

Openness to experience and overexcitabilities in a sample of highly gifted middle school students

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journals.sagepub.com/home/gei**Shelagh Gallagher** 

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Abstract

A sample of 108 highly gifted middle school students participated in a study of the relationships between Big Five factors and overexcitabilities. Students completed the NEO-FFI and Overexcitabilities Questionnaire-II (OEQ-II). A cutoff score applied to the OEQ-II created a threshold for overexcitability, ensuring only extreme responses. Analysis groups were based on the number of OEs students possessed based on the cutoff score. An analysis of variance assessed differences in students' NEO-FFI scores according to the number of OEs they reported. Students with three or more overexcitabilities had significantly higher scores on NEO-FFI openness to experience than students with fewer overexcitabilities. Gifted females had significantly higher scores on NEO-FFI neuroticism scale than gifted males. The results hold implications for understanding the academic and social-emotional needs of highly gifted students and justify use of the Big Five model and overexcitabilities together to further understand the relationship between intelligence, personality, and giftedness.

Keywords

Big Five, Five-Factor Model, Dąbrowski, Openness to Experience, overexcitability, gifted, adolescent, personality, talented, gender

Debate continues over the role of overexcitabilities in giftedness; now, a parallel body of research investigating the relationship between the Five-Factor Model and intelligence has generated new interest. Much of this interest centers around the apparent overlap

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between openness to experience and Dąbrowski's five overexcitabilities. However, the search for clarity regarding where these two constructs converge and diverge requires a thorough understanding of each, and greater attention to how abstract concepts are operationalized and analyzed. The current study tests a new approach to comparing overexcitability and openness to experience in a group of highly gifted adolescents. A broad review of literature creates the context for the current study by establishing the relevance of openness to experience to the study of giftedness, presenting parallel research based on overexcitabilities, reviewing the research comparing the two, and considering its strengths and limitations in order to demonstrate the need for a new approach.

Openness to Experience

Openness to experience (Ote) is one of five factors in the five-factor model of personality, also known as the "Big Five" (Goldberg, 1990). Each of the Big Five factors describes a continuum of attributes; they include openness to experience (v. closed), neuroticism (v. emotional stability), conscientiousness (v. impulsiveness), agreeableness (v. uncooperative), and extraversion (v. reserved). Each factor is further subdivided into six component parts called *facets*. Some researchers also identify mid-level categories, called *aspects* (Christensen et al., 2019; de Young et al., 2007), creating a three-level hierarchy where a factor is divided into aspects, and aspects are subdivided into facets. Together, the five factors purportedly describe the breadth of human personality.

Big Five developers McCrae and Costa (1997) define the openness to experience (Ote) factor as "the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience" (p. 825). Closed individuals are conventional and tend to hold traditional views, prefer familiar routines, and have a narrow range of interests. At the other end of the scale, open individuals tend to embrace new things, experiences, and ideas. In a 1992 presentation to the American Psychological Association, McCrae (1993) recounted that the "concept of Openness to Experience had roots outside the lexical tradition in which the Big Five were identified" (1993, p. 1). Instead of using lexical analysis, McCrae and his colleague Paul Costa looked at a variety of personality measures with conceptual similarity that addressed different possible elements of Ote. Items from these inventories were tested for convergence as a factor. McCrae emphasized that Ote is a broad construct designed to capture (1) the motivation to seek experience and (2) the various avenues of experience-seeking through the mind, senses, emotions, and imagination (McCrae, 1993). Openness to experience is subdivided into six facets that represent modes of experience-seeking: fantasy, aesthetics, feelings, actions, ideas, and values. Definitions for the overall factor and each of its six facets are in Table 1.

The research examining Ote is vast, spanning psychology, biology, and neuroscience. Evidence from twin studies (Bartels et al., 2012; Wainwright et al., 2008) and genomic studies (Jang et al., 1996; Power & Pluess, 2015) have established that Ote is substantially heritable. Research investigating openness in childhood affirms that it manifests as early as preschool and that preschool openness predicts future outcomes such as advanced play patterns (Abe, 2005). Early childhood openness also predicts adolescent school achievement (Asendorpf & van Aken, 2003). Longitudinal research suggests openness is

Table I. Definitions of Openness to Experience and its Six Facets and Overexcitability and its Five Forms.

Openness to Experience	Overexcitability
<p>OtE General: Individuals who are high in openness to experience tend to have an active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, intellectual curiosity, and independence of judgment. Open individuals are curious about both inner and outer worlds, and their lives are experientially richer than those of closed individuals. They are willing to entertain novel ideas and unconventional values, and they experience both positive and negative emotions more keenly (Costa, McCrae, & Dye, 1991, p. 15)</p>	<p>OE General: One could say that one who manifests a given form of overexcitability, and especially one who manifests several forms of overexcitability, sees reality in a different, stronger and more multisided manner. Reality for such an individual ceases to be indifferent but affects him deeply and leaves long-lasting impressions. Enhanced excitability is thus a means for more frequent interactions and a wider range of experiencing. (Dąbrowski, 1972, p. 7)</p>
<p>OtE Fantasy: Individuals who are open to fantasy have a vivid imagination and an active fantasy life. They daydream not simply as an escape, but as a way of creating an interesting inner world for themselves. They elaborate and develop their fantasies and believe that imagination contributes to a rich and creative life. Low scorers are more prosaic and prefer to keep their minds on the task at hand.</p>	<p>Imaginational OE: imaginational overexcitability in its "pure" form manifests itself through rich association of images and impressions, inventiveness, use of image and metaphor in verbal expression, strong and sharp visualization. In its less pure form, emotional tension is transferred to dreams, nightmares, mixing of truth and fiction, fears of the unknown, or vividly visualized emissaries of fear.</p>
<p>OtE Aesthetics: High scores on this scale have a deep appreciation for art and beauty. They are moved by poetry, absorbed in music, intrigued by art, and they often experience a chill in response to sudden beauty... They need not have artistic talent, or even necessarily what most people would consider good taste, but for many of them, their interests in the art will lead them to develop a wider knowledge and appreciation than that of the average individual. Low scores are relatively insensitive to or uninterested in art and beauty.</p>	<p>Sensual OE: Sensual overexcitability appears to be a function of heightened experiencing of sensory pleasure, which may be manifested as a need for comfort luxury, stereotyped or refined beauty, fashions, variety of sexual experiences, numerous superficial relationships with others. Overeating or excessive sexual stimulation are the most common examples of transfer of emotional tension to sensual forms of expression.</p>

(continued)

Table I. (continued)

Openness to Experience	Overexcitability
<p>OtE Feelings: Openness to feelings implies receptivity to one's own inner feelings and emotions and the evaluation of emotion as an important part of life. High scorers experience deeper and more differentiated emotional states and feel both happiness and unhappiness more keenly than others do low scores have somewhat blunted affects and do not believe that feeling states are of much importance. They may be characterized by alexithymia.</p>	<p>Emotional OE: Emotional overexcitability is a function of experiencing emotional relationships. The relationships can manifest as strong attachment to persons, living things, or places. From the point of view presented here, intensity of feelings and display of emotions alone are not developmentally significant unless the experiential aspect of relationship is present. The manifestations of emotional overexcitability include inhibition (timidity and shyness), excitation (enthusiasm), strong affective memory, concern for death, fears, anxieties, depressions, feelings of loneliness, need for security, concern for others. Relationships of friendship and love are developed usually with very few persons, and in extreme cases with only one. For an "emotional" person, as defined here, such an exclusive relationship may be the only source of meaning in life.</p>
<p>OtE Ideas: Intellectual curiosity is an aspect of openness that has long been recognized.... This trait is seen not only in an active pursuit of intellectual interests for their own sake, but also in open-mindedness and a willingness to consider new, perhaps unconventional, ideas. High scorers enjoy both philosophical arguments and brain teasers. Openness to ideas does not necessarily imply high intelligence, although it can contribute to the development of intellectual potential. Low scorers on the scale have limited curiosity and, if highly intelligent, narrowly focus their resources on limited topics.</p>	<p>Intellectual OE: Intellectual overexcitability is manifested in the persistence to ask probing questions, avidity for knowledge, analysis, theoretical thinking, reverence for logic, preoccupation with theoretical problems. Intellectual overexcitability, in contrast to the first three forms, does not manifest the transfer of emotional tension to intellectual activity under distinct forms. When intellectual and emotional processes of high intensity occur together, it always seems possible to separate the intellectual from the emotional component.</p>

(continued)

Table 1. (continued)

Openness to Experience	Overexcitability
<p><i>(OtE has no facet parallel to psychomotor OE, but several studies provide evidence of a significant correlation between psychomotor OE and the Big Five extraversion factor)</i></p>	<p>Psychomotor OE: psychomotor overexcitability appears to be a function of an organic excess of energy or simply an excessive excitability of the neuromuscular system. It manifests itself, for example, in rapid talk, violent games, intense athletic activities, pressure for action. Enhanced neuromuscular excitability facilitates transfer of emotional tension to psychomotor forms of expression. Emotional excitement or stress is converted into gesticulation, pacing, throwing objects, wanderlust, rapid talk, chain smoking.</p>
<p>OtE Actions: Openness is seen behaviorally in the willingness to try different activities, go new places, or eat unusual foods. High scores on this scale prefer novelty and variety to familiarity and routine. Over time, they may engage in a series of different hobbies. Low scores find change difficult and preferred to stick with the tried-and-true.</p>	<p><i>(Dąbrowski did not include an overexcitability related to values. He addressed values as an aspect of human development within the theory of positive disintegration)</i></p>
<p>OtE Values: Openness to values assesses the readiness to re-examine social, political, and religious values. Closed individuals tend to accept authority and to honor tradition and, as a consequence, are generally conservative, regardless of political party affiliation. Openness to values may be considered the opposite of dogmatism.</p>	

Note. From [McCrea & Costa, 2004](#) and [Piechowski, 1975](#), p. 25–28, unless otherwise indicated.

relatively stable over time ([Rantanen et al., 2007](#); [Schwaba et al., 2018](#)), as are most personality traits. Although levels of OtE tend to increase during adolescence and taper off in late adulthood, changes across the lifespan account for only 5% of the variance in scores ([McCrae & Greenberg, 2014](#)). Very few studies investigate whether levels of OtE can change with formal training, but the existing evidence suggests that formal interventions have only a modest, incremental impact of around one-quarter of a standard deviation ([Jackson et al., 2012](#)). There is no research documenting groups of adults or children who first report being closed becoming open or vice versa, although the absence of research does not mean it cannot happen.

McCrea and Costa contend that on “empirical, conceptual, and heuristic grounds” (1997, p. 835) OtE is not a proxy for intelligence. Instead, OtE represents personality characteristics or behaviors that tend to co-occur with intelligence. They also argue that

keeping OtE distinct from intelligence opened the door to important research because “if we distinguish openness from intelligence we can ask whether the former affects or is affected by the latter—a question that might have profound consequences for developmental and educational psychology” (p. 835). The question of whether OtE has a relationship with intelligence also carries importance in gifted education.

Openness and intelligence

Although openness is not a proxy for intelligence, it is related to intelligence. Numerous studies report significant, positive correlations between intelligence and OtE such that people who are open tend to also score higher on intelligence tests than people who are closed (de Young, 2011; Furnham, Dissou, et al., 2007; Schretlen et al., 2010). Structural equation analyses further demonstrate that OtE makes independent contributions to both fluid and crystallized intelligence (Ziegler et al., 2012), although the relationship with crystallized intelligence seems stronger (Bergold & Steinmayr, 2018). Evidence suggests that being high in OtE plays a role, independent of intelligence, in mental functions, including memory retrieval, mental stimulation, future thinking, and creative cognition (Beaty et al., 2015).

