HIGH ABILITY STUDIES
https://doi.org/10.1080/13598139.2021.1985438

Routledge
Taylor & Francis Group

Personality differences in gifted versus non-gifted individuals: A three-level meta-analysis

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ABSTRACT

Some research has investigated the big five personality dimensions among gifted individuals, but these individual studies have provided inconclusive results. The current meta-analysis examined the nature of the relationship between the big five dimensions and giftedness among individuals. Hedge's unbiased *g* was used as the effect size metric, and a 3-level multilevel meta-analytic approach was applied, due to the dependency among the effect sizes obtained from the same study. The analyses used 82 effect sizes, from 13 published studies, and indicated that there was a significant difference between gifted and non-gifted participants in terms of Openness to Experience in favor of gifted individuals (g = .473, p = . 005, 95% CI [.199, .747]). However, there were no significant differences in terms of extraversion, agreeableness, conscientiousness, and neuroticism. The implications and limitations of the findings are discussed.

KEYWORDS

Gifted; personality; the big five model; meta-analysis; multilevel

Introduction

Personality traits are differences between individuals in patterns of thoughts, emotions, and actions (McCrae & Costa, 2003). Since personality traits have been shown to predict positive outcomes in life success (Ozer & Benet-Martínez, 2006), researchers have sought to examine personality differences among individuals. There is a well-established agreement that gifted individuals have some unique cognitive characteristics. However, recent theories on giftedness have taken socioemotional constructs into account when studying personality traits. For example, according to the three-ring model (Renzulli, 2005), above-average ability, creativity, and task commitment are components of giftedness. In other words, high intelligence and creativity without task commitment fall short of a full expression of giftedness. Task commitment is associated with some personality-related constructs such as perseverance, endurance, and confidence (Renzulli,

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2012). Also, the Differentiated Model of Giftedness and Talent (Gagné, 2009) proposed a set of socio-affective abilities including personality and motivation for the actualization of giftedness.

On the contrary, there are discussions about using personality assessments in identifying giftedness (Carman, 2011) and findings on personality-related characteristics of the gifted are inconclusive as well. Even though many different personality characteristics have been associated with individual differences in giftedness, research on personality is increasingly shaped around the Big Five Model (Zeidner & Shani-Zinovich, 2013)

Big five personality model

The Big Five personality model has been seen as the most widely accepted taxonomy of basic personality traits that accounts for the majority of individual differences in adjusting to and interacting with the world (Costa & McCrae, 1987; McCrae & Costa, 1999). The model has five dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. These dimensions are cross-cultural (Yamagata et al., 2006) and relatively stable across conditions and settings (McAdams & Pals, 2006). Each of the dimensions is defined by a number of specific traits. Conscientiousness includes traits such as organization, thoroughness, and reliability. Extraversion describes the extent to which an individual is talkative, assertive, and excitable. Neuroticism is related to negative emotions such as nervousness, moodiness, and low emotional control. Openness to experience is connected with traits such as curiosity, originality, and creativity. Finally, agreeableness characterizes the extent to which an individual is kind, trustworthy, and warm (Goldberg, 1993). Each dimension indicates a continuum of the traits from its lower to the upper end. For instance, individuals who score high in agreeableness tend to be sympathetic and cooperative, while those who have low levels are more likely to be cynical (Costa & McCrae, 1992a).

Recently, some meta-analyses have searched for the relationships between the big five dimensions and other constructs. Feist (1998) pointed out that creative people were more open to new experiences and less conscientious compared to less creative people. Similarly, Puryear, Kettler, and Rinn (2017) found openness and extraversion as strong positive predictors of creativity in their meta-analysis. In their review, Curtis, Windsor, and Soubelet (2015) claimed openness and conscientiousness were related to cognitive ability in older adults. Extraversion was positively associated with long-term memory, but agreeableness was unrelated to general cognitive ability, memory, and executive functioning. Barańczuk (2019) concluded that lower neuroticism and higher extraversion, openness to experience, agreeableness, and conscientiousness were linked to greater

perceived availability of social support. Another meta-analysis result indicated that resilience was negatively correlated with neuroticism but positively associated with extraversion, openness, agreeableness, and conscientiousness (Oshio, Taku, Hirano, & Saeed, 2018).

Even though there are some discussions about the constructs of the model including the number of personality traits (Strus, Cieciuch, & Rowinski, 2014), The Big Five dimensions are beneficial concepts for explaining personality and conducting research on giftedness (Parker & Stumpf, 1998). Mammadov (2016) explored the relationship between the Big Five dimensions and academic achievement in gifted children and found that agreeableness, conscientiousness, and openness had significant associations with the ACT scores whereas neuroticism did not have a significant relationship with any of the achievement indicators. He also indicated that four dimensions were positively correlated with self-regulatory efficacy and autonomous motivation but neuroticism had negative relationships with these variables in the gifted sample.

Giftedness

Researchers have been trying to examine unique personality traits among gifted individuals. For instance, Silverman (1993) identified introversion as a perceived characteristic of the gifted. Teachers perceived gifted students as more open to new experiences, more introverted, less emotionally stable and less agreeable compared to other students (Baudson & Preckel, 2013). A meta-analysis of personality types as measured by the Myers-Briggs Type Indicator pointed out that gifted individuals scored higher on the Introversion, Intuition, Thinking, and Perceiving dimensions than their peers (Sak, 2004). Gifted students scored higher on openness and lower on neuroticism than their peers (Zeidner & Shani-Zinovich, 2011). Similarly, a higher level of openness to experience was found among creatively gifted adults (Vuyk et al., 2016) and honor college students (Scager et al., 2012). McCrae et al. (2002) showed that neuroticism and extraversion scores were not high, nor were agreeableness and conscientiousness scores low in the gifted sample.

