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Medical students' Big Five Personality scores and the effects on the “selection process”

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Abstract:

Assessment of the personalities of medical students not only aids the formulation of strategies for the best development of academic and clinical competencies but can also inform the process of selecting medical practitioners. The hypothesis tested was that medical students have distinct personality profiles that reflect the nature of the selection process.

Two groups of French medical students were compared using the Big Five Inventory (BFI) to measure personality: an unselected group of Year 1 medical students ($n = 1332$; mean age 19.4 years ± 1.4 ; 68% females) and a group of academically successful Year 3 students ($n = 403$; mean age 21.3 ± 1.6 ; 65% female). The data collected further enabled comparisons in an international context where medical students were selected using different procedures.

Year 3 French medical students, who represent only the top 15% of students initially admitted into the medical course, scored lower on two personality dimensions than the unselected Year 1 students: on Agreeableness and Openness to new experience ($p < 0.001$). In keeping with the findings in non-medical populations, both groups of female medical students scored higher on Agreeableness than did males. Nevertheless, the selection effect on Agreeableness and Openness held for both males and females. These findings contrast with medical student personality profiles in other countries that use less overtly competitive procedures to select medical students.

Keywords: Five Factors of personality; Big Five Inventory; Selection effects

Introduction

It has been reported that “exemplary” or “model” medical practitioners should have the characteristics of empathy, warmth, cooperativeness, honesty, and self-control **1-4**. These characteristics all belong to a broad personality dimension labelled Agreeableness in modern research into the psychology of personality **5, 6**. Accordingly, it might be argued that students who score high on personality traits related to Agreeableness should be selected to study medicine⁷. However, there is no general agreement about the methodologies appropriate for selecting such students and internationally many different selection approaches are evident.

The five-factor model (defined by the five broad dimensions of Extraversion vs. Introversion, Agreeableness vs. Antagonism, Conscientiousness vs. Irresponsibility, Neuroticism vs. Emotional Stability, and Openness to New Experience vs. Closed-mindedness) is increasingly gaining acceptance for assessing personality (e.g., **5**). However, it has been little used for medical students. One study investigated the personalities of Flemish medical students in Belgium, students that are selected from school pupils by “an admissions examination organised by the Flemish Provincial Government that includes cognitive ability measures (e.g., reasoning tests) and video-based situational tests (e.g., video-taped interaction between doctor and patient)”, thus taking into account not only intellectual performance but also personality in terms of interpersonal skills. Indeed, the medical students so selected scored higher on Agreeableness and on Extraversion than a range of other university students. With regard to Conscientiousness, Openness, and Neuroticism, these medical students were located in the middle of the range compared with students of other subjects **7**.

In another study, the medical school at Saint Louis, USA, enroll older, graduate students who have already successfully completed university (college) education. Here, the mean scores of the students on personality traits related to Agreeableness were close to the average of the general population. Thus, the students were not particularly high (nor low) on this personality dimension. However, they were above average on Extraversion and on Openness, and average for Neuroticism and Conscientiousness **8**. A study using the Big Five has been undertaken in the United Kingdom where students are selected by assessment of performance at high (secondary) schools in scientific subjects and subsequently on the basis of personal statements, teachers’ reports, and interview performance (it being expected that the selected medical students would not subsequently fail to qualify as medical practitioners). It was reported that medical students who scored high on Conscientiousness performed better at their preclinical medical examination. However, the reports did not characterise the personality profiles of the selected or most successful student, including the mean scores on Agreeableness, in terms of population norms **9**.

