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Review

Big Five personality group differences across academic majors: A systematic review

Anna Vedel

Department of Psychology and Behavioural Sciences, Aarhus University, Bartholins Allé 9, 8000 Aarhus C, DK

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ABSTRACT

During the past decades, a number of studies have explored personality group differences in the Big Five personality traits among students in different academic majors. To date, though, this research has not been reviewed systematically. This was the aim of the present review. A systematic literature search identified twelve eligible studies yielding an aggregated sample size of 13,389. Eleven studies reported significant group differences in one or multiple Big Five personality traits. Consistent findings across studies were that students of arts/humanities and psychology scored high on *Neuroticism* and *Openness*; students of political sc. scored high on *Openness*; students of economics, law, political sc., and medicine scored high on *Extraversion*; students of medicine, psychology, arts/humanities, and sciences scored high on *Agreeableness*; and students of arts/humanities scored low on *Conscientiousness*. Effect sizes were calculated to estimate the magnitude of the personality group differences. These effect sizes were consistent across studies comparing similar pairs of academic majors. For all Big Five personality traits medium effect sizes were found frequently, and for Openness even large effect sizes were found regularly. The results from the present review indicate that substantial personality group differences across academic majors exist. Implications for research and practice are discussed.

1. Introduction

The choice of education is perhaps the first highly important decision that young people have to make for themselves in the developed world. Each education paves the way for certain vocational paths, and the choice has a lasting impact on the young adult's life. In tertiary education students try to find academic majors that suit their abilities, interests, and future vocational goals in order to maximise the likelihood of obtaining a degree. This is in the students' own interest, both financially and in terms of well-being, but society has an interest too in helping students find the right major since higher education and high retention rates are economically desirable (Bloom, Hartley, & Rosovsky, 2007). As a result of this convergence of interests, academic advising has become a societal priority and has captured the attention of researchers (Frost & Brown-Wheeler, 2003).

Two lines of psychological research have sought to inform academic advising. The first line has explored antecedents of students' academic performance, such as cognitive abilities, personality, motivation, etc. (see Richardson, Abraham, & Bond, 2012, for an overview). The second line has examined group differences in these same variables among students in different academic majors. Especially the Big Five personality traits *Neuroticism*, *Extraversion*, *Openness*, *Agreeableness*, and *Conscientiousness* (Costa & McCrae, 1992) have been studied in recent years in order to determine if different academic fields attract different types of students (e.g. Kaufman, Pumaccahua, & Holt, 2013; Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002; Lounsbury, Smith, Levy, Leong, & Gibson, 2009; Rubinstein, 2005). An often-stated rationale in this research is that there may be an optimal "fit" between student and major based on the student's personality, an idea that has been put forth by Holland (e.g. Holland, 1997), among others. If, in fact, some academic majors are more suitable for some students than others due to the students' personality, then that knowledge would be useful in both academic advising, counselling, and educational practice more broadly.

However, the research on Big Five personality group differences among students in different majors has not yet been reviewed in a systematic way. It is therefore unclear what we know about personality group differences across majors, and there is a need for this research to be summarised and evaluated in order to become useful for researchers and practitioners. The aim of the present review is exactly this: to systematically review the existing research on Big Five personality group differences across academic majors and to estimate the magnitude of the findings from this research.

2. Method

2.1. Literature search

A systematic search by thematically relevant electronic databases was conducted to identify studies on the relationships between the Big Five personality traits and academic majors. Using ProQuest the following electronic databases were searched simultaneously with the last search run January 29th 2015: Australian Education Index

E-mail address: avedel@psy.au.dk.

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0191-8869/

(1977–present), ERIC (1966–present), ProQuest Education Journals, (1988–present), ProQuest Research Library, ProQuest Science Journals, and PsycINFO (1806–present). Search terms and Boolean operators were ab(personalit* OR Big Five OR Five-Factor Model) AND ab(facult* OR college major* OR academic major* OR study major*) AND peer(yes). No publication date limits were applied. Abstracts of all located studies were reviewed, and potential eligible studies were identified. Full text copies of potential eligible studies were obtained and examined applying the inclusion criteria outlined in the section below. References of included studies were searched manually to identify additional relevant studies not located in the formal search. Finally, this author's personal collection of personality research articles was searched to identify additional eligible studies.

2.2. Inclusion criteria

Only studies available in English were examined further. There were two basic requirements for inclusion: 1) a Big Five personality measure had been administered to students in tertiary education representing two or more academic majors/groups of majors, and 2) a statistical procedure had assessed the relationships between the Big Five personality traits and academic majors, or the means, standard deviations, and sample size had been reported for each major. Studies using personality measures not directly measuring the Big Five personality traits were not included. Neither were studies using samples of fully trained academics or high school students.