Some stereotypes about gifted individuals have prevailed among educators in society (Preckel, Baudson, Krolak-Schwerdt, & Glock, 2015). These stereotypes can include oddly different from others, lower social and emotional skills (Baudson & Preckel, 2016), being introverted, (Ensign, 2000) or gender stereotypes (Keller, 2001). These stereotypes exaggerate rather than reflect reality and can result in some unrealistic expectations of personality traits from gifted individuals. Debunking these misconceptions about the gifted population is highly crucial to meet their unique needs in educational settings and in society as a whole.

Given the lack of clarity in the nature of the personality differences between gifted and non-gifted individuals and some personality-related misconceptions about gifted individuals, a meta-analysis of available research studies on this topic is critical to take stock of in the extant literature. The major objective of the current meta-analysis is to reveal the personality differences between gifted and non-gifted individuals from the Big Five personality model perspective. Admittedly, the differences could be affected by other factors, and they need to be taken into consideration in order to make sense of variation in the study results. A few of these potential variables (i.e., moderators) are discussed below.

Age differences in the big five dimensions

Another area of controversy is how personality changes as individuals grow older. Personality traits display changes across the lifespan however there is no consistency over the study results in the general population. For instance, in a large sample, Srivastava, John, Gosling, and Potter (2003) found that agreeableness and conscientiousness increased whereas openness to experience decreased slightly across the lifespan of the sampled participants. Extraversion did not change across the lifespan of those who were part of the sample. Soto, John, Gosling, and Potter (2011) found similar results with only an exception of growth in openness. Specht, Egloff, and Schmukle (2011) evidenced inverted-U stability in all dimensions except conscientiousness which had a linear growth with age. Roberts, Walton, and Viechtbauer (2006) indicated increases in measures of social dominance (extraversion), conscientiousness, and emotional stability from age 20 to age 40. Whereas, social vitality (extraversion) and openness increase in adolescence but then decrease as people age. Agreeableness was found to change only in old age.

McCrae et al. (2002) reported an increase in openness between age 12 and age 16 in a gifted sample. However, they did not find significant longitudinal main effects for neuroticism, extraversion, and agreeableness. On the other hand, Mammadov (2016) did not reveal any differences between grade levels on personality traits except extraversion among gifted students. Middle school gifted students had significantly higher extraversion scores than high school gifted students. Because of those mixed results in the general population, and due to the shortage of research regarding the impact of aging on gifted individuals, the current meta-analysis used age as another moderator.

Gender differences in big five dimensions

Personality dimensions do not seem the same across genders. In the general population, neuroticism is consistently found higher in females than males (Costa, Terracciano, & McCrae, 2001; Lynn & Martin, 1997). Costa et al.

(2001) concluded that females also scored higher in openness compered to males. In terms of extraversion, there have been inconsistent results. For example, Lynn and Martin (1997) reported that females scored lower in extraversion whereas Feingold (1994) claimed their scores were slightly higher than males. Schmitt, Realo, Voracek, and Allik (2008) evidenced higher levels of neuroticism, extraversion, agreeableness, and conscientiousness in females than males across 55 nations. McCrae et al. (2002) indicated that females had significantly higher scores than males on neuroticism, extraversion, openness, and agreeableness scales in the gifted sample. In his study with a gifted sample, Mammadov (2016) indicated that female gifted students had higher scores on neuroticism and lower on extraversion in comparison with their peers. The psychological development of men and women, universal gender role socialization processes, and cultural factors could be some possible reasons for gender differences regarding personality (Pirlott & Schmitt, 2014; Schmitt et al., 2017). Therefore, gender is included as a moderator in this meta-analysis.

Cultural differences in big five dimensions

Indicators of personality can be grounded by culturally prescribed rules and norms. Thus, personality traits may differ by culture. Schmitt, Allik, McCrae, and Benet-Martínez (2007) indicated that the five-dimensional structure was visible across cultures. According to McCrae (2002), the heterogeneity of personality traits was quite large in European and American cultures. Schmitt et al. (2007) showed that individuals from Africa and East Asia had different personality trait profiles than other cultures. Inhabitants from those areas seemed to be more conscientious. Thus, culture, which can be coded based on the study sample was a variable.

Educational programs for the gifted

The other factor we considered in personality differences was educational interventions for gifted people. Recent meta-analytic results revealed that educational interventions have had a positive influence on the academic, social, and emotional development of gifted individuals. For instance, acceleration and enrichment programs had a positive impact on academic outcomes and social-emotional development among the gifted population (Kim, 2016; Steenbergen-Hu &Moon, 2011). Given the effects of programs for gifted individuals, attending a gifted program would have different impacts on social-emotional development, including The Big Five dimensions. Thus, involvement in a gifted program or lack thereof was another moderator in the present meta-analysis.

