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Niki De Bondt

Sven De Maeyer

Vincent Donche

Peter Van Petegem

University of Antwerp

Author Note

Niki De Bondt, Department of Training and Education Sciences, Faculty of Social Sciences, University of Antwerp

Sven De Maeyer, Department of Training and Education Sciences, Faculty of Social Sciences, University of Antwerp

Vincent Donche, Department of Training and Education Sciences, Faculty of Social Sciences, University of Antwerp

Peter Van Petegem, Department of Training and Education Sciences, Faculty of Social Sciences, University of Antwerp

Correspondence concerning this article should be addressed to Niki De Bondt, Department of Training and Education Sciences, Faculty of Social Sciences, University of Antwerp, Sint-Jacobstraat 2, B-2000 Antwerp, Belgium.

Contact: niki.debondt@uantwerpen.be

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Abstract

The aim of this study is to provide – first theoretically and, subsequently, through an empirical analysis – a rationale for including the concept of overexcitability in talent research, beyond the five-factor model personality traits. Moreover, the empirical part of this study makes use of an innovative statistical method to address the problem of a frequentist approach to statistics in complex trait models which are based on personality questionnaire data. This study offers insight into the differential significance of overexcitability in relation to the established personality traits, emphasizing Dabrowski's dynamic approach to personality and the key contribution of overexcitability in the developmental process. Furthermore, implications for the field of giftedness are discussed.

Keywords: overexcitabilities; five-factor model; Dabrowski's theory of positive disintegration; Bayesian structural equation modeling; personality; giftedness

A Rationale for Including Overexcitability in Talent Research beyond the FFM-Personality Dimensions

Kazimierz Dabrowski (1902-1980), a Polish psychiatrist and founder of the Theory of Positive Disintegration (TPD), emphasizes the importance of investigating interrelationships between outstanding abilities, psychoneuroses, and personality in children and young people. Dabrowski further stresses the lack of studies examining the correlation between these characteristics, which he regards as qualities on the road to humanity (Dabrowski, 2015). The TPD represents a hierarchically structured and dynamic theory of personality development, in which personality is defined as "[a] self-aware, self-chosen, self-affirmed, and self-determined unity of essential individual psychic qualities" (Dabrowski, 2015, p. 290) and is only attained at the final level of the developmental process. Achieving the highest level of human development – or enacting the personality ideal – depends on the developmental potential of an individual, which is determined by the individual's level of innate heightened excitability (overexcitability) and the presence of special abilities, talents, and autonomous inner forces that cultivate growth (dynamisms) (Dabrowski, 1964, 2015; Mendaglio, 2008; Tillier, 2018).

Dabrowski's Theory of Positive Disintegration

According to the TPD, personality is usually achieved through a process of disintegration in which awareness of a discrepancy between biological and social actuality (determinism) on the one hand and supra-biological necessity on the other hand (the latter refers to how life should be, i.e., absolutely truthful, alter-centric, and according to the moral imperative) gives rise to external but especially internal conflicts that may cause the disintegration of the primitive mental organization (Dabrowski, 2015).

The TPD distinguishes five levels of development, which are not sequential, age-related, or universal (Mendaglio, 2008). The first developmental level (Primary Integration)

refers to a cohesive mental structure that is dominated by primitive instincts and is characterized by egocentrism, conformity, a low level of (self-)consciousness, and a limited critical attitude. It is present in high levels in the average person and, according to Dabrowski, it reflects a low level of mental health. Individuals who are endowed with sufficient developmental potential, or who are in favorable conditions (for example in the period of maturation), are able to achieve disintegration and possibly advanced development. In this process, dissolving dynamisms (more specifically, ambivalences and ambitendencies at the second level [Unilevel Disintegration] and, subsequently, at the third level [Spontaneous Multilevel Disintegration] – when one becomes aware of the existence of an authentic hierarchy of values – anxiety about oneself, dissatisfaction with oneself, feelings of shame and guilt, and feelings of inferiority towards oneself) cause intense negative emotions, and weaken and ultimately destroy primary integration. Attaining the fourth level of development (Organized Multilevel Disintegration) – which is characterized by the conscious self-organization of the course of development – depends largely on the presence of developmental dynamisms (e.g., self-awareness, subject-object attitude[1], the Third Factor[2], self-education, and autopsychotherapy), which reduce the distress by moving toward an ideal and creating a new mental structure. Higher-level emotions are experienced, thus leading to the conscious creation of a hierarchy of values. Higher values are pursued, and a strong sense of responsibility toward oneself and others is developed, along with a strong sense of justice and empathy. Dissolving and developmental dynamisms ultimately constitute an internal mental environment (Inner Psychic Milieu) that is self-directed and free of conflict. In the fifth level of development (Secondary Integration), personality is achieved. The individual experiences inner peace, being driven by a personality ideal based on a personal hierarchy of

1 Subject-object in oneself refers to the process of looking at oneself critically and from a distance (the self as object) and approaching the other as subject, with empathy and compassion (Dabrowski, 2015).
[2] The Third Factor can be considered a conscious self-determinism in which the individual is directed by an inner voice and personal values that reflect a high moral level. The First and Second Factors refer to the constitutional endowment and social environment, respectively (Dabrowski, 2015).

values, which is derived from universal, objective moral values. Autonomy, authenticity, and empathy are fully developed. Only a few people achieve the highest level of human development (Dabrowski, 1964, 1970b, 2015; Mendaglio, 2008; Tillier, 2018).

The Concept of Overexcitability Within the TPD. According to Dabrowski, the developmental potential of an individual depends in part on the extent and nature of psychic intensity. Overexcitability refers to an above average responsiveness to stimuli, due to heightened sensitivity of the central nervous system, which generates a different, more intense, and more multi-faceted experience of internal and external reality (Dabrowski, 1970c, 2015; Mendaglio, 2008; Tillier, 2018). Dabrowski distinguishes five forms of increased psychic excitability – emotional, intellectual, imaginational, psychomotor, and sensual – whose most essential manifestations and characteristics are listed in Table 1. Dabrowski considers the first three forms of overexcitability essential to advanced personality development, with emotional overexcitability constituting the key driver of alter-centrism (Dabrowski, 1970a, 2015). On the one hand, overexcitability or "nervousness" may lead to inner and external conflicts and tension. On the other hand, it constitutes the foundation of powerful perceptivity, which enables an individual to envision a higher, universal reality (Dabrowski, 1970a). As such, overexcitability may contribute to a higher awareness of what should be, as well as to contemplation and the approximation of a higher, truthful reality.

(Table 1)

The Overexcitability Questionnaire-Two (OEQ-II) (Falk, Lind, Miller, Piechowski, & Silverman, 1999) is the most widely used self-reporting instrument for measuring the degree and nature of overexcitability.