Researchers have also investigated OtE in students identified as gifted. In one study, McCrae, Costa, and colleagues (2002) compared 230 gifted students who qualified for the Center for Talented Youth summer program to a sample of 2,748 high school students. They found that gifted students were developmentally advanced in openness to experience such that “at age 12 [gifted students] have already reached the level of [Openness to Experience] characteristic of 15-year-olds” (McCrae, Costa, Terracciano, et al., 2002, p. 1463). In another study comparing 374 gifted and 478 typically developing high school students in Israel, gifted students scored significantly higher on openness (Zeidner & Shani-Zinovich, 2011). A growing list of studies replicate this general finding across different cultures and using a variety of Big Five measures and intelligence assessments (Vuyk et al., 2016; Limont et al., 2014; Wirthwein et al., 2019). Using a finer-grained analysis, Altaras-Dimitrijević (2012) applied a discriminate analysis to comparisons of OtE facet scores across three samples of gifted and non-gifted students in high school and college in Serbia. In the series of studies, she found that gifted students in Serbia reported higher levels of the OtE fantasy, aesthetics, and ideas facets than non-gifted students; however, the gifted and non-gifted groups reported similar levels of OtE actions, values, and feelings. Moreover, gifted students in her samples were significantly different from non-gifted students on facets from Big Five factors beyond openness to experience. Gifted students were significantly higher in assertiveness and significantly lower in gregariousness from the extraversion factor, and significantly lower in modesty and tender-mindedness from the agreeableness factor.

Despite the relationship between intelligence and openness, evidence suggests that the Big Five conscientiousness factor has a stronger relationship with high school and college achievement (McAbee & Oswald, 2013; Nofle & Robins, 2007; Rimfeld et al., 2016). The reason is addressed in a pair of studies by Blickle (1996), who investigated the learning strategies favored by college students with different personality profiles. In this

study, conscientious students were more likely to favor strategies associated with disciplined learning or GRIT, including time management, rehearsal, metacognition, and effort. In contrast, students who identified with openness were more likely to apply elaborative learning strategies associated with higher-order thinking, including seeking further information, identifying relationships, and critical evaluation. Two of the learning strategies preferred by open individuals, seeking information and identifying relationships, had a negative relationship with college GPA. While investigating the same topic, [Chamorro-Premuzic & Furnham \(2009\)](#) created a structural equation model with survey responses of 852 college students and demonstrated that openness contributed positively to both the motivation for deep learning and the practice of deep learning but had a negative relationship with surface-level learning.

Openness and creativity

According to McCrae, “the origins of the concept of Openness [are] in theories of creativity.” (1993, p. 3). Research bears this out; openness to experience has an even stronger association with creativity than it does with intelligence. Silvia, Nusbaum, and colleagues (2009) conducted one of the most comprehensive studies of OtE and creativity. They gave 189 college students the NEO-FFI ([McCrae & Costa, 2004](#)) and five different creativity measures, encompassing both creative thinking and creative behavior. Openness to experience was the strongest and most consistent predictor of creativity among the five factors with large effect sizes regardless of whether creativity was operationalized as divergent thinking, creative self-concept, or creative productivity. The only exception was the self-perception of creativity in math and science domains. In another study of 199 working adults, workers high in openness were more likely to identify as high in both radical and incremental creativity ([Xu, Jiang, & Walsh, 2018](#)). Using data from 197 undergraduate students from Malaysia, Tan and colleagues ([Tan et al., 2016](#)) tested a model using OtE to predict self-perceived creativity. In the resulting path analysis, OtE made a significant direct contribution to self-perceived creativity and significant indirect contributions to self-perceived creativity through its impact on intrinsic motivation and creative process engagement.

[Kaufman \(2013\)](#) also investigated which elements of openness might be related to different types of creativity. He used a model separating OtE into two broad aspects, Openness (also called Experiencing) and Intellect, as measured by the Big Five Aspect Scale ([DeYoung et al., 2007](#)). The 144 adolescents in his study who were higher in the experiencing aspect of OtE were more likely to have creative achievements in the arts, and students higher in the intellect aspect were more likely to have pursued creative achievement in science. Even though this study was hampered by a sample where “the distribution of creative achievement was heavily skewed with many zero values” ([Kauffman, 2013](#), p. 246), a separate study of undergraduate students yielded similar results ([Perrine & Brodersen, 2005](#)). There are no studies replicating these findings with samples of creative, productive adults.

Openness, intelligence, and creative productivity. For decades, researchers have tried to identify the relationship between intelligence and creativity. Some evidence now suggests that openness to experience may be the missing link explaining when and how intelligence and creativity work together, with high levels of openness creating a bridge between the two. After conducting a regression analysis predicting creative potential, Jauk and colleagues (2013) found that openness and fluid intelligence made independent contributions to creative potential among high IQ subjects, but not among low-IQ subjects. They concluded that “High creative potential is not possible with a low-level IQ; but once the intelligence threshold is met, openness may explain to some extent whether the required cognitive disposition is actually turned into high creative potential” (Jauk et al., 2013, p. 221). Shi et al. (2016) drew similar conclusions in their study of 831 Chinese students. They presented evidence that openness acts as a mediator between intelligence and creativity, noting, “Intelligence can predict creative thinking only when the openness to experience score is medium or high; conversely, when the openness to experience level is low, intelligence exerts a very limited influence on creative thinking” (p. 6).

Social-emotional correlates of Openness to Experience

Openness has been associated with increased active coping and decreased avoidance of problems (Scholte-Stalenhoeft et al., 2016). In their study of OtE and mental health, Komiya et al. (2000) concluded that people high in OtE might be more willing to pursue psychological help precisely because they are open to the experience. Even so, studies document a relationship between OtE and the kind of depression that occurs when someone perceives a discrepancy between “what is” and “what could be” (Wolfstein & Trull, 1997). In a study of the Big Five and sleep disturbance, Randler et al. (2017) found that while neuroticism had the largest impact on frequency of nightmares, openness to experience had the second highest impact. After noticing that openness had differing impacts on physiological stress, Xin et al. (2017) concluded that openness could have “differential, opposing effects on the stress responses,” (para. 20) depending on how different facets within openness interacted with the stressor.

The research into openness to experience underscores its importance to a comprehensive understanding of giftedness. Adolescents and adults who have high IQs tend to be open rather than closed. Openness is not only related to intelligence, but it also enhances intelligence, as experience seeking leads to increased knowledge. In the classroom, open students are more likely to desire and engage in deep learning strategies. Openness also seems to contribute to the highest expression of giftedness, creative productivity. This may be why, after reviewing the literature on openness and eminence, McCrea and Greenberg (2014) concluded, “the case studies we have reviewed are consistent with the idea that Openness to Experience is a key feature of the psychology of genius...perhaps genius is a quality of the mind...an approach that takes in much of life experience, processes it deeply and discovers new possibilities” (p. 237).

Overexcitabilities

According to Dąbrowski scholars [Wells and Falk \(2021\)](#), the Polish psychologist and psychiatrist started forming his ideas about psychic overexcitability while writing his dissertation, well before he created the theory of positive disintegration. Dąbrowski defined overexcitability as “higher than average responsiveness to stimuli” (1972, p. 303) in one of five areas: imaginal, sensual, psychomotor, emotional or intellectual. A definition for each overexcitability is included in [Table 1](#).

By definition, a manifestation of overexcitability represents an extreme which Dąbrowski distinguished from being “excitable” (Dąbrowski, 1938/2019). The notion of overexcitability was not radical even in 1938, as similar concepts were presented previously by numerous psychologists, including the eminent psychologist William [James \(1917\)](#). Dąbrowski believed that individuals with several OEs see “reality in a different, stronger and more multisided manner” (Dąbrowski, 1972, p. 7), contributing to the potential for advanced development. However, he was careful to note that overexcitabilities alone do not guarantee advanced development; favorable environmental conditions and a desire for personal growth were also necessary.

As a practicing psychiatrist, one of Dąbrowski’s particular concerns was to help individuals adjust and develop both inwardly and in relation to their surrounding environment. His groundbreaking observation was that sometimes intense behaviors that seem negative and maladaptive could contribute to positive personality development; he referred to this phenomenon as “positive maladjustment” (Dąbrowski, 1972, p. vii). However, in Dąbrowski’s view, overexcitabilities are not inherently positive; OEs can contribute to negative or positive adjustment depending on a host of other variables. In combination with advanced ability and an inner drive for personal development, the influx of stimuli that manifests as an overexcitability can create psychological discomfort that is a catalyst to positive personality growth, but also results in atypical, and in some contexts dysfunctional, behaviors. This notion is also not unusual. Many other psychologists note that behaviors that facilitate creative productivity can be mistaken for psychological maladjustment, as when [Eysenck \(1993\)](#) writes about “overinclusivity” in relation to creative thinking or when [deYoung et al.](#) consider the similarities between creativity and apophenia ([DeYoung et al., 2012](#)).

Dąbrowski also recognized that individuals with overexcitabilities might need help learning how to manage their intensities, including knowing when and how to use them productively and when and how to regulate them. He observed that adjusting to more than one overexcitability presented a particular challenge: “Strong emotional and strong intellectual overexcitability lead to a powerful conflict between a personal, feeling and relationship-oriented intuitive approach to life and a probing, analytical, and logical approach. Inevitably the two will clash many times in the course of development before a resolution of the conflict is achieved” (1996, p. 24).

Dąbrowski’s aim in developing a developmental theory was out of a recognition that cognitive and emotional development are intertwined, claiming “We need a general theory of human development, one that would include and account not only for cognitive but for emotional development as well... where emotional factors are not considered

merely as unruly subordinates of reason” (Dąbrowski, 1996, p. 6). Dąbrowski considered the resolution of psychic tension and inner conflicts created by the presence of over-excitabilities a necessary but not sufficient condition for advanced development.

Overexcitabilities and intelligence

Contemporary research into the relationship between giftedness and overexcitability has placed particular emphasis on having a so-called “Big Three” combination of intellectual, imaginal, and emotional OEs (Mendaglio & Tillier, 2006), but Dąbrowski did not seem intent on all three being present in an OE profile. While he did believe that “Emotional (affective), imaginal and intellectual overexcitability are the richer forms” (1972, p. 7), he also noted that “Intellectual-emotional and intellectual-emotional-imaginal linkages are the basis of *highly creative* intelligence” (Dąbrowski, 1996, p. 78, emphasis added), suggesting that (1) two of the three richer forms were sufficient to promote advanced growth, and (2) the reference was specific to creative intelligence and not necessarily to other forms of intelligence. Dąbrowski also proposed that different combinations of OEs were related to expressed ability in different areas. For instance, he speculated that design talent emerged from a combination of emotional, intellectual, and psychomotor OE, and that heightened emotional, sensual, and psychomotor OE would lead to great compassion and empathy (Limont, 2012).

This more flexible view helps make sense of current research. Some studies report that gifted students are, on average, higher in intellectual, imaginal, and emotional OEs than typically developing comparison groups (Falk & Miller, 2009; Harrison & Van Haneghan, 2011; Piechowski & Colangelo, 1984; Siu, 2010; Winkler & Voigt, 2016). In other studies, gifted individuals are significantly higher in different combinations of three or more OEs, including intellectual, emotional, and psychomotor (Ackerman, 1997), or intellectual, imaginal, and sensual (Limont et al., 2014). Several studies report that intellectually gifted students are higher in two OEs (Bouchard, 2004; He et al., 2017; Moon & Montgomery, 2005; Van den Broeck et al., 2014; Yakmaci-Guzel & Akarsu, 2006). All these findings are consistent with Dąbrowski’s thinking that multiple OEs are associated with advanced potential, even though they do not all support the “Big Three” hypothesis. Only a few studies comparing gifted and typical students find that gifted students are significantly higher in just one OE (Van den Broeck et al., 2014; Wirthwein & Rost, 2011).