To date, there have been no assessments of the personalities of medical students in France. In the light of the different procedures employed to recruit students to medical schools, and the apparent different personality profiles of the students, in Belgium, the United States, and the United Kingdom, this is unfortunate because the French medical-selection system provides a unique cohort of students that are admitted to first year medical school after completing their baccalaureate (high school diploma) without further selection procedures (e.g., such as the Flemish who take personality predispositions into account); and who, at the end of their first year of medical study, are selected rigorously only on the basis of the results of their written medical examinations to continue into full-fledged medical training. Only the top 15 % of high scorers can advance and 85% are rejected. Anecdotal descriptions suggest that the need for such exceptional exam scores leads to an environment of intense, if not fierce, competition, rather than prosocial collaboration, an environment in which only some personalities would be expected to thrive. This environment also requires a narrow focus on academic success over broader intellectual and artistic interests common at this young age

producing certainly a lower Openness effect. Consequently, the aim of this paper is to test the hypothesis that French students admitted into full medical training show a personality profile that reflects the particular admission procedures. Specifically, we hypothesized that the single and highly competitive examination-based selection criterion would be reflected in lower Agreeableness scores in the students successful in this selection environment, as compared to a group of unselected first-year students. We also tested whether sex (gender) differences in personality previously found in the general population (e.g., **10**) are also found in these two groups of French medical students. Previous research shows that practicing doctors who are women scored higher on empathy (a trait related to the broader personality dimension of Agreeableness) than male doctors **2, 3**.

Methods

Subjects

The Big Five personality dimensions were assessed in two groups of medical students, recruited at the same French medical school (University Paris Descartes). One group (n = 403) had passed the first-year examinations and were now in their third year of medical studies, representing the top 15% medical students selected for full-fledged medical training. In this sample, 65% of the students were female and 35% male; the mean age was 21.5 years (SD = 1.8). The comparison group (n=1332) consisted of unselected medical students in their first year of medical training, prior to any elimination due to first-year examinations. There were 68% females and 32% males, with a mean age of 19.4 years (SD = 1.4).

Instruments

To indicate the broad nature of the Big Five personality factors, McCrae and John¹¹ have labelled them as E (Extraversion, Energy, Enthusiasm), A (Agreeableness, Altruism, Affection), C (Conscientiousness, Constraint, Control of impulse), N (Neuroticism, Negative affectivity, Nervousness), and O (Openness, Originality, Open-mindedness) **5**. To measure these five broad dimensions in medical students, we used the Big Five Inventory (BFI), developed by John, Donahue, and Kentle **12** and adapted for use in French by **13, 14**. The 45- item French adaptation is hereafter referred to as the BFI-Fr.

The BFI items consist of short phrases that are easy to understand and were designed to assess the prototypical traits defining both the high pole and the low pole of each of the Big

Five dimensions. For example, "Is helpful and unselfish with others" is an item measuring the high (agreeable) pole of the Agreeableness dimension, whereas "Can be cold and aloof" measures the low (antagonistic) pole of Agreeableness. Respondents are asked to rate their agreement with each BFI item on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Because the BFI takes only 10 to 15 minutes to complete, it is particularly useful for large-survey studies where respondents can only spend a limited amount of time on the personality assessment. In studies in the U.S., Benet-Martinez and John¹⁵, John and Srivastava⁶, John, Naumann, and Soto **5**, and Soto and John **16** reported that the BFI scales have high levels of internal consistency and retest reliability, a clear five-factor structure, and substantial convergent and discriminant validity with longer Big Five measures and independent peer ratings. In terms of sex (gender) differences, women show higher mean scores than men on Agreeableness, Conscientiousness, and Neuroticism.

In several samples of French students and adults, the BFI-Fr replicated the expected five-factor structure, and the scales showed similar psychometric characteristics, with satisfactory reliability, low interscale correlations, and substantial convergent correlations with Costa and McCrae's **17** NEO-PI-R

(the revised NEO personality inventory) domain scales; similar sex (gender) differences were also found **13, 14**. The full English BFI is reprinted in **5, 6, 15** and the BFI-Fr is reprinted in **13**.

