suggest certain specificity for each general factor, at least in adolescents. In any case, and as far as we know, this is the first study conducted in youngsters that examines the association between the p factor and the GFP. So replication studies are clearly needed.

The present study has several limitations. First, it used only self-report scores. Future studies should consider obtaining reports from other informants like parents or teachers (Achenbach & Ndetei, 2012). Second, its design is cross-sectional. Longitudinal designs would allow the study of prospective and functional associations between personality and psychopathology (De Bolle et al., 2012). Third, including additional measures could help to depict a more complete psychopathology structure, and to refine the associations of the FFM with the resulting psychopathology factors. Last, it was not possible to make a categorical diagnosis. Additional studies with clinical adolescent populations could be useful to better understand the associations of personality with the psychopathology structure.

In conclusion, this research supported a bi-factor structure of psychopathology symptoms in adolescence. The differential associations of FFM traits with each subfactor conferred bi-factor structure support. Our findings have implications for clinical practice as they might suggest that different interventions may be relevant at various levels of this hierarchy. Thus, intervention protocols, such as the unified protocol proposed by Barlow et al. (2017), could be useful for preventing/treating internalizing transdiagnostic spectra. Moreover, the existence of a *p* factor highlights an opportunity to implement transdiagnostic prevention/intervention programs at early ages, even when children manifest a tangle of undifferentiated symptoms (Forbes, Rapee & Krueger, 2019). Finally,

FFM traits appear to have strong associations with this psychopathological structure and can be considered early indicators of riskier personality profiles.

## 6. Declaration of Conflicting Interests

The authors declare no potential conflicts of interest in relation to the authorship, research or publication of this study.

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Table 1
*Factor Models.*

| Model | $\chi^2$ | *d.f.* | *p* | CFI | TLI | RMSEA | SRMR | AIC | Compared model | *d.f.* difference | *p* | Δ CFI | Δ RMSEA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 904.776 | 35 | <.001 | .770 | .573 | .173 | .092 | 49470.139 | - | - | - | - | - |
| 2 | 425.840 | 34 | <.001 | .896 | .802 | .118 | .053 | 48747.792 | 1 | 1 | <.001 | .126 | .055 |
| 3 | 233.851 | 32 | <.001 | .947 | .892 | .087 | .039 | 48499.809 | 2 | 2 | <.001 | .051 | .031 |
| 4 | 178.561 | 25 | <.001 | .959 | .894 | .086 | .026 | 48437.961 | 2 | 9 | <.001 | .063 | .032 |
| 5 | 184.292 | 26 | <.001 | .958 | .895 | .086 | .027 | 48440.753 | 3 | 6 | <.001 | .011 | .001 |

Table 2
*Regression Analyses*

| | **Model 3** | | | | | | **Model 4** | | | | | | **Model 5** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INT | | EXT | | HAP | | INT | | EXT | | P Factor | | INT | | EXT | | HAP* | | P Factor | |
| | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** | $\Delta R^2$ | **β** |
| Regression #1 | .39 | | .42 | | .34 | | .42 | | .07 | | .34 | | .42 | | .09 | | .34 | | .33 | |
| Neuroticism | | .53*** | | .21*** | | .33*** | | .48*** | | -.10* | | .31*** | | .47*** | | -.13** | | .33*** | | .35*** |
| Extraversion | | -.12*** | | .19*** | | .22*** | | -.37*** | | .05 | | .21*** | | -.38*** | | .09* | | .21*** | | .19*** |
| Openness | | .10*** | | -.00 | | .02 | | .13*** | | -.00 | | .01 | | .13*** | | -.02 | | .02 | | .03 |
| Agreeableness | | -.07* | | -.24*** | | -.11*** | | .02 | | -.25*** | | -.13*** | | .03 | | -.24*** | | -.11*** | | -.14*** |
| Conscientiousness | | -.06 | | -.29*** | | -.39*** | | .28*** | | .06 | | -.40*** | | .27*** | | -.07 | | -.40*** | | -.35*** |
| Regression #2 | .20 | | .13 | | .17 | | .07 | | .00 | | .18 | | .07 | | .00 | | .18 | | .18 | |
| GFP_UF | | .44*** | | .36*** | | .41*** | | .26*** | | .00 | | .42*** | | .27*** | | .06 | | .43*** | | .42*** |
| Regression #3 | .25 | | .13 | | .22 | | .09 | | .00 | | .22 | | .09 | | .00 | | .20 | | .22 | |
| GFP_CFA | | .50*** | | .36*** | | .47*** | | .29*** | | .07 | | .47*** | | .31*** | | .01 | | .45*** | | .47*** |
| Regression #4 | .10 | | .15 | | .16 | | .00 | | .01 | | .17 | | .00 | | .01 | | .15 | | .17 | |
| GFP_ESEM | | .31*** | | .39*** | | .40*** | | .06 | | .07 | | .42*** | | .06 | | .12** | | .38*** | | .42*** |