Little research exists associating overexcitabilities and learning behavior; the two available studies address different ends of the K-12 spectrum. In a study of 105 kindergartners in Hong Kong, Fung & Chung (2021) found that high levels of intellectual and imaginal overexcitabilities were significant predictors of cognitive spontaneity, which is associated with creativity. Using a sample of 516 Dutch students transitioning from high school to university, De Bondt & Van Petegem (2017) found that students high in intellectual overexcitability tended to prefer deep learning strategies and students high in imaginal overexcitability preferred undirected learning strategies, which they considered indicative of a preference for divergent thinking.

Overexcitabilities and creativity

Dąbrowski was interested in diverse forms of creativity and believed that overexcitabilities were integrally involved in the creative process, particularly imaginal and emotional OEs:

The essence of the process of creativity involves increased mental excitability, especially emotional and imaginal. It is mainly mental hyperexcitability through which the search for something new, something different, more complex and more authentic can be accomplished. (Dąbrowski 1973, p. 15)

Mendaglio & Tillier (2006) expressed understandable concern that early studies investigating overexcitabilities in creative individual had small sample sizes; however, recent studies are larger. Yakmaci-Guzel & Akarsu (2006) looked at overexcitabilities among 105 10th grade students in Turkey. They found that while intellectually gifted students were significantly higher than their peers in intellectual and imaginal OE, students considered creative by their teachers were significantly higher in all five OEs than students that teachers did not consider creative. In another study of 212 college students, female musicians reported significantly higher levels of sensual, imaginal, and intellectual OE when compared to a control group of females. In contrast, male musicians were significantly higher in sensual, emotional, and psychomotor OEs than other men (Martowska & Romanowicz, 2020). One of the largest studies of creativity and OEs was based on a sample of 1055 high school students from Hong Kong (He et al., 2017). He and colleagues investigated the relationship between overexcitabilities and creativity as measured by performance on the Chinese version of the Test for Creative Thinking-Drawing Production. After controlling for age, gender, and education, overexcitabilities accounted for 18.6% of the variance on the creativity test scores. In a subsequent discriminant analysis, they demonstrated that 71.8% of the sample was accurately as classified into highly creative or not highly creative groups based on their OEQ-II scores. Imaginal OE had the strongest predictive power, followed by emotional and intellectual OEs.

Some evidence suggests that OE profiles vary across different forms of creativity. Thompson and Jaque (2016) compared OEs among 195 high-level artistic or athletic performers and found that dancers and opera singers were higher on sensual, imaginal, and emotional OE than athletes. A study conducted with 341 Korean students attending specialized schools found that students attending a science high school were highest in intellectual OE and students in a foreign language high school were higher in emotional OE. However, students attending an art high school were high in psychomotor, sensual and imaginal OE. Among the art students, dancers had the highest psychomotor OE scores, while students studying drama were higher in sensual, imaginal and emotional OE (Moon & Montgomery, 2005). Martowska, Matczak, and Jóźwik (2020) also found that actors had complex OE profiles, reporting significantly higher levels of sensual, imaginal, emotional and psychomotor OEs than a control group.

Social-emotional correlates of overexcitability

Research on the relationship between OEs and social-emotional well-being reveals a complex set of interactions. [Beduna and Perrone-McGovern \(2016\)](#) tested the contributions overexcitabilities might make as latent variables affecting life satisfaction. They found that emotional and intellectual OE each made significant indirect contributions to life satisfaction through their impact on emotional IQ. [Mofield and Parker-Peters \(2015\)](#) found in their sample of gifted adolescents that high levels of intellectual and emotional OEs, and low levels of imaginational OE, were predictors for some dimensions of healthy perfectionism. Similarly, [Perrone-McGovern et al. \(2015\)](#) found that emotional OE had a significant, positive correlation with adaptive perfectionism but significant negative correlations with maladaptive perfectionism and emotional regulation. In a subsequent regression analysis, they found that high levels of emotional overexcitability predicted lower emotional regulation.

Sometimes OEs are associated with emotional distress, for instance, in the study by [Limont et al. \(2014\)](#), where emotional OE was a significant predictor of the Big Five neuroticism factor. In their study of athletes, dancers, and singers, [Thompson and Jaque \(2016\)](#) found imaginational and emotional OE together explained 17.6% of the variance of reported shame, and emotional OE explained 15.4% and 9.8% of the variance for reported anxiety and depression, respectively. Using a sample of 216 middle and high school students, intellectual and emotional OE were related to insomnia while imaginational OE was related to fear of the unknown ([Harrison & Van Haneghan, 2011](#)).

The most complete look at the relationship between OEs and other psychological variables is by [Martowska and Matczak \(2017\)](#). In a series of studies, they gave the OEQ-II and a variety of inventories assessing regulation traits, cognitive intelligence, emotional intelligence, social competency, and depression to groups of university students. Consistent with other studies, they found a negative relationship between imaginational OE and generalized well-being. Intellectual OE was related to crystallized intelligence but not reasoning; it was also related to emotional regulation and to acquiring social competency. Psychomotor OE was related to both a high demand for stimulation and also heightened ability to process stimulation. Emotional OE was related to low levels of well-being but also to emotional empathy and capacity for intimacy.

Similarities and differences between openness to experience and overexcitabilities

Similarities

McCrae and Costa's openness to experience and Dąbrowski's overexcitabilities share remarkable similarities, considering they were derived an ocean and several decades apart. The similarity begins with the definition each uses to describe their respective concept, rooted in portrayals of a rich and intense life experience, evidenced in [Table 1](#). Similarities also exist at the level of OtE facets and individual OEs, especially in the parallels between OtE fantasy and imaginational OE, OtE ideas and intellectual OE, OtE

feelings and emotional OE. An overlap also exists between OtE aesthetics and sensual OE although sensual OE has a broader scope than the aesthetics facet of OtE.

Both originators claim extremes of their construct are integrally involved in the highest levels of intellectual and creative achievement. They each drew on the lives of eminent individuals such as Jean Jacques Rousseau, B.F. Skinner, and John Coltrane (McCrae & Greenberg, 2014), or Franz Kafka, Mahatma Gandhi, Antoine de Saint-Exupéry, Abraham Lincoln (Dąbrowski, 1973) as qualitative evidence of their ideas. Both also believed that personality shapes how children interact with their environment at home, at play, and at school.

McCrae and Dąbrowski also share a conviction that characteristics they describe can manifest in behaviors or attitudes that although positive in some contexts, may seem aberrant because they differ from the norm. McCrae and Costa (1997) use artists as an example:

Artists and poets form another group long held to be different, if not deviant. They are remarkable for their specific artistic talents, but they are also characterized by a set of mental, emotional, and attitudinal characteristics that set them apart... They are all dreamers with keen imaginations, seeing possibilities that others miss. They are sensitive and passionate ...They have insatiable curiosity...And they are unorthodox. (McCrae & Costa, 1997, p. 825)

A fourth similarity is in the general nature of the findings in their separate bodies of research. High levels of OtE and the presence of OE are associated with high-level cognition, including both intellectual ability and creativity. Both seem associated with a preference for deep learning experiences rather than surface learning. Openness and OE also both co-occur with a broad set of social-emotional characteristics. These relationships are complex and associated with specific OEs or OtE facets, which may explain why results sometimes point to relationships with negative outcomes such as life dissatisfaction, depression, and sleep disturbance (Martowska & Matczak, 2017; Wolfenstein & Trull, 1997), while other studies report positive associations such as emotional resilience and empathy (for OtE see Guilera, Batalla, Forne, & Soler-Gonzalez, 2019; for OE see Martowska & Matczak, 2017) or emotional intelligence (for OtE see Alghamdi et al., 2017; for OE see Beduna & Perrone-McGovern, 2016). This complex set of results suggests that, just like OtE, the presence of OEs may have “differential, opposing effects” (Xin et al., 2017, para 20) depending on the specific OE and the triggering event.

Differences

Despite some surface similarities, OtE and OE have clear differences. The first difference is in their conceptual paradigms and the aims each pursues. The Big Five framework describes human attributes from the perspective of personality psychology, a specialty that investigates individual differences in attributes and the laws that govern human behavior. Dąbrowski used two different frameworks: (1) clinical psychiatry, which focuses on the process of alleviating maladjustment, or perceived maladjustment, and (2)

developmental psychology, the study of mechanisms of psychological growth over time. In essence, the Big Five model describes the presence of personality attributes, while Dąbrowski describes possible clinical and developmental implications of having those attributes.

A second difference is in scope. While the Big Five factor is referred to as openness to experience, the openness scale is intended to describe a full range of personality attributes from closed to open. Everyone is represented somewhere on an openness to experience scale. In contrast, an overexcitability is an extreme; having overexcitability is an outlier experience. In this respect, the difference between OtE and OE is comparable to the difference between generalized intelligence and giftedness. Everyone has an IQ, but only a subset is gifted; similarly, everyone has a place on an openness to experience scale, but only a subset are overexcitable.

A third difference is in structure. Openness to experience and overexcitability each contain components that the other does not, as indicated in [Table 1](#). While the OtE actions and psychomotor OE have names that suggest movement, their definitions describe different phenomena: the OtE actions facet is associated with experience-seeking behavior, while psychomotor OE represents high level of physical energy, including the need to pace or having a jittery knee in addition to a desire for action. The difference in the structure of OE and OtE is even more apparent in the treatment of values. McCrae and Costa (2010) define values as a facet within OtE. Dąbrowski believed that values evolve as a part of human development and included the evolution of values in his theory of positive disintegration. In that theory, he proposed that values change due to a combination of developmental potential, growth, and experience: “To each level of mental development there is a corresponding level of value experience. Mental development...and the development of a hierarchy of values are, in fact, two names for the same process” (Dąbrowski, 1970, p. 98).

Research comparing openness to experience and overexcitabilities

The discussion about the relationship between OE and OtE in the research literature began with general comparisons (Altaras-Dimitrijević, 2012; Wirthwein & Rost, 2011), and a brief literature review (Gallagher, 2013) before empirical studies were published in English.¹ Limont et al. (2014) compared 132 students identified as gifted using the Advanced Progressive Matrices with 103 average IQ control group students on scores of Polish translations of the OEQ-II and the NEO-FFI, a 60-item short form of the NEO-PR-I. Gifted students were significantly higher than control group students on sensual, intellectual, and imaginal OEs as well as Big Five factors OtE and neuroticism. Openness was correlated with all OEs except psychomotor. In a subsequent path analysis, sensual, and imaginal OE predicted OtE for both gifted and non-gifted students, with sensual OE having a larger predictive value for gifted students. Psychomotor OE scores for gifted students also had larger predictive value for the Big Five extraversion factor. Intellectual and imaginal OE scores had higher predictive value for Big Five extraversion for control students when compared to gifted students.

As a part of a larger study, [Botella et al. \(2014\)](#) gave a French OEQ-II, the Nagilari Nonverbal Intelligence Test (NNAT), and the 100-item Brief Big 5 (BB5) to 434 12–16 years olds. They did not report correlations between BB5 scores and the NNAT, and found no correlations between OEs and the NNAT, which the authors attributed to the fact that the NNAT is nonverbal. All OEs except psychomotor had significant positive correlations with OtE. Psychomotor OE had a significant positive correlation with the Big Five extraversion factor. Imaginational and emotional OE had significant positive correlations with the Big Five neuroticism factor. Like the [Limont et al. \(2014\)](#) study, these results suggest the relationship between the Big Five and OEs goes beyond OtE. More recently, [De Bondt et al. \(2021\)](#) investigated the relationship between the five OEs and the Big Five openness, conscientiousness, and neuroticism factors. Like [Limont et al. \(2014\)](#) and [Botella et al. \(2014\)](#), these authors found that the OEs loaded on multiple Big Five factors, not just openness.