Present study

There has always been an interest in whether gifted individuals are different from non-gifted individuals regarding their personality, behavior, mental health, or educational adjustment (Wirthwein et al, 2019). Given the fact that The Big Five personality model provides a comprehensive theoretical framework (Costa & McCrae, 1992a), a meta-analysis about personality differences between gifted and non-gifted individuals would help to develop educational programming that takes personality differences into account. Meta-analyses can help with possible issues related to small sample sizes, imprecise measurements, context-bound results, and heterogeneity of study results in gifted education (Pigott & Moon, 2016). To that end, the purpose of this study was to conduct a meta-analysis of the studies that compared the big five personality dimensions between gifted and non-gifted individuals. The current meta-analysis endeavored to reveal the personality differences between gifted and non-gifted participants concerning The Big Five dimensions. One of the benefits of meta-analysis is the consideration of the impact of potential moderators. This meta-analytic study included four moderators: gender, age levels, location of the study, and gifted sample selection. Therefore, this meta-analysis aims to answer the following questions:

- Are there any Big Five (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) differences between gifted individuals and non-gifted peers?
- Do moderators including gender, age levels, location, and gifted sample selection explain the variability in the effect sizes?

Method

Study variables

The current meta-analysis compares the big five personality dimensions (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) of gifted and non-gifted individuals. The literature was searched to locate studies comparing the big five personality dimensions in gifted and non-gifted samples.

Data sources and search strategies

Various search strategies were conducted to locate relevant studies. The first strategy was reviewing some databases, including Academic Search Complete, ERIC, PsycINFO, PsychArticles, Medline (PubMed), Social Sciences Citation Index, Science Direct, ProQuest Social Sciences, Web of

Science, and Dissertation Abstracts International. The authors further carried a general web search, using Google Scholar. The search was conducted with no date limitation. The search process was ended in February 2021.

To find the relevant studies, the following keywords were used: gifted, talented, intellectually superior, high-ability, high potential, high-achieving, high cognitive abilities, non-gifted, precocious, high IQ, academically advanced, grade-skipping, curriculum compacting, early school entrance, and personality, Big five, extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. The Boolean operators and truncations (OR and AND) were used between giftedness related keywords and Big Five related keywords from the aforementioned keywords.

A targeted search was then conducted within relevant journals, including the Gifted Child Quarterly, Journal of Advanced Academics, Journal for the Education of the Gifted, Exceptional Children, High Ability Studies, and Roeper Review.

To reduce the publication bias in this meta-analysis, unpublished studies were searched by the Research Gate database. We also emailed some researchers who had investigated The Big Five personality dimensions among gifted individuals in the past to receive current and unpublished research. We retrieved literature reviews and book chapters about personality in the gifted population. In the last step, we examined the reference lists of each relevant study to reach more studies. Researchers read the abstracts and removed the studies that are not related to the big five personality dimensions in the gifted, or not containing quantitative data. At the end of the search, we found 13 eligible studies.

Inclusion and exclusion criteria

Studies were chosen independently by screening entire texts using the following inclusion and exclusion criteria:

- Studies written in English were included.
- Quantitative studies that reported statistics that allow for the calculation of effect size (e.g., means and standard deviations) were included. Qualitative studies and anecdotal evidence were excluded.
- Studies that compared The Big Five dimensions (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) among gifted and non-gifted individuals were included.

In the beginning, 35 studies were found for eligibility using the aforementioned search strategies. Thirty-four studies were obtained through databases, and one article was found by screening the reference list. Figure 1 demonstrates the chart of inclusion of studies. Thirteen articles

out of 35 publications were about the examination of personality among gifted from different personality perspectives, not the Big Five dimensions. Therefore these 13 studies were excluded. In addition to that, nine studies (e.g. Cross et al., 2018; Larson & Borgen, 2002; Mammadov, 2016; Mammadov, Cross, & Ward, 2018; McCrae et al., 2002; Miller & Speirs Neumeister, 2017; Parker, 1997; Parker & Stumpf, 1995, 1998; Rafatpanah, Seif, Khosravani, & Alborzi, 2016) were excluded because they examined the Big Five personality dimensions among only gifted individuals but they did not include non-gifted sample as a control group. The final data set had 13 studies that are marked with an asterisk in the reference section.

Coding procedure

Appraisal tools have been created to assess the quality of primary studies. While none of these tools were developed in the field of gifted education, the authors chose the Appraisal tool for Cross-Sectional Studies (AXIS tool;