*Note*. INT=Internalizing factor; EXT= Externalizing factor; HAP= Hyperactivity and Attention factor (*or score); GFP_UF= GFP obtained when running an Unrotated Factor Model (Main Components); GFP_CFA= GFP obtained when performing one-factor CFA; GFP_ESEM=GFP obtained when performing bifactor ESEM
*$p$<.05; **$p$<.01; ***$p$<.001.

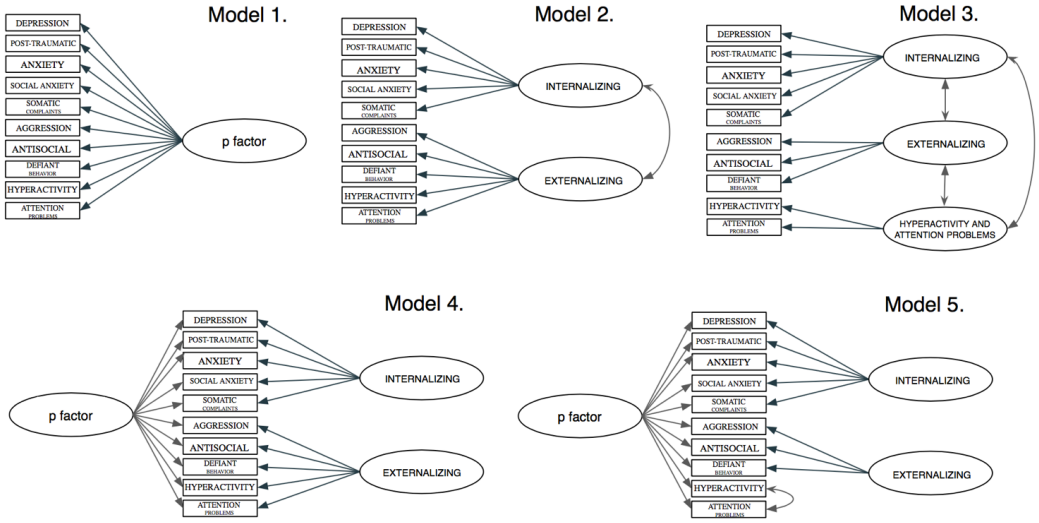


*Figure 1.*
Hypothesized models.