The most detailed look at the similarities between OE and OtE to date was conducted by [Vuyk et al. \(2016\)](#). They used the 240-item NEO-PI-3 inventory ([McCrae, Costa, & Martin, 2005](#)), which allowed for comparisons of individual OEs and the six OtE facets. The study tested different factor analysis techniques to see if the OEs, as measured by the OEQ-II, and OtE facets, as measured by the NEO-PR-I, were psychometrically different from each other or if they represented the same constructs. The researchers used a sample comprised of 149 creative adolescents from the US and a random sample of 312 adults, 70% from the US and 30% from other countries, mainly India.²

When a Confirmatory Factor Analysis (CFI) combining the items from the OEQ-II and the NEO-PRI-3 OtE scale failed to yield a good fit, Vuyk and colleagues (2016) turned to exploratory structural equation modeling (ESEM). In the first model, they tested whether items for the six OtE facets and five OEs would sort back into their original constructs, that is, imaginational OE items would sort into an imaginational OE factor and not on OtE fantasy. Although this model had a reasonable CFI and most of the OEQ-II items loaded on their respective OEs, the authors found the factors hard to define. The second ESEM model had a slightly poorer fit, but the authors considered it adequate and preferable because they believed it created more interpretable factors. In the second model, they observed that “every Openness facet except 06 values loaded onto one factor in combination with their equivalent OE” ([Vuyk et al., 2016](#), p. 198), suggesting that the NEO-PI-3 OtE items and the OEQ-II were essentially measuring the same thing. In fact, four of the blended factors did demonstrate substantial convergence: (1) intellectual OE/OtE ideas, (2) imaginational OE/OtE fantasy, (3) sensual OE/OtE aesthetics, and (4) emotional OE/OtE feelings. Each of these blended factors included every relevant OEQ-II item except one item from the intellectual OE scale. The four blended factors also included most, but not all, NEO-PI-3 items. In general, the OEQ-II items had higher loadings on these blended factors.

The findings for the other two blended factors were more ambiguous. For the blended factor OtE actions/psychomotor OE, only OEQ-II items loaded on the factor with satisfactory strength. Items from the openness to experience action facet either had low factor loadings on the blended factor or higher factor loadings on different blended factors. The final factor created in the analysis, which the authors labeled “06” combined items from

the OtE values facet and a handful of other OtE items. Consistent with its theoretical underpinnings, none of the OEQ-II items loaded on the “06” factor. While this study provided some support for conceptual similarities between intellectual OE and OtE ideas facet, imaginal OE and OtE fantasy facet, emotional OE and OtE feelings facet, and to a lesser extent sensual OE and OtE aesthetics facet, pieces of each construct were unique. Moreover, Vuyk et al. did not account for findings in other studies that some OEs were also related to Big Five factors outside of OtE. Taken together, their study supported similarities between some aspects of OE and OtE but did not support that OE and OtE are the same, despite the authors’ assertion to the contrary (De Bondt et al., 2021; Grant, 2021).

Additional investigation is warranted to clarify the similarities and differences in OE and OtE, and how they can help illuminate our understanding of gifted individuals’ personality attributes. However, it is first necessary to acknowledge the measurement challenges inherent to this line of research.

Measurement challenges when comparing OtE and OE

Research is dependent on appropriate instrumentation, and instrumentation issues are especially challenging when comparing OtE and OE. Some of the challenges involve openness, which remains difficult to define at the facet level leading researchers to note that “Openness-to-Experience/Intellect is the most debated and least understood of the Big Five traits” (Caspi et al., 2005, p. 459) and that it is “a broad, complex trait that is difficult to pin down” (Christensen et al., 2018, p. 574). Costa and colleagues acknowledged that the original facets were selected for pragmatic reasons as well as for psychometric merit, “We identified six facet scales for each domain, not because each is naturally divisible into six parts but because at least six distinctions were suggested in the literature, and more than six scales would tax the user’s ability to learn and remember the facets,” (Costa, McCrae, & Dye, 1991, p. 888). Recent studies reveal that openness is a larger domain than initially believed. The most comprehensive investigation of the facets within openness was conducted by Christensen et al. (2019), who used network analysis to isolate conceptual families of openness items. The items in the analysis came from four commonly used measures, each of which identified somewhat different facets within openness. Unlike previous studies using a more limited range of items, the network analysis yielded three aspects and 10 facets within openness. Christensen and colleagues also found that the individual inventories used in the analysis either did not include all facets or did not have a balanced number of items for each facet. Consequently, the underlying meaning behind the results of any study of openness, particularly studies at the facet level, must be considered within the context of the instrument.

The current OE/OtE research also raises several questions regarding the operationalization of overexcitabilities. Dąbrowski himself acknowledged that “to differentiate [superexcitability] from manifestations of ‘normal’ excitability, is a phenomenon difficult to delineate precisely” (Dąbrowski, 1938/2019, p. 3). The first question is whether the OEQ-II, the most frequently used measure of overexcitabilities, assesses *overexcitability*, or whether it represents a range from low excitability to overexcitability. Little or no discussion exists in the OE literature about where excitability ends and overexcitability

begins in psychometric terms. Adjusting the scoring method for the OEQ-II to include only high-end responses as overexcitable would help create a more accurate representation of OE. Using a cutoff score would also return to the method Dąbrowski originally used with his now-lost 100 item questionnaire (Dąbrowski, 1938/2019).

A second question is whether, given Dąbrowski's emphasis on the number of OEs as well as their intensity, comparisons of OE and OtE should include the number of OEs individuals report. Theoretically, highly gifted students should have high levels of several OEs, and, if overexcitabilities are related to being open on an OtE scale, high levels of OtE should correspond with the presence of multiple OEs.

A different approach to comparing OE and OtE seems necessary, one that improves conceptual integrity when operationalizing overexcitability and that considers the number of OEs reported by individual respondents. Neither of these are two approaches to assessing overexcitability are included in the existing research, so a study testing their efficacy would inform the study of OEs generally as well as refining the comparison of OE and OtE. Research questions addressed in this exploratory study are: (1) What are the patterns of overexcitability reported by a sample of highly gifted middle school students when using a cutoff score on the OEQ-II and a frequency count of number of OEs per student? and (2) What is the relationship between openness to experience as measured by the NEO-FFM, and the number of OEs students report using the OEQ-II?

Method

Subjects

The 108 middle school students in the study attended a public charter school for highly gifted students for grades K-8 in the Southeastern US. The sample included 52 males and 56 females, and they ranged in age from 11 to 14 years old.

Students were considered highly gifted by virtue of their enrollment in the school. The school uses a two-phase process for admissions to accommodate both the school's mission to serve highly gifted students, and the requirement for random selection mandated in the charter. The first phase of admissions was the formation of a candidate pool comprised of students who scored at least three standard deviations above average on an approved IQ test. Students with IQ scores two standard deviations above the mean were included in the application pool if they also presented compelling evidence of a situation that might suppress an IQ score. The application also included parent and teacher recommendations. Students for each new class were selected via lottery from this candidate pool. The school had a policy giving siblings priority for admissions, but these siblings also had to meet eligibility requirements. Written assent and consent forms were gathered from all participating students and their parents.

Measures

NEO-FFI. The NEO-FFI (McCrae & Costa, 2004) is a 60-item abbreviation of the 240 item NEO-PR-I, which is one of the most comprehensive measures of openness. Items on the

NEO-FFI are answered on a five-point Likert-type scale, with responses ranging from strongly disagree to strongly agree. The current form is a revision in which 14 items in the original NEO-FFI were replaced with alternatives selected from the NEO-PI-R. The new items were selected to minimize acquiescence effects, increase correlations with NEO-PR-I factor scores, to diversify item content, and increase ease of item comprehension (McCrae & Costa 2004).

The revised NEO-FFI includes 12 items for each of the five factors. Scores for each factor range from 0 to 60. According to the manual, the average score for young adolescents 12–13 years old is 27.10 with a standard deviation of 6.0. Responses to the NEO-FFI yield scores for factors, but not for facets within factors. The original NEO-FFI was validated against numerous other personality inventories; report internal consistency ranges from 0.68 to 0.86 (Costa & McCrae, 1992), and the new form has Cronbach's alpha ranges from 0.75 to 0.82 (McCrae & Costa, 2004).

Overexcitability Questionnaire-II. The OEQ-II (Falk, Miller, Piechowski, & Silverman, 2016) is a 50-item Likert-type measure of Dąbrowski's five overexcitabilities, with 10 items for each overexcitability. Overexcitability scores are the average of the 10 items for each OE, yielding scores from 0 to 5. Factor analytic studies confirm the structure of the OEQ-II (DeBondt & Van Petegem, 2015; Van den Broeck et al., 2014). Results of some studies suggest a possible gender bias, favoring females, on emotional and sensual overexcitabilities (De Bondt & Van Petegem, 2015; Van den Broeck et al., 2014), necessitating analysis by gender. Cronbach's alpha for this sample were psychomotor $\alpha = 0.86$, sensual $\alpha = 0.91$, imaginal $\alpha = 0.85$, intellectual $\alpha = 0.83$, and emotional $\alpha = 0.82$.

Methods

Procedure

Students completed the NEO-FFI and the OEQ-II on consecutive days during a class period reserved for social and emotional learning. Homeroom teachers administered the inventories. Demographic data were gathered as a part of the NEO-FFI form. To protect student identity, teachers removed student names from forms and substituted an identification number known to school personnel but not to the researcher.

Calculating overexcitability. A new method of scoring the OEQ-II created a strict, high threshold for the designation "overexcitable." Scores for the OEQ-II were first calculated according to traditional instructions, by averaging the 10 items for each OE. Typically, these average scores are used in research analyses. In this study, a score of 3.5 was selected as a cutoff discriminating between "excitable" and "overexcitable." This score matches or exceeds the average scores reported for the norming group in the manual, which range from 3.2 for imaginal OE to 3.5 for emotional OE (Falk et al., 2016). The 3.5 cutoff is also higher than the Grand Harmonic Means calculated using the OEQ-II scores of 5497 individuals across 9 studies which ranged from 2.82 for imaginal OE

to 3.20 for emotional OE (Falk & Miller, 2009). Based on this information 3.5 seemed a reasonable lower limit to designate overexcitability.

Using the 3.5 cutoff, each student's OE scores were coded "0" if an OE score was below 3.5 and "1" if it was 3.5 or above. Only scores coded "1" were considered indicators of overexcitability and included in the analysis. The number of OEs included in each student's OEQ-II profile was then calculated by adding the number of "1" scores, yielding a score from 0 to 5. The final analysis categories were students with 0 OEs, 1 OE, 2 OEs, or 3+ OEs.

Calculating FFM factor scores. The NEO-FFI inventory used in this study was self-scored; students scored their own forms before providing a copy to their teacher. Calculations were checked for accuracy before including them in the database. The NEO-FFI provides scores for each of the Big Five factors, conscientiousness, agreeableness, neuroticism, openness, and extraversion, but not for facets within factors.

Data analysis

A correlation matrix identified relationships between OEs and the Big Five factors in order to compare general trends with findings from previous research. After conducting a Levene test for equality of variance, the main analysis consisted of an ANOVA using the number of OEs and gender as independent variables and the five FFM factors as the dependent variables. Type III sums of squares were used when interpreting the data to account for unbalanced cell sizes. Using Type III also has the advantage of providing the variation attributable to any given variable after adjusting for the effects of other variables and interactions (Maxwell & Delaney, 2004).

Results

Frequency of overexcitabilities

Average scores for each OE were calculated to confirm that the cutoff was reasonable for this group of students. The averages for each OE were similar to scores reported in the manual and in Grand Harmonic Means reported by Falk and Miller (2009), suggesting they are representative. For this group of students, the average scores were psychomotor OE 3.56 (*SD* 0.76), sensual OE 3.06 (*SD* 0.92), imaginal OE 2.99 (*SD* 0.89), intellectual OE 3.53 (*SD* 0.66), and emotional OE 3.35 (*SD* 0.72). For sensual, imaginal, and emotional OEs, the 3.5 cutoff was above the average score, and for psychomotor and intellectual OEs it was just below the average, suggesting it was a reasonable dividing point.