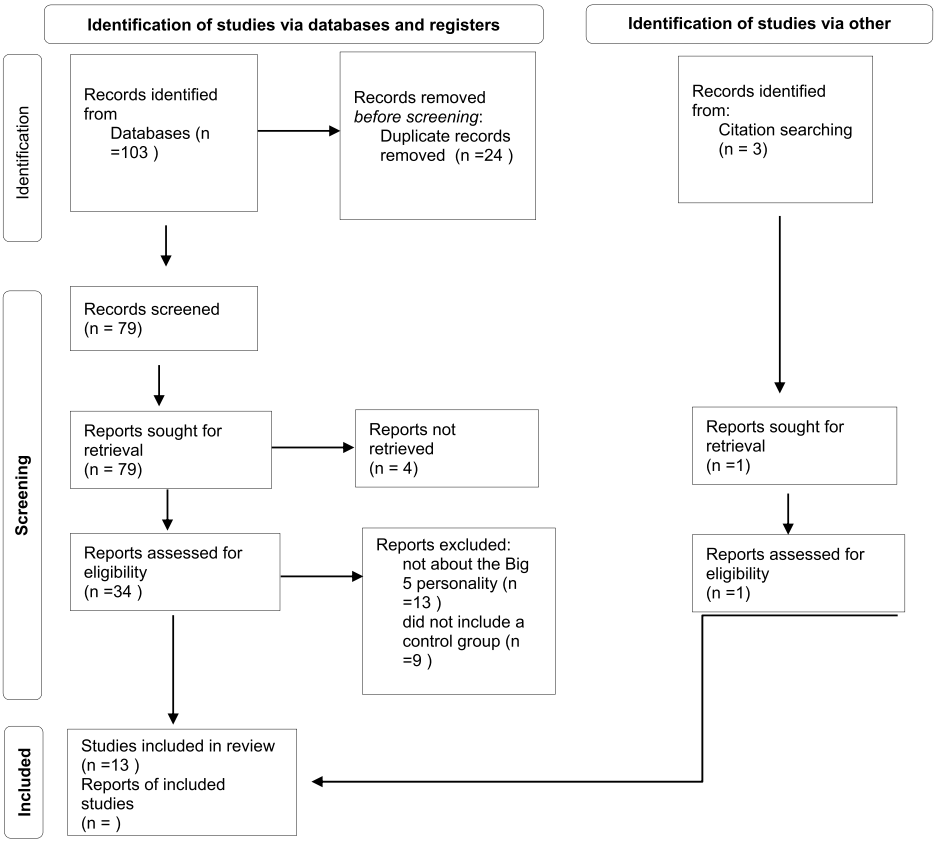

Figure 1. Flow *chart for the inclusion of studies.*

Downes, Brennan, Williams, & Dean, 2016) that was developed to assess the quality of cross-sectional studies. Two researchers evaluated the quality of selected studies by using the AXIS tool.

To create a coding form with basic study information and effect size estimations, along with potential moderators, the authors followed the guidelines of the sixth edition of the Publication Manual of the American Psychological Association (APA, 2010). The researchers coded each study for publication year, gender, gifted sample size, non-gifted sample size, sample selection methods, effect size, location of the study, measures of Big Five personality dimensions, validity, and reliability of the scales. The coding of the study was an intricate process. Each comparison between the gifted and non-gifted samples was coded in a separate row in order to obtain all possible effect sizes from the studies. Each study was coded for potential moderators, which are described below.

Moderators of the study

This meta-analytic study included four moderators: gender, age levels, location of the study, and gifted sample selection.

Gender

The gender of the participants in both the gifted and non-gifted samples in each dimension was coded as male (Agreeableness: k= 2; Extraversion: k = 2; Conscientiousness: k = 2; Neuroticism: k = 2; and openness: k = 2) and female (Agreeableness: k = 3; Extraversion: k = 3; Conscientiousness: k = 3; Neuroticism: k = 3; and Openness: k = 3). Those studies that did not include frequencies for gender were coded as mixed (Agreeableness: k = 10; Extraversion: k = 11; Conscientiousness: k = 11; Neuroticism: k = 11; and Openness: k = 13).

Age

The authors coded the age of the participants based on grade levels since most of the studies did not include the information on the participants' mean age. Participants' grade levels were coded as high school and lower (Agreeableness: k = 10; Extraversion: k = 10; Conscientiousness: k = 10; Neuroticism: k = 10; and Openness k = 10) and college and up (Agreeableness: k = 4; Extraversion: k = 4; Conscientiousness: k = 4; Neuroticism: k = 4; and Openness: k = 6). If the study did not include distribution of the grades, we coded them as mixed (Agreeableness: k = 2; Extraversion: k = 2; Conscientiousness: k = 2; Neuroticism: k = 2; and Openness: k = 2)

Location

The studies in this meta-analysis are conducted in a number of countries around the world. The researchers coded the location where the data was collected using continental categories (i.e., America, Europe, and Middle East). Articles represent nine different countries (e.g. Israel, Iran, the USA, Poland, German, Serbia, Saudi Arabia, Russia, Netherlands), from different regions. Based on their continents, we coded the USA as America (Agreeableness: $k = 1$; Extraversion: $k = 1$; Conscientiousness: $k = 1$; Neuroticism: $k = 1$; and Openness $k = 2$), Poland, German, Serbia, Russia, Netherlands as Europe (Agreeableness: $k = 10$; Extraversion: $k = 10$; Conscientiousness: $k = 10$; Neuroticism: $k = 10$; and Openness $k = 11$) Israel, Saudi Arabia, and Iran were coded as Middle East (Agreeableness: $k = 5$; Extraversion: $k = 5$; Conscientiousness: $k = 5$; Neuroticism: $k = 5$; and Openness $k = 5$)

Gifted sample selection

Gifted individuals in studies were sampled either from employing assessment criteria or chosen from programs or schools for gifted individuals. Based on Petersen's (2013) categorization, we also coded the gifted sample in two categories: selection by assessment criteria (Agreeableness: $k = 8$; Extraversion: $k = 8$; Conscientiousness: $k = 8$; Neuroticism: $k = 8$; and Openness $k = 8$) and selection by special programs including gifted programs or special schools for gifted individuals (Agreeableness: $k = 8$; Extraversion: $k = 8$; Conscientiousness: $k = 8$; Neuroticism: $k = 8$; and Openness $k = 10$)

Rater reliability

We first created a coding scheme including key variables and sample information. Using the coding scheme two researchers coded all included studies separately to ensure the reliability of the study coding. The agreement rate was 98%.