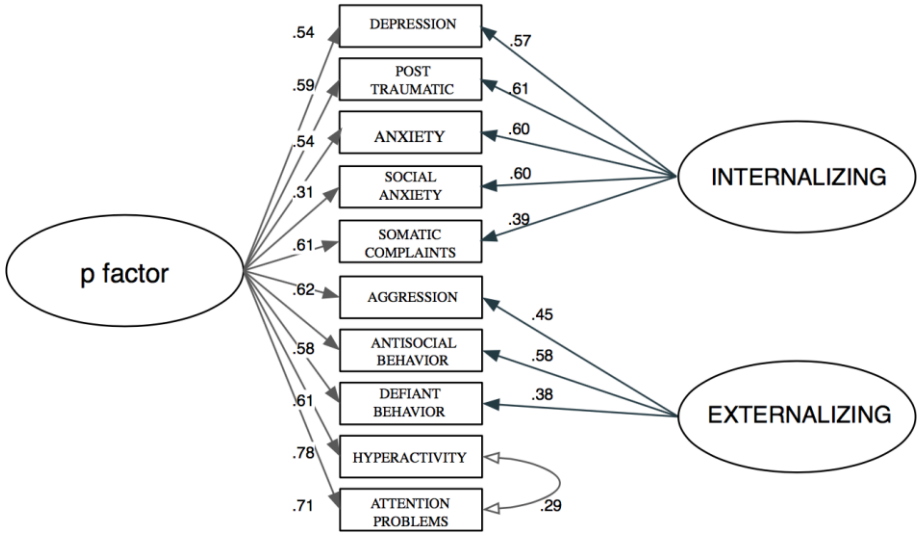


*Figure 2.*
Standardized results for Model 5.
*Note.* All the factor loadings and correlations were significant at $p < .001$.

Supplementary Material

*Descriptive Results*

| | | Total sample | | Boys | | Girls | | Boys - Girls | |
|---|---|---|---|---|---|---|---|---|---|
| | α | M | SD | M | SD | M | SD | *d* | *t* |
| Neuroticism | .83 | 56.22 | 14.89 | 53.09 | 13.62 | 59.41 | 15.38 | .43 | -6.10*** |
| Extraversion | .83 | 74.70 | 15.09 | 74.28 | 13.97 | 75.09 | 16.05 | .05 | - .75 |
| Openness | .75 | 71.69 | 12.77 | 67.99 | 11.46 | 75.14 | 12.83 | .59 | -8.24*** |
| Agreeableness | .82 | 74.65 | 13.73 | 72.13 | 14.12 | 77.42 | 13.01 | .39 | -5.46*** |
| Conscientiousness | .89 | 70.92 | 17.07 | 69.08 | 16.04 | 72.92 | 17.94 | .22 | -3.16** |
| Depression | .90 | 10.82 | 9.66 | 8.75 | 7.80 | 12.96 | 10.93 | .44 | -6.37*** |
| Anxiety | .89 | 14.26 | 9.03 | 11.34 | 7.85 | 17.35 | 9.19 | .70 | 10.12*** |
| Social anxiety | .83 | 9.97 | 6.54 | 8.78 | 6.09 | 11.20 | 6.79 | .37 | -5.40*** |
| Post-traumatic | .79 | 9.81 | 6.94 | 8.30 | 6.36 | 11.40 | 7.15 | .46 | -6.58*** |
| Somatic complaints | .79 | 10.15 | 6.14 | 8.60 | 5.57 | 11.76 | 6.31 | .53 | -7.63*** |
| Hyperactivity | .85 | 11.66 | 8.05 | 11.35 | 8.31 | 11.96 | 7.78 | .07 | -1.08 |
| Attention problems | .89 | 14.01 | 8.58 | 13.70 | 8.55 | 14.31 | 8.65 | .07 | -1.03 |
| Aggression | .76 | 3.03 | 3.87 | 3.59 | 4.40 | 2.41 | 3.09 | .31 | 4.50*** |
| Antisocial | .78 | 2.60 | 4.12 | 3.21 | 4.94 | 1.92 | 2.88 | .32 | 4.64*** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Defiant behavior | .63 | 1.72 | 2.04 | 1.70 | 2.09 | 1.73 | 2.01 | .01 | -.23 |

*Note*. Cohen's d values of .20, .50 and .80 correspond to small, medium and large effect sizes, respectively (Cohen, 1992). *$p$ < .05. **$p$ < .01. ***$p$ < .001. Cronbach's alpha of .60 or higher is adequate for short scales (Loewenthal, & Lewis, 2018). The Defiant behavior scale comprises only three items.