After coding the data and calculating totals of students whose scores were 3.5 or higher, 10 students reported no OEs, 29 students reported one OE, 30 students reported two OEs, and 39 students reported three or more OEs. Psychomotor was the most frequently reported OE among students with only 1 OE, followed by intellectual OE (24%), and emotional OE (21%). Students with two OEs were also most likely to report

psychomotor OE (57%), followed by intellectual OE (53%) and imaginal OE (33%). Students with three OEs were most likely to report intellectual OE (87%), followed by emotional OE (77%) and sensual OE (72%). The frequency of all OE for all groups is included in Table 2. No specific pattern emerged in terms of OE combinations; however, 36% of the 39 students reporting three or more OEs were high in intellectual, imaginal, and emotional OE, and another 51% were high in two of these three OEs.

Relationship between openness to experience and overexcitability

Correlations. A correlation matrix using the students' average scores for the Big Five factors and average scores for each of the five OEs for the entire sample is presented in Table 3. The matrix revealed significant positive correlations between NEO-FFI OtE and four OEs: sensual ($r = 0.71, p < .001$), imaginal ($r = 0.63, p < .001$), intellectual ($r = 0.30, p < .001$), and emotional ($r = 0.54, p < .001$).

Significant positive correlations were also observed between OEs and other FFM factors. Psychomotor OE had a significant positive correlation with FFM extraversion ($r = 0.43, p < .001$), sensual OE had a significant positive correlation with FFM extraversion ($r = 0.21, p < .01$), and FFM agreeableness ($r = 0.24, p < .01$). Imaginal OE had significant positive correlation with FFM neuroticism ($r = 0.41, p < .001$), and a significant negative correlation with FFM conscientiousness ($r = -0.29, p < .001$). A significant positive correlation was found between emotional OE and FFM neuroticism ($r = 0.39, p < .001$) and agreeableness ($r = 0.36, p < .001$). While four overexcitabilities had the strongest linear relationships with openness to experience, the relationship between overexcitabilities and the Big Five in this sample went beyond that factor.

Analysis of variance

A Levine test for equality of variance of FFM scores in advance of the ANOVA analysis yielded nonsignificant results, verifying homogeneity of variance across groups. For FFM openness, $F(7, 100) = 0.54, p < .80$; FFM extraversion, $F(7, 100) = 1.61, p < .14$; FFM

Table 2. Number and Percent of Students Reporting 1, 2, or 3+ Overexcitabilities.

	Emotional		Imaginational		Intellectual		Sensual		Psychomotor	
	n	%	n	%	n	%	n	%	n	%
0	0	0%	0	0%	0	0%	0	0%	0	0%
1	6	21%	2	7%	7	24%	1	3%	13	45%
2	8	27%	10	33%	16	53%	9	30%	17	57%
3+	30	77%	23	59%	34	87%	28	72%	27	69%
Total	44	42%	35	32%	47	44%	38	35%	57	53%

Note. 0 = no overexcitabilities, 1 = 1 overexcitability, 2 = 2 overexcitabilities, 3+ = 3 or more overexcitabilities.

Table 3. Correlations among NEO-FFI Five-Factor Scores and OEQ-II Overexcitability Scores.

Variables	1	2	3	4	5	6	7	8	9	10
1. NN	—									
2. NE	-0.19	—								
3. NO	0.16	0.10	—							
4. NA	-0.12	0.15	0.10	—						
5. NC	-0.34***	0.21*	0.01	0.20*	—					
6. POE	-0.12	0.43***	-0.13	-0.06	0.10	—				
7. SOE	0.16	0.21*	0.71***	0.24**	0.08	-0.03	—			
8. MOE	0.41***	-0.06	0.63***	0.11	-0.29***	-0.19*	0.55***	—		
9. TOE	0.08	-0.14	0.39***	-0.06	0.14	0.20*	0.24**	0.24**	—	
10. EOE	0.39***	0.18	0.54***	0.36***	0.03	-0.24**	0.50***	0.48***	0.20*	—

Note. NN = NEO-FFI neuroticism, NE = NEO-FFI extraversion, NO = NEO-FFI openness to experience, NA = NEO-FFI agreeableness, NC = NEO-FFI conscientiousness; POE = psychomotor OE, SOE = sensual OE, MOE = imaginal OE, TOE = intellectual OE, EOE = emotional OE.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

agreeableness, $F(7, 100) = 0.99, p < .44$; FFM conscientiousness, $F(7, 100) = 1.73, p < .11$; and FFM neuroticism, $F(7, 100) = 0.84, p < .56$.

The ANOVA using number of OEs and gender as independent variables and openness scores as the dependent variables yielded a main effect for FFM openness $F(3, 104) = 19.51, p < 0.00$ with a large effect size $w^2 = .15$. Average scores for each Big Five factor according to number of OEs students reported are in Table 4 and results of the ANOVA are presented in Table 5. Post hoc comparisons using a Sheffé test revealed that students with 3 or more OEs ($M = 34.46, SD = 5.56, p < .01$) had significantly higher OtE scores than students with 0, 1, or 2 OEs. Openness scores among students with 0 OEs ($M = 24.30, SD = 3.40$), and 1 OE ($M = 24.24, SD = 5.36$) were nearly identical. Although students with two OEs ($M = 28.07, SD = 6.36$) had a higher average OtE score than students reporting no OEs or one OE, it was not significantly higher, nor was it significantly different from students with 3 or more OEs. The average score for students reporting three OEs was significantly higher than the other students in the study ($M = 34.46, SD = 5.56$), it was also substantially higher than the average score for 12–13 year olds in the manual ($M = 27.1, SD = 6.00$) (McCrae & Costa, 2004).

The ANOVA also revealed a significant main effect by gender for FFM neuroticism $F(1, 106) = 4.13, p < 0.05$, with a moderate-to-large effect size $w^2 = 0.09$. A Sheffé post hoc test revealed that average neuroticism scores for males ($M = 25.44, SD = 7.80$) were significantly lower than scores for females ($M = 29.11, SD = 6.45$). Females in this group had elevated scores on this scale, suggesting they were more likely to experience worry and anxiety. Scores for males were just above the norm of 24.10 generally observed in 12- to 13-year-old males (McCrae & Costa, 2004). The OE \times Gender analysis yielded no significant interaction effects.

Discussion

One aim of this study was to see how many highly gifted students had OEs when using a cutoff score to ensure that average and below average scores were omitted, and, from there, to see how many gifted students reported multiple OEs. A second aim was to test the relationship between the number of OEs and levels of OtE. Results of this research provide supporting evidence that levels of OtE are statistically similar among students with zero, one, or two OEs but OtE scores reported by three or more OEs were significantly higher.

Using a cutoff score and frequency count to assess overexcitabilities

Using a cutoff score to remove all average or below OE scores and then calculating a total number of OEs to measure breadth of OE profiles provided a clearer measure of overexcitabilities among these highly gifted students. Even though this method made it harder for an OEQ-II score to meet the criterion for overexcitability a plurality of students, 40%, reported three or more OEs and another 28% reported two OEs. These results add to the evidence suggesting that most highly gifted students have multiple OEs in varied combinations. Without an average-ability comparison group, this study cannot address

Table 4. Average NEO-FFI Factor Scores for Highly Gifted Students According to Gender and Number of Overexcitabilities.

Number of OEs	Gender	n	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
			M	SD	M	SD	M	SD	M	SD	M	SD
0	Male	5	23.80	2.77	30.20	2.59	23.80	3.27	31.00	1.41	25.20	5.26
	Female	5	26.80	5.72	31.20	4.09	24.80	3.83	29.20	7.09	30.40	2.30
	Total	10	25.30	4.52	30.70	3.27	24.30	3.40	30.10	4.91	27.80	4.71
1	Male	18	24.78	8.63	26.94	9.66	23.78	5.97	26.94	5.57	25.67	8.55
	Female	11	28.09	4.13	33.00	6.08	25.82	3.92	32.91	3.94	29.91	11.22
	Total	29	26.03	7.35	29.24	8.88	24.24	5.36	29.21	5.75	27.28	9.68
2	Male	16	27.13	7.91	31.94	7.60	26.13	5.93	29.38	6.23	26.88	10.17
	Female	16	28.64	7.45	27.21	11.02	30.29	6.29	28.79	9.11	25.50	6.51
	Total	32	27.83	7.60	29.73	9.49	28.07	6.36	29.10	7.57	26.23	8.54
3+	Male	13	24.92	8.15	32.00	5.99	34.31	5.04	32.77	6.25	27.00	7.62
	Female	26	30.23	6.91	33.73	7.14	34.54	5.89	33.08	7.24	29.58	9.61
	Total	39	28.46	7.67	33.15	6.75	34.46*	5.56	32.97	6.84	28.72	8.98
Total	Male	52	25.44	7.80	30.06	7.91	26.96	6.98	29.54	6.03	26.33	8.43
	Female	56	29.11*	6.45	31.73	8.20	30.89	6.63	31.63	7.34	28.70	8.88
	Total	108	27.34	7.33	30.93	8.07	29.00	7.05	30.62	6.79	27.56	8.71

Note. OEs = overexcitabilities; 3+ = three or more overexcitabilities. Average NEO-FFI scores for normal distribution of 12–13 year olds (standard deviation in parentheses): neuroticism 24.1 (7.1), extraversion 33.5 (6.1), openness to experience 27.1 (6.0), agreeableness 30.2 (6.3), conscientiousness 28.1 (7.7) (McCrae and Costa, 2007).

* $p < 0.01$.

Table 5. Two-way ANOVA of Overexcitabilities × Gender of Five-Factor Model Scores.

Effect	Dependent	Type III sum of squares	df	Mean square	F	p	ω^2
OE	NN	70.60	3	23.53	0.45	0.72	0.01
	NE	210.16	3	70.54	1.13	0.34	0.03
	NO	180.42	3	600.14	19.51	0.00	0.21
	NA	269.58	3	89.86	2.08	0.11	0.06
	NC	76.15	3	25.38	0.33	0.81	0.01
Gender	NN	216.93	1	216.93	4.13	0.05	0.08
	NE	20.75	1	20.75	0.33	0.56	0.01
	NO	79.06	1	79.06	2.57	0.11	0.05
	NA	18.95	1	18.95	0.44	0.51	0.01
	NC	142.38	1	142.38	11.84	0.18	0.04
OE × Gender	NN	58.41	3	19.47	0.37	0.77	0.01
	NE	423.56	3	141.19	2.28	0.08	0.09
	NO	66.33	3	22.11	0.72	0.54	0.03
	NA	207.70	3	69.23	1.60	0.19	0.06
	NC	147.49	3	49.16	0.63	0.59	0.03
Error	NN	5248.12	100	52.48			
	NE	6200.95	100	62.01			
	NO	3076.69	100	30.77			
	NA	4328.91	100	43.29			
	NC	7742.51	100	77.43			

Note. OE = Number of overexcitabilities, NN = NEO-FFI neuroticism, NE = NEO-FFI extraversion, NO = NEO-FFI openness to experience, NA = NEO-FFI agreeableness, NC = NEO-FFI conscientiousness.

the debate over whether gifted students are different from typically developing students in this respect. However, it does add evidence to the argument that most highly gifted students who are identified based on a cognitive ability measure like an IQ test are characterized by more than just enhanced intellectual ability. Most of these students were also likely to have extreme intensity and openness to experience filtered through multiple apertures, whether intellectual, imaginal, emotional, sensual, or psychomotor.