2.3. Data extraction

Included studies were examined in order to extract relevant study characteristics: country in which the study was conducted, academic majors in which the students were enrolled, sample size, mean age, gender distribution, study design, and personality measure used. Results on group differences in the Big Five personality traits across academic majors were extracted, and mean scores on the Big Five personality traits and standard deviations were extracted for each group if reported. If not reported, the corresponding author was contacted in order to retrieve this information.

For those studies that included gender as an independent variable in factorial designs, gender differences in the Big Five personality traits were extracted also.

2.4. Data synthesis

A qualitative data synthesis approach was adopted and combined with effect size calculations of mean differences in the Big Five personality traits across academic majors. Formal meta-analysis was not possible due to profound differences between studies in their selection of academic majors being compared. For more information about the issue of incomparability of primary studies in meta-analysis, see Higgins and Green (2011).

3. Results

3.1. Study characteristics

Following the guidelines outlined in the PRISMA Statement (Liberati et al., 2009), a flow diagram is presented in Fig. 1 to illustrate the process of study selection. As a result of the study selection process, 12 empirical studies meeting all inclusion criteria were included in the review. The aggregated sample size was 13,389. Extracted study characteristics are presented ordered by study author(s) in Table 1.

3.1.1. Study designs and samples

Most studies were conducted in North America and Europe, and all but two studies (Lievens et al., 2002; Vedel, Thomsen, & Larsen, 2015) were retrospective in that the students had been enrolled for months or years in their majors before completing the personality questionnaire. Samples were large in most studies and ranged from 168 to 3295 students, and mean age in the studies ranged from 18.2 to 25.8 years. In three studies mean age was not reported, though (Clariana, 2013; Marrs, Barb, & Ruggiero, 2007; Pringle, DuBose, & Yankey, 2010). There were generally more females than males in the study samples, although this varied depending on the specific majors being compared. Only one study failed to report any gender information (De Fruyt & Mervielde, 1996). Studies differed greatly pertaining to which academic majors were compared. The majority of studies compared four to eight different academic majors/groups of majors covering a wide range of academic fields. One study, though, compared eight rather similar majors in business administration fields (Pringle et al., 2010), and two studies compared only two groups each: business versus non-business students (Lounsbury et al., 2009) and psychology versus nonpsychology students (Marrs et al., 2007).

3.1.2. Personality measures

Nine different Big Five measures were administered across the twelve studies. The nomenclature for the Big Five personality traits varies in these personality measures: the factor in the PPQ denoted *Tough-mindedness* is the opposite pole of the factor Agreeableness in the other Big Five measures, and the factor in the PPQ denoted *Conformity* is the opposite pole of the factor Openness. Similarly, the factor *Emotional Stability* in the IPIP and APSI is the opposite pole of Neuroticism in the other Big Five measures. These primarily semantic differences originate in the historical development of the various Big Five personality measures (John, Naumann, & Soto, 2008), which is outside the scope of this review. There is a practical consequence of the diversity, though. In order to make the results from the reviewed studies comparable, the directions of the group differences were reversed in instances where opposite poles of Neuroticism, Agreeableness, or Openness had been measured.[1] All results in Table 1 therefore refer to the same five terms for the Big Five factors irrespective of personality measures originally used in the included studies.

3.1.3. Statistical approaches

Ten studies used one or multiple omnibus tests (ANOVA, ANCOVA, MANOVA, or MANCOVA) to test the statistical significance of Big Five mean differences among academic majors/groups of majors. Statistically significant results were then followed up with post-hoc tests (Bonferroni, Tukey's Honestly Significant Differences, Newman–Keuls, or Scheffé). Lounsbury et al. (2009) compared only two groups, though, and therefore conducted independent *t*-tests exclusively. Finally, Sánchez-Ruiz, Hernández-Torrano, Pérez-González, Batey, and Petrides (2011) did not test the statistical significance of personality group differences among academic majors. However, means on the Big Five personality traits, standard deviations, and sample sizes were reported for three groups of majors in the article, and this information enabled current pairwise comparisons of the three groups of majors using the Bonferroni correction; hence the inclusion of this study (see Section 2.2.). Half of the studies included gender as a covariate or independent variable in addition to academic major, but Clariana (2013) performed all statistical analyses separately for males and females in four different groups of majors instead. In order to make the results from this study comparable to the results from the other included studies, the standard deviations were retrieved from the author (M. Clariana, personal communication, March 18, 2015), and the descriptives were combined for males and females. Pairwise comparisons of the four

[1] Results for Neuroticism extracted from Sánchez-Ruiz et al. (2011) were also reversed after confirmation of this author's suspicion that the results reflected scores on Emotional Stability, not Neuroticism as originally reported (M. J. Sánchez-Ruiz, personal communication, March 16, 2015).