The calculation of effect sizes

This meta-analysis used an unbiased estimate of Hedges' g (Hedges, 1981) that is based on the standardized mean difference. However, this effect size has a small bias in small samples due to overestimating the absolute value of effect sizes. This bias can be fixed by using Hedge's unbiased effect size formula as follows (Lipsey & Wilson, 2001):

Hedge's unbiased g (gub = unbiased g) was calculated using Equation 1.

$$g_{ub} = g\left(1 - \frac{3}{4N - 9}\right) \quad (1)$$

where g is calculated as

$$g = \frac{M_{g1} - M_{g2}}{s_p} \quad (2)$$

where Mg1 and Mg2 represent group means, and sp represents pooled standard deviation.

Weight term (w) is defined in terms of standard error (SE) of the effect size as:

$$w = \frac{1}{SE^2} \quad (3)$$

The effect sizes in the study are reported alongside 95% confidence intervals, for simplicity in interpretation. In this study, gifted individuals have a higher mean score when a positive difference is reported.

2.7.2. Assessment of publication bias and homogeneity tests

Publication bias is defined as the systematic unrepresentativeness of the published studies in the literature, which leads to the selection of studies with significant effects. This bias could have an impact on the conclusions of the meta-analyses (Rothstein, Sutton, & Borenstein, 2005). In this meta-analysis, funnel plots were used to examine the publication bias. A funnel plot is a scatter plot with the effect sizes on the x-axes, and standard errors or sample sizes on the y-axes. In the absence of bias, and between-study heterogeneity, the plot will look like a symmetrical reversed funnel.

Both Egger's regression test (Egger, Smith, Schneider, & Minder, 1997) and Begg and Mazumdar's rank (Begg & Mazumdar, 1994) were conducted to assess funnel plots for asymmetry. Egger et al. (1997) developed a test for the Y intercept = 0 from a linear regression of the standardized effect sizes against precision. The regression intercept is expected to be zero when there is no publication bias. Begg and Mazumdar (1994) examined the interdependence of variance and effect size using Kendall's method.

Heterogeneity refers to the variability within a meta-analysis. A heterogeneity test assesses the null hypothesis that all studies are assessing the same effect (Higgins, Thompson, Deeks, & Altman, 2003). To examine heterogeneity in this meta-analysis, we used both Cochran's *Q* test (Hedges & Olkin, 1985) and I^2 statistic (Higgins et al., 2003). The *Q* statistic follows a chi-square distribution with degrees of freedom (N – 1). The I^2 statistic is a percentage of total variation across studies owing to heterogeneity rather than chance (Higgins et al., 2003).

Statistical power

Statistical power estimates the proportion of studies that should produce a statistically significant effect (Borenstein, Rothstein, & Cohen, 1997). For this meta-analysis, considering previous literature, we anticipated that 15 studies would meet inclusion criteria with an average participant group size of 200 and large heterogeneity between studies. In addition, we anticipated a small (d = .25) effect size. Using metapower (Griffin, 2021), we calculated the power estimate as 0.59% to detect a small effect size and as 0.98 to detect a moderate effect size (d = .50). Regardless, we planned to include as many studies as possible.

Statistical analyses

Since The Big Five measurement tools have various subscales (agreeableness, extraversion, conscientiousness, neuroticism, and openness subscales), we obtained multiple effect sizes from one single study during the coding process. That is to say, 82 effect sizes were identified from 13 studies. Attaining multiple effect sizes from a single study results in dependency among the effect sizes. This dependency leads to a violation of the assumption that data should be statistically independent in meta-analyses. Therefore, we applied the three-level meta-analytic model in this meta-analysis to deal with this dependency among multiple effect sizes This three-level approach represents the sampling variation for each effect size (level 1), variation over effect sizes within a study (level 2), and variation over studies (level 3) (Van Den Noortgate, López-López, Marín-Martínez, & Sánchez-Meca, 2015). A specific form of 3-Level Multilevel Modeling was used in this study which, has been utilized by previous research as well (e.g. Acar, Sen, & Cayirdag, 2016; Ogurlu, 2020, 2021). In this model, the first level shows a within-effect size model, the second level represents variation between the effect sizes within the same study, and the third one is about variation across studies. The unconditional model provides an estimate of an overall mean, based on the random-effects model considering second and third-level variances (Raudenbush & Bryk, 2002). Konstantopoulos (2011) showed the unconditional model, which will be used to estimate the overall mean effect size, as follows:

$$Y_{ig} = \gamma_{00} + u_{0g} + r_{ig} + e_{ig}, \tag{4}$$

where symbolizes observed effect size, γ_{00} symbolizes overall mean, u_{0g} is a level-3 unit-specific random effect, r_{ig} is a level-2 random effect, g = 1, 2, . . ., m symbolizes the level-3 units (studies) and i = 1, 2, . . . n symbolizes level-2 units (effect size). e is error term.

When p moderators are added at level-2, the final models seems

$$\pi_{ig} = \beta_{0g} + \beta_{1g}X_{1ig} + \cdots + \beta_{pg}X_{pig} + r_{ig}, \quad (5)$$

where $\beta_{0g}, \beta_{1g}, \ldots \beta_{pg}$ symbolize regression coefficients to be estimated, and $X_{1ig}, \ldots . X_{pig}$ symbolize study-specific moderators. r_{ig} is a level-2 random effect or residual

Unlike the traditional random-effects model, this three-level model includes variance between studies, and variance between effect sizes from the same study (Van Den Noortgate et al., 2015). The three-level analysis also takes into account the inclusion of predictors to explain the heterogeneity, and the estimation of Level 2 and Level 3 heterogeneity (Cheung & Chan, 2014). (For more on the three-level meta-analytic model, see Konstantopoulos, 2011; Raudenbush & Bryk, 2002; Van Den Noortgate et al., 2015). This model was tested using the SAS PROC MIXED command with the restricted maximum likelihood (REML) estimation.