Implications for the Field of Giftedness. Numerous studies on intensity in gifted and non-gifted students have demonstrated associations of giftedness with intellectual (Bouchet & Falk, 2001; Carman, 2011; Harrison & Van Haneghan, 2011; Siu, 2010; Tieso, 2007; Van den

Broeck, Hofmans, Cooremans, & Staels, 2014; Wirthwein, Becker, Loehr, & Rost, 2011; Wirthwein & Rost, 2011), imaginational (Carman, 2011; Harrison & Van Haneghan, 2011; Siu, 2010; Tieso, 2007), and emotional (Bouchet & Falk, 2001; Siu, 2010) overexcitability. Based on systematic research, Dabrowski also reports a substantial degree of overexcitability, as well as psychoneurotic symptoms in groups of intellectually and artistically gifted young people, as compared to a control group (Dabrowski, 2015). This is in line with the results of some recent studies that demonstrate a significant positive relationship between high intelligence and both mood and anxiety disorders (Gale et al., 2013; Harrison & Van Haneghan, 2011; Karpinski, Kolb, Tetreault, & Borowski, 2018; MacCabe et al., 2010). Unconventionally, Dabrowski defines psychoneuroses (e.g., depression and existential anxiety) as syndromes emerging from internal and external conflicts arising from the awareness of the discrepancy between "what is" and "what ought to be" (Dabrowski, 1970a, 1972). He regards psychoneuroses as qualities in the process of personality development, however, if they occur at a sufficiently high level, meaning that they are in conjunction with excellent mental capabilities, overexcitabilities, and developmental dynamisms, including self-consciousness, the Third Factor, creativity, self-education, and autopsychotherapy (Dabrowski, 1970a, 1970c, 2015). In this condition, overexcitability and psychoneuroses enhance the possibility of inner mental transformation and, according to Dabrowski, they are a necessary element of an individual's psychic enrichment (Dabrowski, 1970a, 2015; Dabrowski & Joshi, 1972). Moreover, they serve as a prophylactic against psychotic disorders (Dabrowski, 1970a). It is only through the awareness of a different, higher, truthful reality (through intuition [Dabrowski, 1970b] and creative search [Dabrowski, 1972]) and through cognizance, understanding, and acceptance of the tension that may result from its contrast with actuality (through autopsychotherapy [Dabrowski, 2015]), that one can consciously embrace the road to self-perfection, alter-centrism, and essence. Psychoneuroses are non-

existent at the level of Secondary Integration (Dabrowski, 1970c; Dabrowski & Piechowski, 1969).

Implications for Gifted Education. With their inherent characteristics, therefore, gifted individuals appear to have more potential to arrive at autonomous and strong personalities (Dabrowski, 1970b, 2015; Tillier, 2002). Dabrowski nevertheless emphasizes the importance of guidance of the process of personality development by an "adviser" who is personally characterized by a strong personality, and who first evaluates both the developmental potential and actual level of the individual (Dabrowski, 2015). According to Dabrowski, the maturation period is well suited for this purpose, given the inherent intensification of disintegrative symptoms and increased brain plasticity during this period. The adviser should ideally raise awareness of the existence of multilevel contradictions in an individual caused by, on the one hand, the presence of instinctive motives aimed at self-preservation, and on the other hand, the necessity of alter-centrism, deep identification, and conscious empathy. The adviser strengthens positive developmental traits and encourages self-insight, identification, empathy, moral responsibility, and self-determinism based on high moral values (Dabrowski, 2015). This process of authentic education (Rankel, 2008) is then gradually taken over by a process of self-education, in which the individual becomes aware of his/her own personality ideal and the necessity of approaching this ideal. Through critical and objective self-examination and the conscious perception of the higher and lower within themselves, while simultaneously becoming aware of a higher, true reality, individuals can develop a personal hierarchy of values and aims. The personality ideal is activated by means of the Third Factor, which acts as an active consciousness that rejects the lower, instinctive dimension and affirms the higher, true one (Dabrowski, 2015). Further progress in the process of self-education will ultimately allow room for what might be called transformational education, in which the individual takes on an exemplary and value-directing leading role in

society. According to Dabrowski, gifted individuals are ideally suited to create normative patterns. In addition to having a deeper awareness of a hierarchy of values, they possess a more uniform interpretation of the highest level, which indicates the existence of a universal hierarchy of values (Dabrowski, 1970b, 2015).

Relationships Between Overexcitabilities and Personality Traits

Despite Dabrowski's call for empirical research on interrelationships between overexcitability, personality, abilities and psychoneuroses, such studies are virtually non-existent. Based on an assumed level of conceptual congruence (Gallagher, 2013), three studies (which are discussed below) have investigated associations between overexcitability and the five-factor model (FFM) personality traits. The FFM is a comprehensive taxonomy of personality traits, consisting of five factors that represent the basic dimensions of personality identified in analyses of standard personality measures (Costa & McCrae, 1992a; McCrae & Costa, 1987). In this context, personality refers to the relatively stable style of thinking, feeling, and acting that is characteristic of an individual (Costa, McCrae, & Kay, 1995). Although the FFM has developed into a dominant paradigm in personality psychology (Costa & McCrae, 1995), it is still an evolving scientific construct (Costa & McCrae, 1992a). The five personality factors are defined according to a large set of specific traits or facets (Costa & McCrae, 1992b). The neuroticism factor may be described as the tendency to experience negative affects such as depression, anxiety, and anger, and it also includes the disturbed thoughts and behaviors that accompany emotional instability (McCrae & Costa, 1987, 1989). The extraversion factor can be described as the predisposition to experience positive emotions and to be active, sociable, and dominant, while the openness factor is characterized by active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, and intellectual curiosity (Costa & McCrae, 1992b; McCrae & Costa, 1989). The factor of conscientiousness is defined by organization, perseverance, meticulousness, and need for

performance, whereas the agreeableness factor is characterized by sympathy, trust, cooperation, and altruism (McCrae & Costa, 1989).

Limont, Dreszer-Drogorób, Bedyńska, Śliwińska, and Jastrzębska (2014) investigated interrelationships between overexcitability and personality, as measured by the 60-item NEO Five-Factor Inventory (NEO-FFI) (Costa & McCrae, 1992b), applying maximum likelihood (ML) estimation in five structural equation models with each of the personality traits as the sole dependent variable. This study, which generated only partially good model fit (despite the low complexity of the models), reveals only weak to moderate relationships between the five forms of overexcitability and personality traits. Vuyk, Krieshok, and Kerr (2016) investigated associations between the six openness facets (i.e., fantasy, aesthetics, feelings, actions, ideas, and values) – as measured by the 240-item NEO Personality Inventory-3 (NEO-PI-3) (McCrae, Costa, & Martin, 2005) – and overexcitability, applying robust ML exploratory structural equation modeling (ESEM). In their joint-factor model, six factors (which correspond to hypothesized relationships between fantasy and imaginational overexcitability, aesthetics and sensual overexcitability, feelings and emotional overexcitability, actions and psychomotor overexcitability, ideas and intellectual overexcitability, and to an unrelated facet of values) were measured by each of the 50 overexcitability indicators and 45 openness indicators (three items were removed from the model in order to achieve convergence). The ESEM model demonstrated weak model fit, as measured by the chi-square statistic ($p < 0.00001$) and comparative fit index (CFI = .790), and a more or less recovered hypothesized factor loading pattern, with substantial target loadings and many significant cross-loadings. Despite the poor model fit, the authors conclude that "openness facets and OEs [i.e., overexcitabilities] appear to represent the same construct" (Vuyk et al., 2016, p. 205). They further claim that there is no justification for the existence of overexcitability as a separate research construct, given the strong research support for the

FFM. Finally, a study by Botella et al. (2015, p. 217) provides evidence of only a few, predominantly weak to moderate positive (Pearson) correlations between overexcitabilities and personality traits, from which the authors deduce that "OE [i.e., overexcitability] and the Big Five model are two different views of personality, and their combination might enhance the understanding of the development of personality."