Students reported psychomotor OE most frequently. Fifty-three percent of the overall group identified with the characteristics of this overexcitability, and it was the most frequently reported OE among students with one or two OEs. Sixty-nine percent of students with three or more OEs also identified with psychomotor OE, although it was not the OE most frequently reported by this group. Although psychomotor OE was common among students with three or more OEs, more students reported intellectual, sensual, and emotional OEs. Overall, psychomotor OE seems important to the personality profiles of these gifted students.

Nine percent of this group of highly gifted students reported no OEs and had low openness to experience scores relative to their age group. Although this was the smallest analysis group, it still lends credence to the argument that sweeping generalizations about

all gifted student having overexcitabilities or being open to experience are unwarranted. A few gifted students, even highly gifted students, experience the world in ways that are typical of the majority. This certainly does not disqualify them as highly gifted and it is impossible to say from this study what else, if anything, distinguishes this group of students from their classmates with many OEs and high OtE.

Openness to Experience and overexcitabilities

Correlations. The correlation matrix including all of the Big Five factors and the five OEs revealed patterns consistent with previous research. The OtE factor of the NEO-FFI had significant, positive correlations with all except psychomotor OE. The correlation coefficients between OtE and sensual, imaginal, intellectual, and emotional OE were much higher than observed in either the Botella et al. (2014) or Limont et al. (2014). Sensual OE had the highest correlation coefficient with OtE and intellectual OE had the lowest. The relatively low correlation between OtE and intellectual OE might be a surprising finding, given that the students were identified as gifted as the result of IQ test scores, but Botella et al. (2014) noted that intellectual OE items relate more to meta-cognition, or thinking about thinking, than to specific cognitive functions. This finding may also be an indicator that intellectual OE is a personality construct that is separate from, though related to, cognitive function, just as OtE is different from, though related to cognitive function. The correlation coefficient with imaginal OE was second largest, consistent with the association of OEs and OtE with creativity.

As in other studies, many OEs had significant positive correlations with Big Five factors besides OtE. Only intellectual OE was significantly correlated exclusively with OtE. Sensual OE had significant positive correlations with extraversion and agreeableness, and emotional OE had significant positive correlations with neuroticism and agreeableness. Imaginal OE had a significant positive correlation with neuroticism and a significant negative correlation with conscientiousness. As previously mentioned, psychomotor OE had a significant positive correlation with extraversion but not with OtE. Together, these correlations support the claim that OE and the OtE share some corresponding concepts and refute that the similarity between OE and the Big Five rests exclusively between OE and OtE. The significant positive correlation between psychomotor OE and the Big Five extraversion factor observed here was reported in two previous studies (Botella et al., 2014; Limont et al., 2014). Items on the NEO-FFI associating extraversion with physical activity might cross-reference with psychomotor OE. This possibility raises questions about the breadth of the Big Five relationship with OEs and about the definition of extraversion within the Big Five paradigm, which seems to conflate being outgoing and physical action. The frequency of psychomotor OE reported by this sample of students makes this relationship a good target for further investigation.

Analysis of Variance

Analysis of variance (ANOVA) results determined that for this group, students with three or more OEs had higher levels of OtE than students with zero, one, or two OEs. Students

with one or two OEs had OtE scores markedly lower than the average scores of 27.1 for 12–13 year olds, and scores for students with two OEs scores were not statistically different from that average (McCrae & Costa, 2004). In contrast, students with three or more OEs had significantly higher OtE scores than other students in the study. The average OtE score for this group was also much higher than typically expected among students this age, or even among adults, whose average scores on the NEO-FFI range from 25 to 28 (McCrae & Costa, 2004). Together they provide evidence that this group of students has a deeper and broader perceptual experience, or Dąbrowski's "different, stronger and more multisided manner" (1972, p. 7). The breadth of intensity is confirmed by the frequency of OEs and the high OtE scores because a high score on any OtE measure requires scoring high across facets.

The significant difference between males and females on the neuroticism scale, with females scoring higher, is consistent with other research investigating gender differences on Big Five factors, regardless of age (Chapman et al., 2007; Weisberg et al., 2011). Implications from this data could include an increased need for emotional support for girls in a highly competitive academic environment; however, it is also worth noting there may be an instrumentation issue in this research too. When using a neuroticism scale with gender neutral language, Heaven and Shochet (1995) found no significant gender differences in neuroticism scores.

Implications and future research

This study's results align with the four existing empirical studies suggesting that OtE and OE share some form of relationship. At this point, the relationship seems to rest primarily in the overlap between OtE and intellectual, imaginal, and emotional OEs. Interestingly, these are the three OEs Dąbrowski described as the "richer forms" (1972 p. 7). Supposing that these aspects of OE and OtE are the same or substantially the same. The research in OtE provides independent support of many of Dąbrowski's ideas, including that these traits are (1) heritable, (2) associated with neural activity, (3) related to advanced ability, and (4) associated with seeing the world differently in ways that contribute to creativity and some social-emotional challenges.

Vuyk et al. (2016) propose that the similarity between OtE and OE makes Dąbrowski "redundant" (p. 68). However, even if OE and OtE are broadly similar, that conclusion seems counterproductive, especially when considering the larger goals of each approach to personality. The literature on openness to experience offers no recommendations for coping when extreme intensity is overwhelming or unhelpful. Students struggling to cope with the intensities associated with high levels of openness or multiple overexcitabilities may benefit from the positive, growth-oriented clinical lens provided by Dąbrowski's theory; this is absent from the literature on OtE. There is little in the OtE literature focusing specifically on the consequences of being extremely open.

The conclusion that Dąbrowski is redundant, even on the level of OtE facets and specific OEs, also seems premature. The combined research does not fully pinpoint the nature of the relationships between OE and OtE, nor do they fully account for the relationship between OE and other Big Five facets. Of particular interest is the relationship

between psychomotor OE and the Big Five extraversion factor and whether values are a personality facet or a part of human development, or both. Continued research into both OtE and OE, in combination and individually, is the path to a thorough understanding. A precedent for this approach already exists. Openness also shares significant positive correlation coefficients and factorial similarity with the Sensing-Intuition scale of the Myers-Briggs Type Indicator (MBTI) (Furnham, Dissou et al., 2007; Furnham, Moutafi, & Crump, 2003; Kauffman, 2013). Noting the substantial similarity, prominent researchers in this area concluded that “The most important implication of [these correlations] is that the research ... can be joined to provide a more comprehensive picture of the construct of personality” (Furnham, Moutafi, & Crump, 2003, p. 583). Given the differing conclusions drawn from research findings thus far, this seems to be the best position regarding research into OtE and OE.

Additional research into OtE and giftedness would also add helpful insights into the nature of advanced ability. Particularly important are the continued exploration of the relationships among of openness, intelligence, and creative productivity. The questions of how openness can be maximized and whether openness can be altered in the short- or long-term through instruction, and under what conditions changes are sustained, seem pivotal to many educational outcomes important to gifted education.

The OtE research could also serve as a catalyst to new thinking about overexcitabilities. The new method of scoring the OEQ-II requires replication, with continued attention to identifying the most appropriate cutoff score between “excitable” and “overexcitable.” Slight adjustments in either direction would change the proportion of students in each OE group. Overexcitability research would also benefit from continued work on instrumentation. Big Five research features a variety of instruments, including some measures that focus specifically on openness to experience. Although this can cause some confusion when comparing studies of openness, the continued search to find a way to operationalize openness promotes conceptual refinement, and this would also benefit research into OEs. Researchers might consider whether “overexcitability” constitutes a global factor with OEs acting as facets, mimicking the structure of OtE. Research into OtE almost always includes analysis of a total score; research in OE never does. An overall OE score may be as informative as individual OEs, reflecting a general tendency to have extreme responses to phenomena. This approach would allow for additional forms of comparison between OE and OtE, for instance, whether OEs, like OtE, remains stable at the global level but shift in emphasis over time (Caspi et al., 2005). At the level of individual OEs, it seems reasonable to move away from the current emphasis on the “Big Three” and toward the study of how different combinations of OEs might be associated with varied expressions of ability. The relationship among the five OEs has yet to be explored in the same manner as researchers have investigated the number, type, and hierarchical relationships among OtE facets. Given all the exciting possibilities introduced by this new area of exploration, it seems best to follow McCrae’s advice: “To advance scientific constructs we must not only appeal to the rational scientific mind; we must also fire the scientific imagination” (1993, p. 4).

Limitations

Results of this study are informative, but their scope is limited to the relationship between OE and OtE among these highly gifted students. The results do not address whether highly gifted students are different from the regular population in OtE or in the number or type of OEs they report. It is impossible to infer from these results any specific differences between students high or low in OtE, or with several or few OEs. The small sample size limits generalizability.

Conclusions

This author agrees that the literature on OtE brings important data into play when considering the nature of giftedness. The OtE research provides further evidence of a personality dimension of giftedness that adds both depth and breadth of experience to many, but not all, gifted individuals. Evidence from OtE studies suggests these personality characteristics are related to intelligence, but not the same as intelligence. Research suggests that this personality dimension is largely heritable and relatively stable. People high in OtE tend to prefer deep learning strategies, as do people who report high levels of OE; this has implications for altering both curriculum and instruction to ensure gifted students are both challenged and engaged in learning. Being open may be essential to uniting intelligence and creativity. The underpinnings of high levels of OtE and OE converge on the challenges of having extreme intensity, especially in the social-emotional realm. All this information is helpful when considering how to raise, educate, or counsel a gifted child.

Nevertheless, saying that many fields should inform gifted education (Gallagher, 2015) does not mean that any one of those fields, even psychology, will provide a precise definition of giftedness or a definitive direction for the education of gifted and talented children. Psychology encompasses numerous specialties, representing developmental, cognitive, personality, neurological, biological, and clinical paradigms. Different branches of psychology sometimes offer different answers to seminal questions related to giftedness and talent. The current research into OE and OtE is a perfect example, as the implications of having a similar set of attributes are interpreted differently through the lenses of either personality or clinical and developmental psychology.

With respect to Dąbrowski in particular, it is worth remembering that Abraham Maslow said of the theory of positive disintegration, “I consider this to be one of the most important contributions to psychological and psychiatric theory in this whole decade....It digs very deep and comes up with extremely important conclusions ...” (Dąbrowski, 1972, p. i). Endorsement from one of psychology’s most eminent scholars is not the same as empirical validation; however, it might be enough to justify more investigation into what warranted such a resounding commendation. One of the great benefits of research comparing OtE and OE is its potential to re-energize research into overexcitabilities and the personality attributes of giftedness more generally, guided by equal parts of reasonable skepticism and temperate open-mindedness. Ultimately, this line of research will lead to a better understanding of gifted children, which is the most important goal.

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Notes

1. In 2010, Limont, Dreszer, and Bedyńska presented a research study in an edited book by Sekowski and Klincosz, *Zdolności człowieka w ujęciu współczesnej psychologii*; the book is not available in English.
2. Although not reported by the authors, t-tests and effect sizes calculated by this author using reported means and standard deviations suggest that the creatively gifted participants were significantly higher than the random sample of adults in five OtE facets: fantasy ($t(459) = -7.16$, $p < 0.0001$, $d = .72$), ideas ($t(459) = -5.082$, $p < 0.0001$, $d = .52$), values ($t(459) = -4.749$, $p = 0.0001$, $d = .49$), aesthetics ($t(459) = -3.361$, $df 459$, $p < 0.0008$, $d = .33$), feelings ($t(459) = -.281$, $p < 0.001$, $d = .33$), and actions ($t(459) = -2.807$, $p < 0.005$, $d = .28$). Creatively gifted adolescents and adults also reported significantly higher levels of four OEs relative to the random sample: Imaginational ($t(459) = -5.998$, $p < 0.0001$, $d = .60$), emotional ($t(459) = -4.369$, $p < 0.0001$, $d = .43$), psychomotor ($t(459) = -3.249$, $p < 0.0012$, $d = .32$), and intellectual ($t(459) = -2.630$, $p < 0.0088$, $d = .27$).