Cohen, J. (1992). A power primer. Psychological Bulletin, 112, 155–159. https://doi.org/10.1037/0033-2909.112.1.155

## Supplementary Material 2

### 1. First Unrotated Factor Model

**Unrotated Factor Solution using Principal Axes Factoring**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| C1 | .626 | .128 | .008 | -.289 | -.122 |
| C4 | .621 | .077 | .258 | -.358 | .040 |
| C5 | .615 | .272 | -.047 | -.272 | -.103 |
| E1 | .591 | -.279 | .173 | .192 | .220 |
| A1 | .566 | .082 | .087 | .082 | .237 |
| C2 | .564 | .102 | -.123 | -.265 | .069 |
| N6 | -.560 | .320 | .278 | -.099 | .065 |
| E6 | .546 | -.345 | .156 | .120 | .002 |
| C3 | .507 | .223 | .345 | -.278 | .049 |
| E3 | .467 | -.277 | -.073 | .109 | -.148 |
| E4 | .444 | -.427 | .054 | .092 | .059 |
| C6 | .415 | .413 | -.252 | -.153 | .035 |
| E2 | .356 | -.462 | -.024 | .068 | .190 |
| A4 | .338 | .459 | -.071 | .208 | .028 |
| A5 | -.111 | .435 | .133 | .275 | .152 |
| E5 | .084 | -.429 | .265 | -.085 | -.119 |
| A2 | .399 | .422 | .013 | .310 | .220 |
| O5 | .163 | .382 | .169 | .032 | -.347 |
| N2 | -.351 | -.355 | .280 | -.084 | .072 |
| N5 | -.226 | -.314 | .304 | .092 | .012 |
| N4 | -.281 | .239 | .559 | -.182 | .167 |
| N3 | -.503 | .232 | .533 | -.220 | .149 |
| A6 | .313 | .075 | .490 | .201 | .087 |
| O3 | .226 | -.162 | .465 | .009 | -.154 |
| N1 | -.201 | .043 | .459 | .038 | .170 |
| O4 | .346 | -.294 | .426 | .001 | -.147 |
| A3 | .389 | .301 | .126 | .427 | .077 |
| O6 | -.026 | .141 | .092 | .257 | -.169 |
| O2 | .147 | .233 | .304 | .092 | -.444 |
| O1 | -.131 | .037 | .223 | .267 | -.327 |

## 2. Confirmatory Factor Analysis

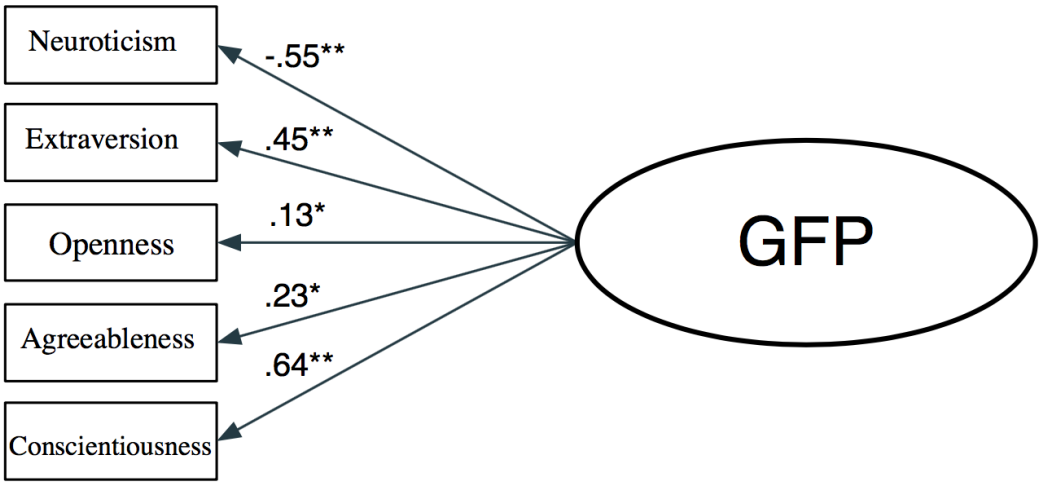


Figure. CFA.
*Note*: GFP= General Factor of Personality; * $p<.05$, ** $p<.001$

Fit indices.