Results

We obtained a total of 82 effect sizes from 13 published studies. The included studies are provided in Table 1. Publication year ranges from 1995 to 2020.

The total sample size was 7976 individuals (3244 gifted and 4732 non-gifted). Before examining the mean effect size and the study moderators, the funnel plot was used to examine the publication bias for each dimension. Egger's test and Begg and Mazumdar's rank were used to assess funnel plots for asymmetry. Table 2 shows the values of Egger's test and Begg and Mazumdar's rank correlation for each Big five dimension. Funnel plots for each dimension are also provided as a supplementary document.

As seen in the table, the values of Egger's test, and of Begg and Mazumdar's rank correlation were not significant for each dimension. Thus, we could conclude that publication bias did not seem to be a serious threat to the dataset.

In this study, both Cochran's Q test (Hedges & Olkin, 1985) and I^2 statistic (Higgins et al., 2003) were applied to assess heterogeneity in the meta-analysis. The values of the Q test and I^2 are given in Table 3 for each dimension. These two statistics showed that the data were largely heterogeneous for each dimension.

The unconditional model provides an estimate of the overall mean as a random effect and the variances at the second and third levels. Table 4 indicates the fixed coefficients, variance components, standard errors, p values, and 95% confidence intervals (CI).

The unconditional model provided the overall effect size for each dimension. The average effect sizes provided no significant difference existed between the gifted and non-gifted participants with respect to

Table 1. Overview of studies compared the EI levels between gifted and non-gifted individuals (n = 13).

Study	Gifted Participants	Non-Gifted Participants	Country	EI measurement Tool/ Model	Major Findings
Alhoish (2019)	In a summer enriching program (n = 48)	non-gifted female students in secondary schools (n = 110)	Saudi Arabia	Big Five Personality Traits Inventory (Costa & McCrae, 1992c)	Gifted students had higher scores on extraversion, agreeableness, openness to experience, and neuroticism than non-gifted students. Neuroticism was higher among non-gifted students.
Altaras-Dimitrijević (2012)	Gifted students were identified based on some intelligence tests (n = 278)	High school and undergraduate students (n = 107)	Serbia	NEO Personality Inventory-Revised (Costa & McCrae, 1992b)	They found higher Openness scores yet lower Neuroticism and Agreeableness scores among gifted samples than non-gifted peers.
Biedroń (2011)	They used proficiency scores, the number of languages they had learned, language learning history, recommendation of their teachers, the MLAT score, and the Language Ability Test score for identification (n = 44)	English philology freshmen students (n = 46)	Poland	NEO-Five Factor Inventory (Costa & McCrae, 1992b)	There were no statistically significant differences in personality factors between the gifted and non-gifted learners however the gifted learners scored the highest on Openness and Conscientiousness,
Dijkstra et al. (2012)	Gifted participants were recruited through organizations for the gifted (Mensa and Mind in Development) (n = 196)	Non-gifted adults (n = 192)	Nederland	Shafer's 30 markers. (1999).	Results showed that gifted individuals indicated lower levels of conscientiousness, agreeableness, and extraversion compared to others,
Likhanov et al. (2021).	From a special program (n = 973)	Several general education schools (n = 1261)	Russia	The Big Five (John, Naumann, & Soto, 2008)	The gifted sample had on average slightly lower scores on conscientiousness, extraversion, agreeableness, and openness to experience comparing the non-gifted sample
Limont et al. (2014).	Gifted adolescents were identified based on Raven's Tests (n = 132)	From regular schools, without out-standing academic achievement. (n = 103)	Poland	NEO Personality Inventory–Revised (Costa & McCrae, 1992b)	The gifted scored higher than the control group openness to experience but lower on neuroticism.
Lusby (1994).	In a summer program (n = 178)	In public high schools (n = 140)	USA	NEO-Five Factor Inventory (Costa & McCrae, 1992b)	The gifted adolescents scored higher on openness to experience than the control group.
Ramzi etal. (2011).	Based on some cognitive scales (n = 280)	In public schools (n = 280)	Iran	NEO-Five Factor Inventory (Costa & McCrae, 1992b)	The results showed that gifted students were significantly higher on neuroticism and lower on openness than non-gifted students.

(*Continued*)

Table 1. (Continued).

Study	Gifted Participants	Non-Gifted Participants	Country	EI measurement Tool/ Model	Major Findings
Sadat et al. (2014).	Based on some cognitive scales (n = 120)	In public schools (n = 400)	Iran	NEO-Five Factor Inventory (Costa & McCrae, 1992b)	The results indicated that the gifted sample had higher scores on extraversion, openness to experience, agreeableness, and consciousness but lower scores on neuroticism comparing to the non-gifted sample
Scager et al. (2012).	College honors students (n = 467)	non-honors students (n = 655)	Netherlands	The Big Five Openness to Experience scale (Gerris et al. 1998)	Honors students were significantly higher than non-honors students in terms of Openness to Experience
Vuyk et al. (2016).	In gifted programs (n = 149)	Adults from the general population (n = 312)	USA	The NEO Personality Inventory-3 (NEO PI-3 (McCrae, Costa, & Martin, 2005)	Gifted participants scored higher on Openness to Experience than others
Wirthwein et al. (2019).	In special schools (n = 97)	From general schools (n = 529)	Germany	NEO-Five Factor Inventory (Costa & McCrae, 1992b	Gifted adolescents scored higher regarding openness to experience than non-gifted adolescents.
Zeidner & Shani-Zinovich, (2011).	In special programs for gifted or talented students (n = 374)	in regular classes (n = 428)	Israel	The OCEANIC (Roberts, 2001)	Gifted students scored higher than non-gifted peers on Openness to Experience but scored lower on Neuroticism.