References

- Abe J. A. A. (2005). The predictive validity of the five-factor model of personality with preschool age children: A nine year follow-up study. *Journal of Research in Personality*, 39(4), 423–442. <https://doi.org/10.1016/j.jrp.2004.05.002>
- Ackerman C. M. (1997). Identifying gifted adolescents using personality characteristics: Dabrowski's overexcitabilities. *Roepers Review*, 19(4), 229–236. <https://doi.org/10.1080/02783199709553835>
- Alghamdi N. G., Aslam M. and Khan K. (2017). Personality traits as predictor of emotional intelligence among the university teachers as advisors. *Education Research International*, 2017, 1–6. <https://doi.org/10.1155/2017/9282565>
- Altaras-Dimitrijevic A. (2012). A faceted eye on intellectual giftedness: Examining the personality of gifted students using FFM domains and facets. *Psihologija*, 45(3), 231–256. <https://doi.org/10.2298/PSI1203231A>
- Asendorpf J. B. and van Aken M. A. G. (2003). Personality-relationship transaction in adolescence: Core versus surface personality characteristics. *Journal of Personality*, 71(4), 629–666. <https://doi.org/10.1111/1467-6494.7104005>

- Bartels M., van Weegen F. I., van Beijsterveldt C. E. M., Carlier M., Polderman T. J. C., Hoekstra R. A. and Boomsma D. I. (2012). The five factor model of personality and intelligence: A twin study on the relationship between the two constructs. *Personality and Individual Differences*, 53(4), 368–373. <https://doi.org/10.1016/j.paid.2012.02.007>
- Beatty R. E., Benedek M., Barry Kaufman S. and Silvia P. J. (2015). Default and executive network coupling supports creative idea production. *Scientific Reports*, 5, 10964. <https://doi.org/10.1371/journal.pone.0162234>
- Beduna K. and Perrone-McGovern K. M. (2016). Relationships among emotional and intellectual overexcitability, emotional IQ, and subjective well-being. *Roeper Review*, 38(1), 24–31. <https://doi.org/10.1080/02783193.2015.1112862>
- Bergold S. and Steinmayr R. (2018). Personality and intelligence interact in the prediction of academic achievement. *Journal of Intelligence*, 6(2), 27. <https://doi.org/10.3390/jintelligence6020027>
- Blickle G. (1996). Personality traits, learning strategies, and performance. *European Journal of Personality*, 10(5), 337–352. [https://doi.org/10.1002/\(SICI\)1099-0984\(199612\)10:5<337::AID-PER258>3.0.CO;2-7](https://doi.org/10.1002/(SICI)1099-0984(199612)10:5<337::AID-PER258>3.0.CO;2-7)
- Botella M., Fürst G., Myszkowski N., Storme M., Pereira Da Costa M., Luminet O. and Luminet O. (2014). French validation of the overexcitability questionnaire 2: Psychometric properties and factorial structure. *Journal of Personality Assessment*, 97(2), 209–220. <https://doi.org/10.1080/00223891.2014.938750>
- Bouchard L. L. (2004). An Instrument for the measure of dąbrowskian overexcitabilities to identify gifted elementary students. *Gifted Child Quarterly*, 48(4), 339–350. <https://doi.org/10.1177/001698620404800407>
- Caspi A., Roberts B. W. and Shiner R. L. (2005). Personality development: stability and change. *Annual Review of Psychology*, 56, 453–484. <https://doi.org/10.1146/annurev.psych.55.090902.141913>
- Chamorro-Premuzic T. and Furnham A. (2009). Mainly Openness: The relationship between the big five personality traits and learning approaches. *Learning and Individual Differences*, 19(4), 524–529. <https://doi.org/10.1016/j.lindif.2009.06.004>
- Chapman B. P., Duberstein P. R., Sørensen S. and Lyness J. M. (2007). Gender differences in five factor model personality traits in an elderly cohort. *Personality and Individual Differences*, 43(6), 1594–1603. <https://doi.org/10.1016/j.paid.2007.04.028>
- Christensen A. P., Cotter K. N. and Silvia P. J. (2019). Reopening openness to experience: A network analysis of four openness to experience inventories. *Journal of Personality Assessment*, 101(6), 574–588. <https://doi.org/10.1080/00223891.2018.1467428>
- Costa P. T. and McCrae R. R. (1992). *NEO PI-R professional manual*. Psychological Assessment Resources.
- Costa P. T., McCrae R. R. and Dye D. A. (1991). Facet scales for agreeableness and conscientiousness: A revision of the NEO Personality Inventory. *Personality and Individual Differences*, 12(9), 887–898. [https://doi.org/10.1016/0191-8869\(91\)90177-D](https://doi.org/10.1016/0191-8869(91)90177-D)
- Dąbrowski K. (1938/2019). Types of increased psychic excitability (Michael M. Piechowski, Trans.). *Advanced Development*, 17, 1–26.
- Dąbrowski K. (1970). *Mental growth through positive disintegration*. Gryf.
- Dąbrowski K. (1972). *Psychoneurosis is not an illness*. Gryf.
- Dąbrowski K. (1973). *The dynamics of concepts*. Gryf.

- Dąbrowski K. (1996). Multilevelness of emotional and instinctive functions. *Towarzystwo Naukowe Katolickiego Uniwersytetu Lubelskiego*.
- De Bondt N., De Maeyer S., Donche V. and Van Petegem P. (2021). A rationale for including overexcitability in talent research beyond the FFM-personality dimensions. *High Ability Studies*, 32(1), 1–26. <https://doi.org/10.1080/13598139.2019.1668753>
- De Bondt N. and Van Petegem P. (2015). Psychometric evaluation of the overexcitability questionnaire-two applying bayesian structural equation modeling (BSEM) and Multiple-Group BSEM-based alignment with approximate measurement invariance. *Frontiers in Psychology*, 6(6), 1963. <https://doi.org/10.3389/fpsyg.2015.01963>
- De Bondt N. and Van Petegem P. (2017). Emphasis on emotions in student learning: Analyzing relationships between overexcitabilities and the learning approach using Bayesian MIMIC modeling. *High Ability Studies*, 28(2), 225–248. <https://doi.org/10.1080/13598139.2017.1292897>
- DeYoung C. G. (2011). Personality and intelligence. In Sternberg R. J. and Kaufman S. B. (Eds.), *The Cambridge handbook of intelligence* (pp. 711–737). Cambridge University Press.
- DeYoung C. G., Grazioplene R. G. and Peterson J. B. (2012). From madness to genius: The openness/intellect trait domain as a paradoxical simplex. *Journal of Research in Personality*, 46(1), 63–78. <https://doi.org/10.1016/j.jrp.2011.12.003>
- DeYoung C. G., Quilty L. C. and Peterson J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology*, 93(5), 880–896. <https://doi.org/10.1037/0022-3514.93.5.880>
- Eysenck H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry*, 4(3), 147–178. https://doi.org/10.1207/s15327965pli0403_1
- Falk R. F. and Miller N. B. (2009). Building firm foundations: Research and assessments. In Daniels S. and Piechowski M. M. (Eds.), *Living with intensity: Understanding the sensitivity, excitability and emotional development of gifted children, adolescents and adults* (pp. 239–260). Great Potential Press.
- Falk R. F., Miller N. B., Piechowski M. M. and Silverman L. K. (2016). *Overexcitability Questionnaire-Two (OEQ-II): Manual, scoring system, and questionnaire* (2nd Ed.). Institute for Advanced Development.
- Fung W. K. and Chung K. K. H. (2021). Associations between overexcitabilities and playfulness of kindergarten children. *Thinking Skills and Creativity*, 40, 1–10. <https://doi.org/10.1016/j.tsc.2021.100834>
- Furnham A., Dissou G., Sloan P. and Chamorro-Premuzic T. (2007). Personality and intelligence in business people: A study of two personality and two intelligence measures. *Journal of Business and Psychology*, 22(1), 99–109. <https://doi.org/10.1007/s10869-007-9051-z>
- Furnham A., Moutafi J. and Crump J. (2003). The relationship between the revised NEO-personality inventory and the myers-briggs type indicator. *Social Behavior and Personality: An International Journal*, 31(6), 577–584. <https://doi.org/10.2224/sbp.2003.31.6.577>
- Gallagher S. A. (2013). Building bridges: Using research from the Big Five, MBTI, overexcitabilities, and Perry to explore personality differences of gifted youth. In Neville C. S., Piechowski M. M. and Tolan S. S. (Eds.), *Off the charts: Asynchrony and the gifted child* (pp. 56–118). Royal Fireworks Press.

- Gallagher S. A. (2015). Gifted education and the structure of interdisciplinarity. *International Journal for Talent Development and Creativity*, 3(2), 125–140. https://doi.org/10.1007/978-1-4020-6162-2_64
- Goldberg L. R. (1990). An alternative “description of personality”: The Big-Five factor structure. *Journal of Personality and Social Psychology*, 59(6), 1216–1229. <https://doi.org/10.1037/0022-3514.59.6.1216>
- Grant B. (2021). Overexcitabilities and openness to experience are not the same: A critique of a study and reflections on theory, ethics, and truth. *Roepers Review*, 43(2), 128–138. <https://doi.org/10.1080/02783193.2021.1881852>
- Guilera T., Batalla I., Forné C. and Soler-González J. (2019). Empathy and Big Five personality model in medical students and its relationship to gender and specialty preference: A cross-sectional study. *BMC Medical Education*, 19(1), 57. <https://doi.org/10.1186/s12909-019-1485-2>.
- Harrison G. E. and Van Haneghan J. P. (2011). The gifted and the shadow of the night: Dabrowski’s overexcitabilities and their correlation to insomnia, death anxiety, and fear of the unknown. *Journal for the Education of the Gifted*, 34(4), 669–697. <https://doi.org/10.1177/016235321103400407>
- Heaven P. C. L. and Shochet I. M. (1995). Dimensions of neuroticism: Relationships with gender and personality traits. *Personality and Individual Differences*, 18(1), 33–37. [https://doi.org/10.1016/0191-8869\(94\)00130-K](https://doi.org/10.1016/0191-8869(94)00130-K)
- He W.-j., Wong W.-c. and Chan M.-k. (2017). Overexcitabilities as important psychological attributes of creativity: A Dabrowskian perspective. *Thinking Skills and Creativity*, 25, 27–35. <https://doi.org/10.1016/j.tsc.2017.06.006>
- Jackson J. J., Hill P. L., Payne B. R., Roberts B. W. and Stine-Morrow E. A. L. (2012). Can an old dog learn (and want to experience) new tricks? Cognitive training increases openness to experience in older adults. *Psychology and Aging*, 27(2), 286–292. <https://doi.org/10.1037/a0025918>
- James W. (1917). *The varieties of religious experience: A study in human nature*. Longmans Green & Co.
- Jang K. L., Livesley W. J. and Vernon P. A. (1996). Heritability of the Big Five personality dimensions and their facets: A twin study. *Journal of Personality*, 64(3), 577–592. <https://doi.org/10.1111/j.1467-6494.1996.tb00522.x>
- Jauk E., Benedek M., Dunst B. and Neubauer A. C. (2013). The relationship between intelligence and creativity: New support for the threshold hypothesis by means of empirical breakpoint detection. *Intelligence*, 41(4), 212–221. <http://dx.doi.org/10.1016/j.intell.2013.03.003>
- Kaufman S. B. (2013). Opening up openness to experience: A four-factor model and relations to creative achievement in the arts and sciences. *The Journal of Creative Behavior*, 47(4), 233–255. <https://doi.org/10.1002/jocb.33>
- Komiya N., Good G. E. and Sherrod N. B. (2000). Emotional openness as a predictor of college students’ attitudes toward seeking psychological help. *Journal of Counseling Psychology*, 47, 138–143. <https://doi.org/10.1037/0022-0167.47.1.138>
- Limont W. (2012). “Passion of growth”: Giftedness and creativity in the Theory of Positive Disintegration. In Ziegler A., Fischer C., Stoeger H. and Reutlinger M. (Eds.), *Gifted education as a lifelong challenge: Essays in honor of Franz. J. Mönks* (pp. 43–56). Lit Verlag.
- Limont W., Dreszer-Drogorób J., Bedyńska S., Śliwińska K. and Jastrzębska D. (2014). ‘Old wine in new bottles’? Relationships between overexcitabilities, the Big Five personality traits and