Empirical Study

The first aim of this study is to investigate interrelationships between overexcitability, as measured by the OEQ-II, and the personality traits of neuroticism, openness, and conscientiousness, as gauged by the NEO-FFI, applying Bayesian structural equation modeling (BSEM) with informative, small-variance priors (Muthén & Asparouhov, 2012). All of the existing three studies on interrelationships between overexcitabilities and personality traits adopted a frequentist approach to statistics. None of the above-mentioned studies that made use of ML estimation in their structural equation model generated good model fit, as measured by the chi-square statistic. A Bayesian approach to statistics might have been more appropriate, given the complexity of trait models which rely on personality questionnaire data. Results of validation studies indicate that most personality instruments exhibit slight cross-loadings and measure several supplementary minor factors in addition to the postulated personality factors. On the one hand, freeing all cross-loadings and residual covariances leads to a non-identified model (Muthén & Asparouhov, 2012); on the other hand, modifying the model using modification indices in a frequentist analysis may capitalize on chance (MacCallum et al., 1992), with a large risk of model misspecification (Muthén & Asparouhov, 2013b). We hypothesize that the BSEM model will generate a good fit to the data, as it is capable of taking into account the existence of trivial cross-loadings and many minor correlated residuals among the factor indicators. The BSEM technique allows for the simultaneous inclusion in the model of all, approximate zero cross-loadings and residual

covariances based on zero-mean, small-variance prior distributions[3], therefore overriding the problem of non-identification. More specifically, cross-loadings and residual covariances will not be fixed at exactly zero (as in ML CFA), but will be able to deviate slightly from zero, using strong informative priors with zero-mean and small variance. This will enhance the model with the *a priori* research-driven information that ML CFA models are too strict and do not meet the reality of the existence of small cross-loadings and minor correlated residuals in most psychological instruments. Using a small-variance prior, which reflects strong prior knowledge (i.e., according to substantive theory, cross-loadings and residual covariances must be approximately zero), the data will tend to contribute less information to the construction of the posterior distribution (Muthén & Asparouhov, 2012). In light of the results of the studies by Botella et al. (2015), Limont et al. (2014), and Vuyk et al. (2016), we hypothesize weak to moderate associations between the five forms of overexcitability and the personality traits of neuroticism, openness, and conscientiousness, with the most substantial relationship concerning openness.

As posited in the theoretical analysis, the TPD does not regard intelligence as negligible. The awareness of a discrepancy between a lower and higher reality, as well as the perception of a transcendental objectivity (through intuition) requires higher mental capabilities (Dabrowski, 2015). Intelligence may also be an active driver of the third factor, thereby giving rise to conscious, highly value-based auto-determinism. The developmental

[3] Drawing on Bayes theorem, the formula for the posterior distribution $P(\theta|z)$ of the unknown parameter θ given the observed data z can be expressed as:

$$P(\theta|z) = \frac{P(\theta,z)}{P(z)} = \frac{P(z|\theta)\,P(\theta)}{P(z)}$$

where $P(\theta)$ stands for the prior distribution of the parameter, reflecting substantive theory or the researcher's prior beliefs, and $P(z|\theta)$ is referred to as the distribution of the data given the parameter, which represents the likelihood (Kaplan & Depaoli, 2012; Kruschke, Aguinis, & Joo, 2012; Levy, 2011; Zyphur & Oswald, 2015). Omitting the marginal distribution of the data $P(z)$ in the formula, reveals the proportionality of the unnormalized posterior distribution to the product of the likelihood and the prior distribution (Kaplan & Depaoli, 2012; Levy, 2011). The uncertainty regarding the population parameter value, as indicated by the variance of its prior probability distribution, is influenced by the observed sampling data, yielding a revised estimate of the parameter, as reflected in its posterior probability distribution (Kaplan & Depaoli, 2012).

process, however, is directed by higher-level emotions. Nonetheless, intelligence and higher-level emotions cooperate closely at high levels of psychic functioning (Dabrowski, 1970b, 1970c). When combined with a high level of overexcitability and strong developmental dynamisms, intelligence may thus function as a catalyst if used in the service of the developmental process. Therefore, we additionally hypothesize a moderation effect of intellectual ability on the influence of overexcitability on personality.

Furthermore, Dabrowski (2015) states that "[n]one of the forms of hyperexcitability […] develops in isolation. As a rule these are mixed forms with predominance of this or that form. They are disintegrating factors and, in conjugation with mental hyperexcitability [i.e., intellectual overexcitability], permit preparation for higher forms of disintegration and secondary integration" (p. 75). "Positive developmental potential" is comprised of all of the five overexcitabilities, although emotional, intellectual and imaginational overexcitability aid the transformation of the lower forms of overexcitability, i.e., psychomotor and sensual overexcitability (Mendaglio, 2012). Therefore, and in reference to the study by Vuyk et al. (2016), we further hypothesize a substantial relationship between positive developmental potential – which represents in our study the interaction between the five overexcitabilities – and the personality trait of openness.

The second aim of this study is to investigate the possible presence of distinct factors within the variable of emotional overexcitability, applying ESEM with ML estimation. A hierarchical organization of human development is the hallmark of the TPD and, according to Dabrowski, each form of overexcitability has a different expression, depending on the level of personality development (Dabrowski, 1970c; Tillier, 2018). Although the OEQ-II does not define the five overexcitability factors according to a set of hierarchically structured facets, a multiple-level perspective can clearly be distinguished with regard to emotional overexcitability. For example, the item "I am deeply concerned about others" is situated on a

higher, more humane and abstract level in the process of personal development in comparison with the item “I can feel a mixture of different emotions all at once.” Therefore, we hypothesize that a two-factor exploratory structure will fit the data better than a one-factor structure. A two-factor structure that reflects the multidimensional and multi-stage process of disintegration would diverge from the FFM model, which does not include distinct levels of personality growth.

Method

Participants

The OEQ-II and NEO-FFI were added to a large-scale study conducted in Flanders (i.e., the Dutch-speaking part of Belgium) that investigated the influence of learning patterns on both academic performance and the successful transition from secondary to higher education. In all, 516 students (318 women: 61.6%; 198 men: 38.4%) completed the three measures discussed below. The respondents (M = 19.54 years; SD = 0.67) were in the second consecutive year of a program of higher education (69% had completed general secondary education before entering higher education, while 26% had followed technical secondary education, 4% had followed vocational secondary education, and 1% had followed secondary education in the arts). Almost all of the participants (99%) spoke at least Dutch in the home, while a minority (20%) also used Arabic, Berber, Chinese, German, English, French, Italian, Spanish, or Turkish as their at-home language. Many of these individuals could be considered talented, given their prior education and continued participation in higher education. The study was executed in accordance with the guidelines of the Ethics Committee for the Social Sciences and Humanities of the university with written informed consent from all subjects.