In the two groups of medical students in this research, the coefficient alpha reliability coefficients for the BFI scales (indexing the internal-consistency reliability of multi-item questionnaire scales) were similar to those in previous research. In the group of selected third-year medical students, alpha reliability coefficients were 0.84 for Extraversion, 0.75 for Agreeableness, 0.80 for Conscientiousness, 0.80 for Neuroticism, and 0.75 for Openness. In the comparison group of unselected first-year medical students, alpha coefficients were 0.80, 0.75, 0.80, 0.81, and 0.73, respectively. All alpha coefficients were above 0.70 which is considered satisfactory reliability for brief psychological measures **18**.

Procedure and analyses

Participation in the study was voluntary and confidentiality was guaranteed by having participants complete the BFI anonymously, a common procedure which also eliminates concerns about individual differences in socially desirable self-presentation. Participants only reported their sex and age and could thus not be identified from the material they completed; the survey received ethical approval at University Paris Descartes.

Statistical analysis was accomplished using the SPSS (Statistical Package for the Social Sciences) package (version 16). In addition to a descriptive analysis of the data, correlation analysis (Bravais-Pearson) and group comparison (ANOVA) were employed to make statistical comparisons.

Results

Comparisons of selected third-year medical students with unselected first-year medical students from the same university

Overall, 85% of the students in the first-year French medical class are rejected from full-time medical training and thus represent students that enter other majors, such as physical or social sciences. Thus, the effect of the procedure used to select students from the first year into the full-fledged medical training program should be apparent in differences in personality between the unselected first-year student group and the smaller group of selected medical students. The means and standard deviations (SD) for the two groups of students are shown in TABLE 1 and illustrated in FIGURES 1, 2, 3.

As expected, the selected third-year medical students had lower Agreeableness scores than the unselected first-year students, $F(1, 1729) = 44.1, p < 0.001$. In addition, they scored lower in Openness, $F(1, 1729) = 12.9, p < 0.001$.

Most important, these two effects held for both genders: females showed the same difference in A "agreeableness" ($F(1, 1150) = 31.5, p < 0.0001$) and in O "openness" ($F(1, 1150) = 9.9, p < 0.005$), and so did males on A "agreeableness" ($F(1, 555) = 12.7, p < 0.0005$), and O "openness" ($F(1, 555) = 4.1, p < 0.05$). In addition, males showed a group difference for N "negative affectivity" ($F(1, 555) = 4.3, p < 0.05$), with third-year male medical students scoring higher.

Insert TABLE 1 and FIGURES 1, 2, 3 about here

Sex differences in the two groups of medical students

Table 1 also shows means separately for males and females in the two groups of French medical students. The sex differences in the medical students were very similar to those in other populations and countries. In the selected third-year students, females scored significantly higher than males on three Big Five dimensions: Agreeableness, $F(1, 391) = 10.7, p < 0.01$; Conscientiousness, $F(1, 391) = 25.9, p < 0.01$; and Neuroticism, $F(1, 391) = 12.3, p < 0.01$. The same pattern of sex differences held in the unselected group of first-year medical students: Agreeableness, $F(1, 1314) = 24.1, p < 0.001$; Conscientiousness, $F(1, 1314) = 55.3, p < 0.001$; and Neuroticism, $F(1, 1314) = 105.2, p < 0.001$.

Discussion

Our survey shows that, for a cohort of third-year medical students (i.e. at “advanced stages of their medical education and training”) scored low in “agreeableness” and in “openness”. Differences were found compared with a cohort of first-year students and between sexes (genders). Our findings are thus inconsistent with our general hypothesis, “advanced” medical students not scoring low in “agreeableness”.

Of course, the third-year students had attended university two years longer and were therefore on average two years older (21.5 vs. 19.4 years). However, the findings that the selected third-year medical students scored lower in Agreeableness and lower in Openness cannot be explained by general age changes in personality. Extensive research (e.g., **10, 19, 20**) has documented (a) that individual differences in personality traits are quite stable over time and (b) that the small changes that occur from age 19 to age 22 consist of increases in Conscientiousness and Agreeableness, not the decreases in Agreeableness and O “openness” we observed during the selection from first-year status to advanced medical student in the third year. In summary, as observed in the preliminary (unpublished, comparing first year and second year) data, we found two significant differences that replicated across males and females when third year medical students were compared to the heterogeneous population of the first year, with the selected medical students in the third year scoring consistently lower in A “agreeableness” and O “openness”.