- giftedness in adolescents. *Personality and Individual Differences*, 69, 199–204. <https://doi.org/10.1016/j.paid.2014.06.003>
- Martowska K. and Matczak A. (2017). W Poszukiwaniu Korelatów Wzmoczonej Pobudliwości Psychicznej. *Studia Psychologica*, 16, 5–21. <https://doi.org/10.21697/sp.2016.16.02.01>
- Martowska K., Matczak A. and Józwik K. (2020). Overexcitability in actors. *Psychology of Aesthetics, Creativity, and the Arts*, 14(1), 81–86. <https://doi.org/10.1037/aca0000192>
- Martowska K. and Romanowicz M. (2020). Overexcitability profile among university students at music-focused institutions. *Roeper Review*, 42(4), 271–280. <https://doi.org/10.1080/02783193.2020.1815265>
- Maxwell S. E. and Delaney H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective*. Taylor & Francis Group.
- McAbee S. T. and Oswald F. L. (2013). The criterion-related validity of personality measures for predicting GPA: A meta-analytic validity competition. *Psychological Assessment*, 25(2), 532–544. <https://doi.org/10.1037/a0031748>
- McCrae R. R. (1993). Openness to experience as a basic dimension of personality. *Imagination, Cognition and Personality*, 13(1), 39–55. <https://doi.org/10.2190/H8H6-QYKR-KEU8-GAQ0>
- McCrae R. R. and Costa P. T. (1997). Conceptions and correlates of Openness to Experience. In Hogan R., Johnson J. and Briggs S. (Eds.), *Handbook of Personality Psychology* (pp. 825–847). Academic Press.
- McCrae R. R. and Costa P. T. (2004). *NEO PI-R professional manual*. Psychological Assessment Resources.
- McCrae R. R., Costa P. T. Jr. and Martin T. A. (2005). The NEO-PI-3: A more readable Revised NEO Personality Inventory. *Journal of Personality Assessment*, 84(3), 261–270. https://doi.org/10.1207/s15327752jpa8403_05
- McCrae R. R., Costa P. T. Jr., Terracciano A., Parker W. D., Mills C. J., De Fruyt F. and Mervielde I. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional and cross-cultural analyses. *Journal of Personality and Social Psychology*, 83(6), 1456–1468. <https://doi.org/10.1037/0022-3514.83.6.1456>
- McCrae R. R. and Greenberg D. M. (2014). Openness to experience. In Simonton D. K. (Ed.), *The Wiley Handbook of Genius* (pp. 222–243). John Wiley & Sons.
- Mendaglio S. and Tillier W. (2006). Dabrowski's theory of positive disintegration and giftedness: Overexcitability research findings. *Journal for the Education of the Gifted*, 30(1), 68–87. <https://doi.org/10.1177/016235320603000104>
- Mofield E. L. and Parker Peters M. (2015). The relationship between perfectionism and overexcitabilities in gifted adolescents. *Journal for the Education of the Gifted*, 38(4), 405–427. <https://doi.org/10.1177/0162353215607324>
- Moon J. and Montgomery D. (2005). Profiles of overexcitability for Korean high school gifted students according to gender and domain of study. *Journal of Gifted/Talented Education*, 15, 1–10.
- Noftle E. E. and Robins R. W. (2007). Personality predictors of academic outcomes: Big Five correlates of GPA and SAT scores. *Journal of Personality and Social Psychology*, 93(1), 116–130. <https://doi.org/10.1037/0022-3514.93.1.116>
- Perrine N. E. and Brodersen R. M. (2005). Artistic and scientific creative behavior: Openness and the mediating role of interests. *The Journal of Creative Behavior*, 39(4), 217–236. <https://doi.org/10.1002/j.2162-6057.2005.tb01259.x>

- Perrone-McGovern K. M., Simon-Dack S. L., Beduna K. N., Williams C. C. and Esche A. M. (2015). Emotions, cognitions, and well-being. *Journal for the Education of the Gifted*, 38(4), 343–357. <https://doi.org/10.1177/0162353215607326>
- Piechowski M. M. and Colangelo N. (1984). Developmental potential of the gifted. *Gifted Child Quarterly*, 28(2), 80–88. <https://doi.org/10.1177/001698628402800207>
- Power R. A. and Pluess M. (2015). Heritability estimates of the Big Five personality traits based on common genetic variants. *Translational Psychiatry*, 5–e604. <https://doi.org/10.1038/tp.2015.96>
- Randler C., Schredl M. and Göritz A. S. (2017). *Chronotype, sleep behavior, and the Big Five personality factors*. SAGE Open. <https://doi.org/10.1177/2158244017728321>
- Rantanen J., Metsäpelto R.-L., Feldt T., Pulkkinen L. and Kokko K. (2007). Long-term stability in the Big Five personality traits in adulthood. *Scandinavian Journal of Psychology*, 48(6), 511–518. <https://doi.org/10.1111/j.1467-9450.2007.00609.x>
- Rimfeld K., Kovas Y., Dale P. S. and Plomin R. (2016). True grit and genetics: Predicting academic achievement from personality. *Journal of Personality and Social Psychology*, 111(5), 780–789. PMID 26867111. <https://doi.org/10.1037/pspp0000089>
- Scholte-Stalenhoef A. N., la Bastide-van Gemert S., van de Willige G., Dost-Otter R., Visser E., Liemburg E. J., Knegtering H., van den Heuvel E. R., Schoevers R. A., Pijnenborg G. H. M. and Bruggeman R. (2016). Personality and coping in first episode psychosis linked to mental health care use. *Psychiatry Research*, 238, 218–224. <https://doi.org/10.1016/j.psychres.2016.02.035>.
- Schretlen D. J., van der Hulst E.-J., Pearlson G. D. and Gordon B. (2010). A neuropsychological study of personality: Trait openness in relation to intelligence, fluency, and executive functioning. *Journal of Clinical and Experimental Neuropsychology*, 32(10), 1068–1073.
- Schwaba T., Luhmann M., Denissen J. J. A., Chung J. M. and Bleidorn W. (2018). Openness to experience and culture-openness transactions across the lifespan. *Journal of Personality and Social Psychology*, 115(1), 118–136. <https://doi.org/10.1037/pspp0000150>
- Shi B., Dai D. Y. and Lu Y. (2016). Openness to experience as a moderator of the relationship between intelligence and creative thinking: A study of Chinese children in urban and rural areas. *Frontiers in Psychology*, 7, 641. <https://doi.org/10.3389/fpsyg.2016.00641>
- Silvia P. J., Nusbaum E. C., Berg C., Martin C. and O'Connor A. (2009). Openness to experience, plasticity, and creativity: Exploring lower-order, high-order, and interactive effects. *Journal of Research in Personality*, 43(6), 1087–1090. <https://doi.org/10.1016/j.jrp.2009.04.015>
- Siu A. F. Y. (2010). Comparing overexcitabilities of gifted and non-gifted school children in Hong Kong: does culture make a difference?. *Asia Pacific Journal of Education*, 30(1), 71–83. <https://doi.org/10.1080/02188790903503601>
- Tan C. S., Lau X. S., Kung Y. T. and Kailsan R. A. L. (2016). Openness to experience enhances creativity: The mediating role of intrinsic motivation and the creative process engagement. *The Journal of Creative Behavior*, 53, 109–119. <https://doi.org/10.1002/jocb.170>
- Thomson P. and Jaque S. V. (2016). Overexcitability: A psychological comparison between dancers, opera singers, and athletes. *Roeper Review*, 38(2), 84–92. <https://doi.org/10.1080/02783193.2016.1150373>
- Van den Broeck W., Hofmans J., Cooremans S. and Staels E. (2014). Factorial validity and measurement invariance across intelligence levels and gender of the Overexcitabilities Questionnaire-II (OEQ-II). *Psychological Assessment*, 26(1), 55–68. <https://doi.org/10.1037/a0034475>

- Vuyk M. A., Krieshok T. S. and Kerr B. A. (2016). Openness to experience rather than overexcitabilities. *Gifted Child Quarterly*, 60(3), 192–211. <https://doi.org/10.1177/0016986216645407>
- Wainwright M. A., Wright M. J., Luciano M., Geffen G. M. and Martin N. G. (2008). Genetic covariation among facets of openness to experience and general cognitive ability. *Twin Research and Human Genetics*, 11(3), 275–286. <https://doi.org/10.1375/twin.11.3.275>
- Weisberg Y. J., Deyoung C. G. and Hirsh J. B. (2011). Gender differences in personality across the ten aspects of the Big Five. *Frontiers in Psychology*, 2, 178. <https://doi.org/10.3389/fpsyg.2011.00178>
- Wells C., & Falk F. (2021). The origins and conceptual evolution of overexcitability. *Psychologia Wychowawcza*, 62(20), 23–44. Available at: <https://doi.org/10.5604/01.3001.0015.3816>.
- Winkler D. and Voight A. (2016). Giftedness and overexcitability. *Gifted Child Quarterly*, 60(4), 243–257. <https://doi.org/10.1177/0016986216657588>
- Wirthwein L., Bergold S., Preckel F. and Steinmayr R. (2019). Personality and school functioning of intellectually gifted and nongifted adolescents: Self-perceptions and parents' assessments. *Learning and Individual Differences*, 73, 16–29. <https://doi.org/10.1016/j.lindif.2019.04.003>
- Wirthwein L. and Rost D. H. (2011). Focussing on overexcitabilities: Studies with intellectually gifted and academically talented adults. *Personality and Individual Differences*, 51, 337–342. <https://doi.org/10.1016/j.paid.2011.03.041>
- Wolfestein M. and Trull T. J. (1997). Depression and openness to experience. *Journal of Personality Assessment*, 69(3), 614–632. https://doi.org/10.1207/s15327752jpa6903_14
- Xin Y., Wu J., Yao Z., Guan Q., Aleman A. and Luo Y. (2017). The relationship between personality and the response to acute psychological stress. *Scientific Reports*, 7(1), 16906. <https://doi.org/10.1038/s41598-017-17053-2>
- Xu S., Jiang X. and Walsh I. J. (2018). The influence of openness to experience on perceived employee creativity: The moderating roles of individual trust. *The Journal of Creative Behavior*, 52(2), 142–155. <https://doi.org/10.1002/jocb.138>
- Yakmaci-Guzel B. and Akarsu F. (2006). Comparing overexcitabilities of gifted and non-gifted 10th grade students in Turkey. *High Ability Studies*, 17(1), 43–56. <https://doi.org/10.1080/13598130600947002>
- Zeidner M. and Shani-Zinovich I. (2011). Do academically gifted and nongifted students differ on the Big-Five and adaptive status? Some recent data and conclusions. *Personality and Individual Differences*, 51(5), 566–570. <https://doi.org/10.1016/j.paid.2011.05.007>.
- Ziegler M., Danay E., Heene M., Asendorpf J. and Bühner M. (2012). Openness, fluid intelligence, and crystallized intelligence: Toward an integrative model. *Journal of Research in Personality*, 46(2), 173–183. <https://doi.org/10.1016/j.jrp.2012.01.002>.

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