Measures

Overexcitabilities. The OEQ-II consists of 50 items (equally representing the five forms of overexcitability) that are scored along a five-point Likert scale with response options

ranging from “Not at all like me” to “Very much like me.” The OEQ-II demonstrates good factorial validity (De Bondt & Van Petegem, 2015; Van den Broeck et al., 2014) and approximate scalar measurement invariance across gender (De Bondt & Van Petegem, 2015). In this study, as represented in Table 2, the Cronbach’s alphas all exceed 0.80, thus indicating good reliability, as well as correspondence to the results of previous studies.

(Table 2)

Because of significant relationships between gender and overexcitability – in other words, a higher score for females on emotional and sensual overexcitability and a lower score on psychomotor overexcitability relative to males (Bouchet & Falk, 2001; De Bondt & Van Petegem, 2015; Van den Broeck et al., 2014) – statistical analyses will be performed for the different gender groups separately.

Personality traits. An abbreviated Dutch version of the NEO-FFI, which operationalizes the FFM, was used to measure three major dimensions of personality: neuroticism, openness, and conscientiousness (Hoekstra, Ormel, & De Fruyt, 1996). Each of these three traits is measured by a scale consisting of twelve items that are scored along a five-point Likert scale with response options ranging from “Strongly disagree” to “Strongly agree.” In the present data set, all Cronbach’s alphas for the NEO-FFI factors were higher than 0.70 indicating an acceptable level of internal consistency.

Intellectual ability. Intellectual ability was measured by the Prüfsystem für Schul- und Bildungsberatung Test 3 (PSB-3) (Horn, 1969). The PSB-3 is a non-verbal intelligence test with a 5-minute time limit, which measures reasoning capacity and is composed of 40 items, each consisting of 8 symbols from which one should select the incorrect figure. In this study, the Cronbach’s alpha reliability coefficient exceeds 0.80, thus indicating good internal consistency.

Analyses

Using the Mplus software program (Version 7.4; Muthén & Muthén, 1998-2017), a multiple-indicators, multiple-causes (MIMIC) model (Jöreskog & Goldberger, 1975) was utilized, in which latent variables (in this case, personality traits) are predicted by observed variables (in this case, the dispositional traits of overexcitabilities that actively drive personality according to the TPD). Before performing a Bayesian analysis of the MIMIC model, as represented in Figure 1, a frequentist analysis was carried out for comparison purposes. Using ML estimation, a CFA model with covariates was tested with the five overexcitability indicators, positive developmental potential (which represents the interaction between the five forms of overexcitability and which is obtained by multiplying them), and intellectual ability as observed independent variables, with all of the personality trait indicators as observed dependent variables, and with neuroticism, openness, and conscientiousness as latent dependent variables. All personality trait factors were regressed on all of the covariates in the MIMIC model.

(Figure 1)

Subsequently, a Bayesian analysis of the MIMIC model was performed with zero-mean and small-variance priors for cross-loadings and residual covariances in the measurement model. Target loadings with non-informative priors – i.e., normally distributed priors with a mean of zero and a large variance – and cross-loadings with strong informative priors – i.e., normally distributed priors with a mean of zero and a variance of 0.01, yielding 95% small cross-loading bounds of ±0.20 (Muthén & Asparouhov, 2012) – were utilized in this model. An inverse-Wishart prior distribution $IW(0, df)$ with $df = 42$ was applied for the correlated residuals, corresponding to prior zero-means and variances of 0.0111 ($SD = 0.1054$). In this BSEM analysis, every tenth iteration was used – in order to reduce autocorrelation between

successive posterior draws – with a total of 100,000 iterations and one McMC[4] chain to describe the posterior distribution. With regard to all these specifications we have adhered to the recommendations of Muthén and Asparouhov (2012). Standardized variables were analyzed.

Finally, in order to investigate the possible presence of distinct factors within the variable of emotional overexcitability, an exploratory factor analysis for two factors was performed – using ML ESEM with oblique Geomin rotation – and compared to a one-factor structure. In the ESEM models, the two correlated factors were measured by each of the 10 factor indicators and the residuals were not correlated.

Model fit assessment. The following fit measures were used to evaluate the fit of the ML CFA and ESEM models: the chi-square statistic, comparative fit index (CFI; Bentler, 1990), and root mean square error of approximation (RMSEA; Steiger, 1990). A non-significant chi-square value, CFI values close to 1 (Hu & Bentler, 1995), and a value of the RMSEA of 0.05 or less (Browne & Cudeck, 1989) indicate a close fit of the model.

For the BSEM models, fit assessment was carried out using Posterior Predictive Checking in which – as implemented in Mplus – the likelihood-ratio chi-square statistic for the observed data is compared to the chi-square based on synthetic data obtained by means of draws of parameter values from the posterior distribution (Asparouhov & Muthén, 2010; Muthén & Muthén, 1998-2017). The simulated data should approximately match the observed data if the model fits the data. The Posterior Predictive *p*-value (PP*p*) measures the proportion of the chi-square values of the replicated data that exceeds that of the observed data. A low

[4] Bayesian estimation makes use of Markov chain Monte Carlo (McMC) algorithms to iteratively draw random samples from the posterior distribution of the model parameters (Muthén & Muthén, 1998-2017). The software program Mplus uses the Gibbs algorithm (Geman & Geman, 1984) to execute McMC sampling. McMC convergence of posterior parameters, which indicates that a sufficient number of samples has been drawn from the posterior distribution to accurately estimate the posterior parameter values, is evaluated via the potential scale reduction (PSR) convergence criterion (Gelman et al., 2014; Gelman & Rubin, 1992). When a single McMC chain is used, the PSR compares variation within and between the third and fourth quarters of the iterations. A PSR value of 1.000 represents perfect convergence (Kaplan & Depaoli, 2012; Muthén & Muthén, 1998-2017).

PP*p* (< 0.05) indicates poor model fit. On the contrary, a PP*p* of 0.50, as well as a 95% confidence interval (CI) for the difference in the chi-square statistic for the observed and simulated data that contains zero positioned close to the middle of the interval, are both indicative of excellent model fit (Muthén & Asparouhov, 2012).

Results

Descriptive Statistics

Descriptive summary statistics for the overexcitability indicators, personality traits, and intellectual ability are reported per gender group in Table 2. The overexcitability mean outcomes are consistent with all other studies using the OEQ-II, in which the two highest scores have been for emotional, intellectual, or psychomotor overexcitability (Falk & Miller, 2009). Also of note are the relatively high mean scores for the scale measuring conscientiousness, which could be expected, given the higher intellectual profile of the respondents.