| $\chi^2$ | *p* | *d.f.* | AIC | CFI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| 35.186 | .000 | 5 | 31984.752 | .872 | .088 | .032 |

### 3. Bi-factor Exploratory Structural Equation Model (ESEM).

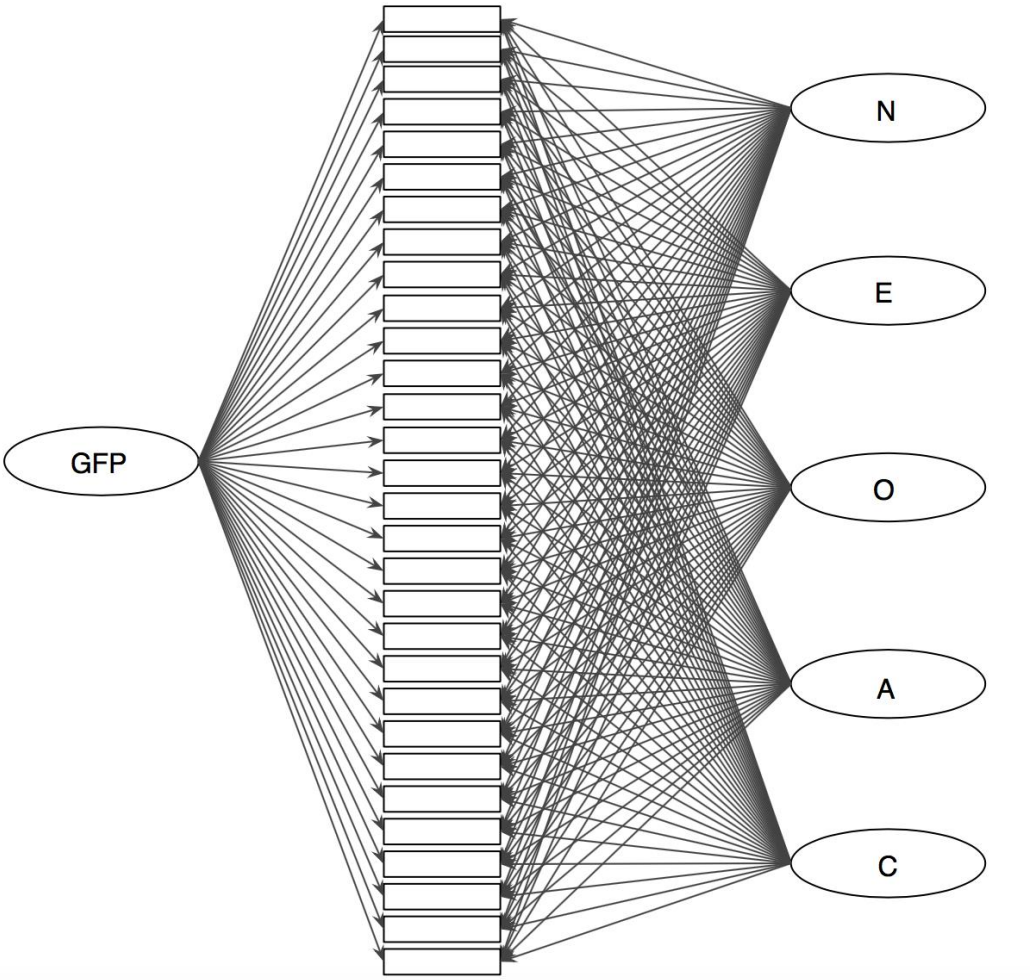


Figure. Bi-factor ESEM.
*Note*: GFP= General Factor of Personality. N=Neuroticism; E=Extraversion; O=Openness; A=Agreeableness; C=Conscientiousness.