Agreeableness (g = .174, p = .302, 95% CI [−.140, .488]), Extraversion (g = .184, p = .279, 95% CI [−.130, .498]), Conscientiousness (g = .223, p = .221, 95% CI [−.112, .558]), and Neuroticism (g = −.338, p = .173, 95% CI [−.789, .113]). On the other hand, the average effect size for Openness (g = .473, p = .005, 95% CI [.199, .747]) suggested that a significant difference existed between the gifted and non-gifted participants with respect to the Openness dimension in favor of gifted individuals. On the basis of the overall comparison between gifted and control groups, the power to detect a moderate effect size was calculated as .96 using metapower (Griffin, 2021). In other words, on average, authors had a 96% chance of detecting an effect size in the moderate level at an alpha level of 0.05.

For each dimension, the third level variance was found to be significant. Significant Level 3 variances indicated variation across studies which shows multilevel analysis is needed.

There were four moderators in this study: gender, age, location, and gifted sample selection. A full model was examined by including all of the moderators in the model. The results of the three-level main model in Table 5 indicated that none of the moderators were significant for any of The Big Five dimensions. Namely, gender, age, location, and the gifted sample did not explain a significant amount of variation in effect sizes for any dimensions.

Discussion

This meta-analysis investigated differences in The Big Five personality dimension between gifted and non-gifted individuals using multilevel analysis. For this meta-analysis, 82 effect sizes were obtained from 13 studies, which compared the Big five personality dimensions between gifted and non-gifted groups within the same study. Results indicated that gifted individuals had higher scores than their non-gifted peers concerning Openness to Experience (g = .473). On the other hand, there were no significant differences in other dimensions including agreeableness, extraversion, conscientiousness, and neuroticism between gifted and their counterparts in this meta-analysis.

Since intelligence is considered a crucial characteristic of all conceptions of giftedness (Sternberg & Davidson, 2005), previous studies pointed out that the openness dimension is more closely related to intelligence than other dimensions (DeYoung, 2011; Zeidner & Matthews; 2000). These results have aligned with this study. Some research findings indicated a negative association between neuroticism and intelligence (Hembree, 1988; Moutafi, Furnham, & Paltiel, Moutafi, et al., (2005)). Contrary to this study, we did not find any differences between gifted and non-gifted samples concerning

Table 2. The values of egger's test and of begg and mazumdar's rank correlation.

Dimensions	Egger's test (*t*)	*p*	Begg and Mazumdar's rank correlation (*rt*)	*p*
Agreeableness	−1.00	.337	−.167	.368
Neuroticism	.022	.983	−.183	.322
Conscientiousness	.101	.921	.150	.418
Extraversion	−.426	.676	−.017	.928
Openness	1.270	.222	.190	.272

neuroticism. According to DeYoung (2011), the other factors (conscientiousness, agreeableness, and extraversion) did not have significant relationships with intelligence.

Miller and Speirs Neumeister (2012) found that openness was a significant predictor of creativity in a sample of high-ability students; creativity being another important component of giftedness definitions. In addition, some traits related to openness such as openness to new learning, discovery, exploration, curiosity, imagination, and creativity are characterized by gifted samples as well (Costa & McCrae, 1992a; Davis, Rimm, & Siegle, 2010; Kaufman, 2009).

The findings of this study debunked the misconception that gifted students have a maladaptive personality or social difficulties (Neihart, 2002). In addition to this meta-analysis, other meta-analytic results have pointed out that gifted individuals have different social-emotional pathways including lower perfectionism (Ogurlu, 2020); higher emotional intelligence (Ogurlu, 2021); higher self-concept (Hoge & Renzulli, 1993; Litster & Roberts, 2011 and lower anxiety (Martin, Burns, & Schonlau, 2010). While creating educational programs for gifted individuals, focusing on cognitive potentials would not be sufficient. This unique developmental pattern should be considered as well.

Limitations

There were some limitations in this meta-analysis. We used a funnel-plot to assess publication bias but this method has some limitations, especially with the small sample number of effect sizes (Kvarven, Strømland, & Johannesson,

Table 3. The values of Q_T and I^2 index.

Dimensions	Q test (Q_T)	*p*	I^2
Agreeableness	245.00	< .001	93.88%
Neuroticism	245.00	< .001	93.88%
Conscientiousness	263.40	< .001	94.31%
Extraversion	230.26	< .001	93.49%
Openness	301.24	< .001	94.36%

Table 4. Unconditional model.