ML MIMIC

Table 3 shows the chi-square statistic, CFI, and RMSEA for the evaluation of the frequentist MIMIC models. Significant chi-square statistics, RMSEA values of more than 0.05, and CFI values of less than 0.90 all indicate that both female and male models fit the data poorly.

(Table 3)

BSEM MIMIC

Subsequently, a Bayesian analysis of the MIMIC model was performed. The 95% CIs for the difference between the observed and the replicated chi-square values cover zero and the PP*p*s are 0.141 and 0.581 for the female and male group, respectively, both indicating good model fit. However, the covariate of intellectual ability is only weakly negatively indicative of neuroticism for males (β = -0.240, p < 0.01). Moreover, it has no significant

(significant in the sense that the 95% Bayesian credibility interval[5] does not cover zero) interactive effect on the influence of each of the overexcitabilities on the three personality dimensions in the male group. Likewise, the covariate of positive developmental potential has no significant effect on any of the personality traits. Consequently, both variables were dropped from the Bayesian MIMIC model. In Bayesian analysis, the deviance information criterion (DIC) can be used for the purpose of comparing different models, where the model with the lowest DIC value is preferably selected (Spiegelhalter, Best, Carlin, & van der Linde, 2002). The DIC values generated by the full model and the more parsimonious model were 36439.131 and 34056.584 for the female group, and 20672.984 and 19758.881 for the male group, respectively. Thus, the more parsimonious models produced the smallest DIC values. As presented in Table 3, omitting the variables of intellectual ability and positive developmental potential from the Bayesian MIMIC model yields satisfactory fit for both the female (PPp = 0.108, Δ observed and replicated χ^2 95% CI [-42.581, 189.744]) and male groups (PPp = 0.165, Δ observed and replicated χ^2 95% CI [-62.605, 181.482]). Figure 2A presents the distribution of the difference between the observed and the replicated chi-square values for the male group. The matching scatterplot (see Figure 2B), with the majority of the points plotted along the 45 degree line, indicates satisfactory model fit for the observed data.

(Figure 2)

Good McMC convergence was established for the two models. The PSR values smoothly decreased over the iterations, reaching a value close to 1 for the last few tens of thousands of iterations. Thus, the results of both BSEM models can be reliably interpreted. With the exception of only a small number of non-significant major factor loadings, the

[5] The Bayesian credibility interval, based on the percentiles of the posterior distribution, allows direct probability statements about the parameter, in contrast to the confidence interval in frequentist theory, which is contingent on the hypothesis of extensive repeated sampling from the population (Bolstad, 2007; Kaplan & Depaoli, 2012; Zyphur & Oswald, 2015). If the posterior probability interval of a particular parameter does not contain zero, the null (condition) can be rejected as implausible, and as a consequence, the parameter is considered significant (which is indicated by a one-tailed Bayesian *p*-value below 0.05).

hypothesized factor loading pattern is fully recovered with substantial target loadings and only one non-trivial cross-loading (in both gender groups), as displayed in Table 4 (in Mplus, the reported estimates are the medians of their posterior distributions). 68 (i.e., 11%) minor residual covariances were found to be significant at the 5% level, for both groups. Excluding these residual correlations may lead to the poor fit of the frequentist models (Cole, Ciesla, & Steiger, 2007).

(Table 4)

Table 5 presents the estimation results for the substantive structural parameters for both gender groups (see also Figure 1). As hypothesized, intellectual overexcitability is indicative of openness for both females ($\beta = 0.301$, $p < 0.001$) and males ($\beta = 0.275$, $p < 0.01$). Moreover, it is a supplementary indicator of conscientiousness but only for the female group ($\beta = 0.184$, $p < 0.01$). As expected, sensual overexcitability is indicative of openness ($\beta = 0.454$, $p < 0.001$ for females, and $\beta = 0.245$, $p < 0.01$ for males). Psychomotor overexcitability is negatively related to neuroticism ($\beta = -0.174$, $p < 0.01$) and openness ($\beta = -0.175$, $p < 0.001$) but only for the female group. Furthermore, emotional overexcitability is an indicator of neuroticism ($\beta = 0.318$, $p < 0.001$ for females, and $\beta = 0.327$, $p < 0.001$ for males), while imaginational overexcitability is indicative of neuroticism ($\beta = 0.271$, $p < 0.001$) and negatively indicative of conscientiousness ($\beta = -0.472$, $p < 0.001$), but only for females.

(Table 5)

We can conclude that intellectual, psychomotor (negative parameter), and sensual overexcitability account for 45.1% of the variance in openness for the female group. For the male group, 25.6% of the variance in openness can be explained by intellectual and sensual overexcitability. Emotional, psychomotor (negative parameter), and imaginational overexcitability (the latter two only with respect to females) account for 19.9% and 15.0% of the variance within the trait of neuroticism for females and males, respectively. In addition,

intellectual and imaginational overexcitability (negative parameter) account for 21.2% of the variance within conscientiousness for the female group.

ML ESEM

As expected, a two-factor exploratory structure [$\chi 2$ (df = 26, N = 318) = 56.614, p < 0.001, RMSEA = 0.061 (low = 0.039, high = 0.083), and CFI = 0.955 for the female group, and $\chi 2$ (df = 26, N = 198) = 55.549, p < 0.001, RMSEA = 0.076 (low = 0.048, high = 0.103), and CFI = 0.930 for the male group] fits the data better than a one-factor structure [$\chi 2$ (df = 35, N = 318) = 160.760, p < 0.0001, RMSEA = 0.106 (low = 0.090, high = 0.123), and CFI = 0.815 for females, and $\chi 2$ (df = 35, N = 198) = 131.047, p < 0.0001, RMSEA = 0.118 (low = 0.097, high = 0.140), and CFI = 0.772 for males].

Similar results were obtained for both gender groups. As presented in Table 6, two factors can clearly be distinguished: the first (F1) and second factor (F2) may represent the catalyst role that emotional overexcitability may play at a respectively higher and lower level in the course of personality development. For example, the items “I am deeply concerned about others,” “It makes me sad to see a lonely person in a group,” and “I feel other people’s feelings” all load significantly on F1. Thus, the first factor may be indicative of the emergence of empathy in the phase of Organized Multilevel Disintegration. In contrast, all of the items that load significantly on F2 (e.g., “I can feel a mixture of different emotions all at once,” “I have strong feelings of joy, anger, excitement, and despair,” and “I worry a lot”) may reflect the mixed feelings or ambivalences that emerge in the phase of Unilevel Disintegration.

(Table 6)

Discussion

The main objective of this study was to investigate interrelationships between overexcitability and neuroticism, openness, and conscientiousness, applying BSEM. BSEM is an innovative and flexible approach to statistics, allowing the application of zero-mean, small-

variance priors for cross-loadings and residual covariances, which leads to better model fit and less overestimation of factor correlations compared to ML CFA (which postulates exact parameter constraints and is usually too strict) (Fong & Ho, 2014; Muthén, 2013; Muthén & Asparouhov, 2013a).The analysis yielded positive results regarding the fit of the models, in contrast to the ML MIMIC models which could not generate a satisfactory model fit, due to the existence of many minor cross-loadings and residual covariances in the measurement model.