Fit indices.

| $\chi^2$ | *p* | d.f. | AIC | CFI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| 742.771 | .000 | 270 | 120015.819 | .921 | .047 | .027 |

Standardized factor loadings of each trait in the broad traits of the FFM and the GFP (Bi-factor ESEM model)

| Facet | Neuroticism | Extraversion | Openness | Agreeableness | Conscientiousness | GFP |
|---|---|---|---|---|---|---|
| N1 | .48*** | .07. | .10 | .15** | -.02 | -.15 |
| N2 | .32* | .36*** | .06 | -.06 | .18* | -.55*** |

| | | | | | | |
|---|---|---|---|---|---|---|
| N3 | .73*** | -.26*** | .05 | -.02 | -.05 | -.26** |
| N4 | .69*** | -.20* | .05 | -.01 | -.07 | -.02 |
| N5 | .23* | .32*** | .17* | .00 | -.03 | -.33* |
| N6 | .48*** | -.41*** | .03 | .04 | -.11* | -.32*** |
| E1 | .00 | .55*** | -.05 | .13*** | -.04 | .48*** |
| E2 | -.12** | .56*** | -.15*** | -.04 | .02 | .16* |
| E3 | -.30*** | .40*** | .15** | .02 | .14** | .23*** |
| E4 | -.13* | .58*** | .02 | -.01 | .10 | .21* |
| E5 | .13* | .37*** | .17* | -.31*** | -.06 | .05 |
| E6 | -.07 | .49*** | .09 | -.08* | -.11 | .49*** |
| O1 | .03 | -.04 | .44*** | .06 | -.20*** | -.08 |
| O2 | .06 | -.11* | .58*** | .12** | .16*** | .12* |
| O3 | .26*** | .27** | .34*** | -.08 | -.03 | .24 |
| O4 | .19*** | .41*** | .31** | -.13* | .00 | .30* |
| O5 | .04 | -.30*** | .39*** | .08 | .06 | .26*** |
| O6 | -.05 | -.05 | .28*** | -.23*** | -.03 | -.06 |
| A1 | .01 | .19** | -.11* | .22*** | .05 | .56*** |
| A2 | -.06 | -.05 | -.03 | .64*** | .13** | .33*** |
| A3 | -.05 | .05 | .15*** | .57*** | -.02 | .34*** |
| A4 | -.13 | -.26*** | .02 | .35*** | -.04 | .44*** |

| | | | | | | |
|---|---|---|---|---|---|---|
| A5 | .16*** | -.23*** | .04 | .53*** | .00 | -.08 |
| A6 | .33*** | .20* | .22** | .23*** | -.10 | .38*** |
| C1 | -.11** | .04 | .08* | -.07 | .45*** | .54*** |
| C2 | -.16*** | .10* | -.13** | .07* | .57*** | .37*** |
| C3 | .29*** | .02 | .08 | .03 | .34*** | .55*** |
| C4 | .17*** | .15* | .04 | -.07 | .45*** | .58*** |
| C5 | -.14*** | -.06* | .06 | .06 | .56*** | .50*** |
| C6 | -.19* | -.29*** | -.16* | .11 | .24* | 45*** |

*Note*: In order to help the model properly converge, the facet of gregariousness in extraversion was set at 1 (~1).
GFP= General Factor of Personality (ESEM). *= $p<.05$, **= $p<.01$, ***= $p<.001$

## 4. Correlations.

Correlations between General Factors of Personality

| | 1 GFP_ ESEM | 2 GFP_ CFA | 3 GFP_ UF |
|---|---|---|---|
| 1 | - | .82* | .87* |
| 2 | | - | .95* |
| 3 | | | - |

GFP_UF= GFP obtained when running an Unrotated Factor Model (Main Components); GFP_CFA= GFP obtained when performing a one-factor CFA; GFP_ESEM=GFP obtained when performing a bifactor ESEM;
* $p<.001$