		Estimates	*SE*	*p*	95% CI
Agreeableness	Fixed effects				
	Intercept	.174	.160	.302	(−.140, .488)
	Variance components				
	Second level	0	-	-	-
	Third level	.268	.126	.016	(.021, .515)
Extraversion	Fixed effects				
	Intercept	.184	.160	.279	(−.130, .498)
	Variance components				
	Second level	.003	.006	0.264	(−.009, .015)
	Third level	.268	.128	.018	(.017, .519)
Neuroticism	Fixed effects				
	Intercept	−.338	.230	.173	(−.789, .113)
	Variance components				
	Second level	.016	.015	.143	(−.013, .045)
	Third level	.556	.264	.017	(.039, 1.073)
Conscientiousness	Fixed effects				
	Intercept	.223	.171	.221	(−.112, .558)
	Variance components				
	Second level	0	-	-	-
	Third level	.309	.145	.016	(.025, .593)
Openness	Fixed effects				
	Intercept	.473	.140	.005	(.199, .747)
	Variance components				
	Second level	.006	.016	.374	(−.025, .037)
	Third level	.237	.107	.013	(.027, .447)

Note: The second level models the variation over effect sizes within a study; the third level models the variation over studies

Table 5. Main model.

		Estimates	*SE*	*p*	95% CI
Agreeableness	Fixed effects				
	Intercept	1.042	.507	.096	(.048, 2.036)
	Age (College and up)	−.051	.129	.702	(−.304, .202)
	Age (Mixed)	1.000	.406	.054	(.204,1.796)
	Culture (Europe)	−.483	.425	.305	(−1.316, .350)
	Culture (Middle East)	−.798	.636	.262	(−2.045, .449)
	Gender (Female)	−.021	.075	.782	(−.168, .126)
	Gender (Both)	−.634	.362	.143	(−1.344, .076)
	Gifted Sample (Assessment)	−.192	.270	.508	(−.721, .337)
	Variance components				
	Second level	0	-	-	-
	Third level	.113	.079	.077	(−.042,.268)
Extraversion	Fixed effects				
	Intercept	.254	.687	.727	(−1.093, 1.601)
	Age (College and up)	.005	.148	.973	(−.285,.295)
	Age (Mixed)	.758	.689	.322	(−.592,2.108)
	Culture (Europe)	.022	.530	.967	(−1.017, 1.061)
	Culture (Middle East)	.204	.812	.811	(−1.388, 1.796)
	Gender (Female)	.099	.096	.449	(−.089, .287)
	Gender (Both)	−.151	.519	.782	(−1.168, .866)
	Gifted Sample (Assessment)	−.450	.304	.198	(−1.046, .146)
	Variance components				
	Second level	.003	.010	.377	(−.017,.023)
	Third level	.186	.128	.072	(−.065,.437)
Neuroticism	Fixed effects				
	Intercept	.532	1.277	.694	(−1.971, 3.035)
	Age (College and up)	.258	.165	.190	(−.065, .581)
	Age (Mixed)	−.402	1.278	.765	(−2.907, 2.103)
	Culture (Europe)	−.631	.973	.545	(−2.538, 1.276)
	Culture (Middle East)	−1.042	1.501	.518	(−3.984, 1.900)
	Gender (Female)	−.195	.110	.257	(−.411, .021)
	Gender (Both)	−.500	.962	628	(−2.386, 1.386)
	Gifted Sample (Assessment)	.579	.561	.518	(−.521, 1.679)
	Variance components				
	Second level	.005	.013	.330	(−.020, .030)
	Third level	.674	.438	.061	(−.184, 1.532)
Conscientiousness	Fixed effects				
	Intercept	.059	.798	.943	(−1.505, 1.623)
	Age (College and up)	−.041	.134	.766	(−.304, .222)
	Age (Mixed)	.592	.801	.493	(−.978, 2.162)
	Culture (Europe)	.271	.612	.675	(−.929, 1.471)
	Culture (Middle East)	.492	.942	.624	(−1.354, 2.338)
	Gender (Female)	.096	.075	.236	(−.051, .243)
	Gender (Both)	−.048	.604	.939	(−1.232, 1.136)
	Gifted Sample (Assessment)	−.541	.353	.186	(−1.233, .151)
	Variance components				
	Second level	0	-	-	-
	Third level	.259	.174	.068	(−.082,.600)
Openness	Fixed effects				
	Intercept	.431	.603	.499	(−.751, 1.613)
	Age (College and up)	−.204	.186	.339	(−.569,.161)
	Age (Mixed)	−1.179	.696	.135	(−2.543, .185)
	Culture (Europe)	−.334	.405	.436	(−1.128, .460)
	Culture (Middle East)	.683	.736	.436	(−.760, 2.126)
	Gender (Female)	.038	.156	.837	(−.268, .344)
	Gender (Mixed)	.557	.519	.320	(−.460, 1.574)
	Gifted Sample (Assessment)	−.436	.293	.180	(−1.010, .138)
	Variance components				
	Second level	.017	.030	.283	(−.042,.076)
	Third level	.185	.117	.057	(−.044,.414

Note: Dummy coding: Age Level 0 = High School&Lower, Age Level 1 = College& Up, Age Level 2 = Mixed; Gender 0 = Male, Gender 1 = Female, Gender 2 = Mixed; Culture 0 = America, Culture1 = Europe, Culture 2 = Middle East; Gifted Sample 0 = From Special Programs, Gifted Sample 1 = From Assessment

2019). The sample of the study was not too large so in the future, this study should be done with a larger sample. In the study, the identification process of gifted individuals was not added as a moderator, although the gifted sample selection was taken into consideration since most studies did not include sufficient information on the identification of giftedness.

Conclusion

The study findings reveal that gifted individuals had higher openness levels than their non-gifted counterparts but there were no significant differences between the two groups in regards to the other factors (agreeableness, extraversion, conscientiousness, and neuroticism). While interpreting these results, various definitions and identifications of giftedness should be taken into account. This study underlines the significance of addressing personality differences in gifted versus non-gifted individuals.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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