The results of both BSEM MIMIC models indicate that overexcitability is weakly related to the three personality traits examined with one exception (i.e., a moderate association with openness for females, as inferred from the explained variance). None of the above-mentioned studies that investigated associations between overexcitabilities and the FFM-personality traits took possible gender differences into account. Despite similarities in substantive structural parameter estimates for females and males (i.e., non-trivial associations between intellectual and sensual overexcitabilities and openness, and between emotional overexcitability and neuroticism), this study also reveals clear differences in both gender groups regarding significant parameter values and explained variance.

Furthermore, based on the similarities and differences identified between overexcitability and personality traits, we cannot deduce any conceptual equivalence of or interchangeability between overexcitability and openness, despite the moderate relationship for females. Moreover, the interaction term “positive developmental potential” had no substantive effect on any of the personality traits. The results of this study do not support the assertion of the Vuyk et al. (2016) study, but rather concur with the findings of Botella et al. (2015) and Limont et al. (2014). This does not preclude a potential understanding of the overexcitability scores within the framework of a widely accepted personality taxonomy. However, classifying overexcitabilities within the five-factor taxonomy must take into

account the variety of distinctive facets from which all five broad personality dimensions are comprised, in order to interpret overexcitability from a pattern of convergent and discriminant relationships. After all, most of the overexcitability scales have loadings on more than one personality factor, and clear correspondences in content between overexcitability and various discrete facets (e.g., the anxiety, depression, and self-consciousness facets of neuroticism, all facets – excluding actions – of openness, the altruism and tender-mindedness facets of agreeableness, and in some sense the dutifulness facet of conscientiousness) may be assumed. However, divergences may also be expected, which derive from different conceptual origins and a different approach to personality. As stated by McCrae and Costa (1989, p. 23), "The five-factor model is not based on any single theory of personality, but has been shown to encompass scales that operationalize a number of theoretical perspectives." Furthermore, "[t]he five-factor model is purely descriptive, it does not explain the origins of personality nor the mechanisms that account for individual differences" (McCrae & Costa, 1989, p. 34). In contrast, Dabrowski's personality theory assumes a hierarchical organization of personal development, and personality is only achieved at the level of Secondary Integration. Few reach this highest level of human development (Dabrowski, 2015; Mendaglio, 2008; Tillier, 2018).

The results of the ML ESEM models clearly reveal this multiple-phase perspective. Just as F2 may reflect a dissolving dynamism in the transitional phase between primary integration and disintegration, F1 may mirror a developmental dynamism, which reduces distress by moving toward a personality ideal. Neither human growth, entelechy, positive mental health nor a multidimensional perspective on personality development are tapped by the NEO-FFI scales or FFM. Moreover, as inferred from table 5, the openness scale of the NEO-FFI seems to primarily reflect the "Intellect" factor (Goldberg, 1990), with an emphasis on intellectual curiosity and aesthetic sensitivity – not to be confused with intelligence, as indicated by the

results of the BSEM models and in accordance with previous research (Costa & McCrae, 1992a). In the same way, the core dimension of the neuroticism factor in the FFM is negative emotionality, and thus mainly corresponds with lower levels of development according to Dabrowski's theory. In contrast to emotional overexcitability, the personality trait of neuroticism does not include higher level constructs such as syntony, identification, and empathy. In this context, McCrae and Costa (1987, p. 87) state that "[v]irtually all theorists would concur in the centrality of negative affect to neuroticism; the question is whether other features also define it." Moreover, they add that "[v]iewing Neuroticism solely as negative affectivity may prevent a recognition of its broader motivational and interpersonal aspects" (Costa & McCrae, 1988, p. 264).

Although multidimensionality can clearly be deduced from the results of the ESEM models regarding emotional overexcitability, a multi-stage perspective is much less clear with respect to the other forms of overexcitability. According to Dabrowski, however, each form of overexcitability has a different expression, depending on the level of personality development (Dabrowski, 1970c; Tillier, 2018). It would therefore be interesting to consider a hierarchically structured questionnaire that goes beyond the five-factor static taxonomic model of personality and can be used in future research on dynamic developmental processes of personality in accordance with the TPD. Organizing the OEQ-II according to a set of hierarchically structured facets may offer better insight into the implicit theoretical basis and differential significance of overexcitability in relation to the established personality traits. It may also elucidate relationships between higher levels of personality development and some positioning in the FFM while also enabling an explanation of the dynamic operation of traits and facilitating further empirical investigation of the TPD.

In any case, overexcitability is a major concept. In addition to revealing that emotional, intellectual, and imaginational overexcitability are important indicators of personality

development (Falk & Miller, 2009; Lysy & Piechowski, 1983; Miller, Silverman, & Falk, 1994), empirical studies have indicated that intellectual overexcitability, as measured by the OEQ-II, is particularly strongly interrelated with the deep learning approach (De Bondt & Van Petegem, 2017). This close relationship could not be demonstrated when using the FFM-personality traits (Chamorro-Premuzic & Furnham, 2009).

Furthermore, the introduction refers to an important association between overexcitability, as measured by the OEQ-II, and giftedness, as well as to the greater potential of gifted individuals to arrive at autonomous and authentic personalities. With their intensity, sensitivity, heightened reflectivity, and consciousness, along with their state of being different and their awareness thereof, combined with their innate urge to strive for authenticity, gifted individuals experience the discrepancy between what is and what ought to be more intensely. This makes them potentially more vulnerable to inner conflicts and tension. Because of the same attributes, along with their creativity and penchant for self-determinism, however, gifted individuals have a greater capacity than anyone else to find the path to absolute meaningfulness and even ultimately to inspire others, and help them grow along the road to humanity. This is the greatest and most valuable human contribution and, by their very nature, gifted individuals appear to be the very best in this respect.

With regard to the development of a strong personality, however, Dabrowski emphasizes the importance of authentic education, which encourages individuals to transcend mediocrity and to develop their own personal hierarchies of values and aims, which they are then taught to realize (Rankel, 2008).

With regard to the limitations of this study, we have to note that although the BSEM approach to factorial validation better represents substantive theory, it is an innovative method that requires further research. In particular, the susceptibility of the PP*p* to specific model features, the number of variables, variable distributions, and model misspecification needs to

be investigated in more detail (Muthén & Asparouhov, 2012). Nevertheless, the Bayesian approach to statistics has many advantages over the frequentist approach. Bayesian analysis makes it possible to incorporate prior knowledge into parameter estimation, and is well suited for testing complex, non-linear models with non-normal distributions, regardless of sample size (Kruschke et al., 2012). Even in the case of very limited prior knowledge (non-informative prior) with little influence on the posterior distribution, the Bayesian credibility interval nevertheless allows direct probability statements about the parameter values given the data.

A second limitation of this study is the use of a brief version of the Revised NEO Personality Inventory (NEO-PI-R) (Costa & McCrae, 1992b) to determine only three personality traits. The NEO-FFI lacks the rich detail of the 240-item NEO-PI-R, which assesses 30 facets that define the five factors. Furthermore, a more complete grasp of latent constructs such as personality and overexcitability would require additional in-depth research on their neurobiological foundations.

To conclude, the results of this study provide clear evidence of similarities and differences for the OEQ-II scales when interrelated with the NEO-FFI scales. However, it should be noted that the interrelationships are not sufficiently strong to suggest that broader based personality instruments may serve as a substitute when a more comprehensive insight into human personality, its developmental course, and evolutionary significance is required.

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Table 1. Essential Characteristics of Overexcitabilities.

Intellectual overexcitability ▪ intensified activity of the mind ▪ asking penetrating questions ▪ reflective thought ▪ problem solving ▪ searching for truth and understanding ▪ conceptual and intuitive integration ▪ interest in abstraction and theory	**Emotional overexcitability** ▪ intense connectedness with others ▪ experience things deeply ▪ strong affective and somatic expressions ▪ sensitivity in relationships ▪ responsiveness to others ▪ well-differentiated feelings toward self	**Psychomotor overexcitability** ▪ intense physical activity ▪ work addiction ▪ nervous habits ▪ rapid speech ▪ impulsiveness ▪ competitiveness ▪ urge to action
Imaginational overexcitability ▪ visualize events very well ▪ ingenuity ▪ fantasy ▪ need for novelty and variety ▪ poetic and dramatic perception		**Sensual overexcitability** ▪ enhanced receptivity of the senses ▪ aesthetic appreciation ▪ sensuality ▪ pleasure in being the center of attention

Note. Adapted from Daniels and Piechowski (2009).

Table 2. Descriptive Statistics for Females and Males and Cronbach's Alphas.

		Females				Males			
Variable	α	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis
Intellectual overexcitability	.800	3.450	0.581	-0.035	0.102	3.540	0.538	0.161	-0.128
Imaginational overexcitability	.838	2.809	0.779	0.220	-0.195	2.708	0.663	0.148	-0.245
Emotional overexcitability	.820	3.737	0.571	-0.245	-0.153	3.162	0.617	-0.097	0.148
Sensual overexcitability	.863	3.295	0.736	-0.147	-0.175	3.112	0.691	0.041	0.054
Psychomotor overexcitability	.861	3.233	0.714	0.105	-0.217	3.380	0.700	-0.253	-0.094
Neuroticism	.840	3.026	0.616	-0.050	-0.191	2.588	0.616	0.120	-0.405
Openness to experience	.709	3.263	0.520	0.211	-0.138	3.145	0.517	0.524	0.020
Conscientiousness	.744	3.587	0.484	-0.124	-0.471	3.500	0.440	-0.053	-0.337
Intellectual ability	.828	31.310	4.157	-0.501	0.198	31.200	4.172	-0.656	0.378

Table 3. ML and Bayesian MIMIC Model Testing Results for Females (n = 318) and Males (n = 198).

Model	χ^2	*df*	*p*-value	RMSEA	CFI	PP *p*	95% CI
Females							
ML-MIMIC	1732.395	822	< 0.0001	0.059	0.688		
BSEM-MIMIC						0.108	-42.581-189.744
Males							
ML-MIMIC	1364.909	822	< 0.0001	0.058	0.645		
BSEM-MIMIC						0.165	-62.605-181.482

Note. ML = maximum likelihood; MIMIC = multiple-indicators, multiple-causes; *df* = degrees of freedom; RMSEA = root mean square error of approximation; CFI = comparative fit index; PP *p* = posterior predictive probability; CI = confidence interval; BSEM = Bayesian structural equation modeling.

Table 4. Bayesian MIMIC Model Estimation Results for the Measurement Parameters for Females (n = 318) and Males (n = 198).

	Females			Males		
	N	O	C	N	O	C
Factor loadings						
y1	**0.487***	-0.002	0.056	**0.833***	-0.058	0.054
y2	**0.582***	-0.007	0.021	**0.352***	0.024	0.035
y3	**0.522***	-0.003	-0.014	**0.606***	0.049	0.009
y4	**0.576***	0.020	0.001	**0.541***	0.056	-0.016
y5	**0.683***	-0.015	0.053	**0.702***	0.016	0.014
y6	**0.643***	0.000	-0.018	**0.550***	0.015	0.022
y7	**0.618***	0.011	0.046	**0.659***	0.001	-0.101
y8	**0.464***	0.014	-0.014	**0.178**	-0.003	-0.068
y9	**0.506***	-0.013	-0.038	**0.444***	-0.042	-0.030
y10	**0.588***	-0.003	-0.013	**0.592***	0.030	0.039
y11	**0.431***	-0.006	-0.093	**0.294***	-0.109	-0.009
y12	**0.524***	0.008	-0.038	**0.254**	0.021	-0.022
y13	0.061	**0.302***	-0.204*	-0.046	**0.834***	-0.049
y14	0.002	0.031	**-0.048**	-0.066	0.009	**-0.141**
y15	0.006	**0.734***	-0.007	-0.013	**0.642***	0.064
y16	-0.023	**0.417***	0.064	-0.023	**0.321***	0.023
y17	0.012	**0.675***	0.015	0.027	**0.632***	-0.025
y18	0.017	**0.446***	0.006	0.030	**0.045**	0.022
y19	0.041	**0.306***	0.013	0.140	**0.288***	0.112
y20	-0.006	**-0.136**	-0.028	-0.078	**0.206**	-0.051
y21	0.000	**0.719***	-0.034	0.054	**0.677***	-0.018
y22	-0.026	**0.424***	0.033	-0.020	**0.332***	0.005
y23	-0.062	**0.503***	0.036	-0.078	**0.546***	0.011
y24	0.001	**0.557***	0.007	0.024	**0.565***	0.034
y25	0.033	-0.015	**0.645***	0.099	-0.009	**0.827***
y26	-0.019	0.019	**0.479***	-0.141	0.016	**0.385***
y27	0.034	-0.009	**0.559***	-0.007	-0.030	**0.440***
y28	0.021	-0.007	**0.419***	0.082	0.012	**0.406***
y29	-0.005	0.011	**0.414***	-0.134	0.080	**0.584***
y30	-0.019	-0.022	**0.502***	0.058	-0.066	**0.555***
y31	0.035	0.009	**0.405***	0.128	-0.035	**0.488***

y32	0.015	0.004	**0.513***	0.017	0.017	**-0.081**
y33	-0.006	0.007	**0.518***	**-0.025**	-0.108	-0.023
y34	-0.031	0.022	**0.281***	-0.084	-0.009	**0.256**
y35	-0.065	-0.004	**0.702***	-0.170*	-0.131	**0.600***
y36	0.037	0.003	**0.098**	0.096	0.085	**0.404***

	Females			Males		
	N	O	C	N	O	C
Factor correlations						
N	1.000			1.000		
O	0.050	1.000		0.147	1.000	
C	-0.306*	0.029	1.000	-0.017	-0.061	1.000

Note. MIMIC = multiple-indicators, multiple-causes; N = neuroticism; O = openness; C = conscientiousness. The standardized coefficients in bold represent factor loadings that are the largest for each factor indicator.

* Significance at the 5% level in the sense that the 95% Bayesian credibility interval does not cover zero.

Table 5. Bayesian MIMIC Model Estimation Results for the Significant Structural Parameters for Females (n = 318) and Males (n = 198).

				95% Credibility Interval	
Parameter	Estimate	Posterior *SD*	One-tailed *p*	Lower 2.5%	Upper 2.5%
Females					
Neuroticism regressed on					
imaginational overexcitability	0.271	0.071	< 0.001	0.129	0.407
emotional overexcitability	0.318	0.063	< 0.001	0.192	0.438
psychomotor overexcitability	-0.174	0.058	< 0.01	-0.285	-0.057
Openness regressed on					
intellectual overexcitability	0.301	0.056	< 0.001	0.189	0.409
psychomotor overexcitability	-0.175	0.049	< 0.001	-0.270	-0.080
sensual overexcitability	0.454	0.055	< 0.001	0.343	0.557
Conscientiousness regressed on					
intellectual overexcitability	0.184	0.072	< 0.01	0.042	0.323
imaginational overexcitability	-0.472	0.067	< 0.001	-0.594	-0.334
Males					
Neuroticism regressed on					
emotional overexcitability	0.327	0.083	< 0.001	0.158	0.484
Openness regressed on					
intellectual overexcitability	0.275	0.085	< 0.01	0.104	0.433
sensual overexcitability	0.245	0.092	< 0.01	0.059	0.419

Note. MIMIC = multiple-indicators, multiple-causes.

Table 6. Maximum Likelihood ESEM Model Estimation Results for Females (n = 318) and Males (n = 198).

	Females		Males	
	F1	F2	F1	F2
Factor loadings				
y6	**0.556***	0.144	**0.428***	0.096
y9	0.032	**0.406***	0.196*	**0.431***
y11	**0.721***	-0.159	**0.406***	0.143
y17	0.039	**0.318***	-0.006	**0.414***
y26	-0.184	**0.837***	-0.010	**0.808***
y31	**0.790***	0.008	**1.118***	-0.003
y35	0.030	**0.654***	0.081	**0.550***
y41	0.160	**0.532***	0.113	**0.368***
y44	**0.383***	0.209	**0.083**	0.057
y49	0.217	**0.270***	**0.380***	0.247*
Factor correlations				
F1	1.000		1.000	
F2	0.574*	1.000	0.421*	1.000

Note. ESEM = exploratory structural equation modeling; F1 = factor 1; F2 = factor 2. The standardized coefficients in bold represent factor loadings that are the largest for each factor indicator.

* $p < 0.05$.

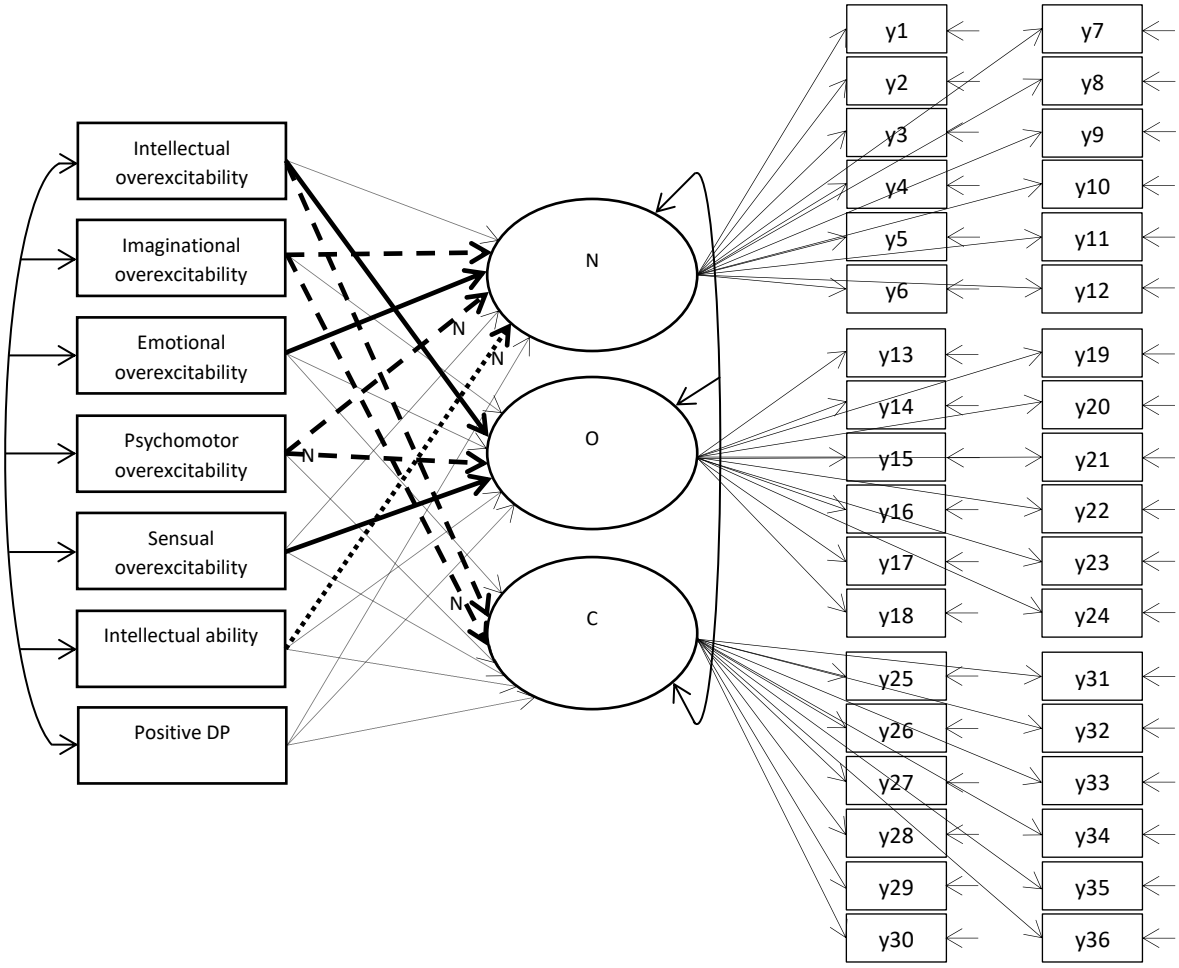

Figure 1. Multiple indicators, multiple causes model for females and males.

Note. N = neuroticism; O = openness; C = conscientiousness; DP = developmental potential. The bold lines represent significant – in the sense that the 95% Bayesian credibility interval does not cover zero – relationships for both female and male Bayesian models with zero-mean, small-variance priors for cross-loadings and residual covariances in the measurement model. The dashed lines represent non-trivial relationships with regard to the female group, while the dotted lines correspond to substantive associations exclusively regarding the male group. Lines marked by the letter "N" represent negative effects.