Concerning sex (gender) differences, for the medical students across all three cohorts studied in this survey, females scored higher in “agreeableness”, “conscientiousness”, and “negative affectivity” than males. Nonetheless, the differences in “agreeableness” (and “openness”) we found in the “advanced” medical students held across both sexes (genders), the females who had progressed into the third year of medical studies being less agreeable than the females in the first-year cohort. The sex (gender) differences reported here are consistent with our own previous research using French samples **13, 14** and with research in the U.S. **10, 15**, as well as with another recent study of university students **21**. Furthermore, these sex (gender) differences in personality have been found across a wide range of different cultures **22**. It has also been found that sex (gender) differences are most marked among industrialized European and American cultures and relatively attenuated among African and Asian cultures. The question remains unresolved as to whether the sex (gender) issues that have been reported relate primarily to biological factors (i.e., sex as defined by WHO) or to socially constructed roles (i.e., gender as defined by WHO).

Our findings for medical students appear to differ from an earlier survey where it was reported that Flemish students at a medical school in Ghent scored high on “agreeableness” **7**. This might reflect cultural differences between Belgium and France in the way medical students are selected. However, an investigation of medical students’ personalities at Saint Louis, USA, also showed that the students were not inordinately “agreeable” and this was considered a difficulty in terms of building clinical teams where there needs to be conflict resolution and alliance making⁸. The personality differences that we recorded between Year one and Year three medical students may well reflect the highly

competitive nature of those in Year three that had succeeded in progressing beyond Year one. The exact mechanisms underlying this selection effect await further investigation. Overall, however, the data support our hypothesis that medical students, both male and female, are relatively low in “agreeableness”. Moreover, it is noteworthy that fewer students high in “openness” (the tendency to be open to, and interested in, new experiences, opinions, and perspectives) remained in the medical school by the third year of training.

That there are personality differences within the cohort of medical students has implications for the manner whereby students are admitted to medical school. The admission of medical students does not usually rely upon a measured assessment of personality and it is usually assumed that there are no important differences, or that, differences “balance out” across the whole cohort of students, or that a “good personality mix” is desirable. However, admission to medical school should be on the basis of choosing those students whose attributes (academically, attitudinally, and behaviourally) are best suited for patient care. Indeed, the question should be raised: what are the personality traits best suited for the practice of medicine? In this context, is it in society’s best interest for students to be admitted to medicine who are low in “agreeableness” and “openness” however academically capable they may be? It may be argued that the best medical practitioners are those who, regardless of personality, arrive at correct diagnoses and treatment plans. However, others would argue that medical practitioners must additionally have good communication and social skills. These assumptions have regrettably not, as yet, been properly assessed and medical authorities, even in the most democratically orientated societies, have not deemed it worthy of considering lay-persons opinions in this regard! That this is an important issue is shown by an investigation that found that those medical practitioners scoring high in “agreeableness” and “extraversion” (both dimensions defining interpersonal dynamics) are better at developing the skills needed for collaboration and communication in professional practice **7**. Furthermore, because “conscientiousness” affects examination results, and can be reliably assessed at the start of medical studies, it was further recommended that personality assessments be employed for guiding students as to their suitability for entering medical school. While there may be a lack in political will to change medical admissions policies, in France (as indeed in many other countries worldwide) there are presently important discussions taking place about structural modifications to the first year of medical school and about the integration of the medical curricula into the Bologna process. Therefore, now might be the ideal time for reconsidering matters relating to the admission of students to the medical profession.

This issue can be considered further by noting that individual differences in the Big Five personality dimensions remain quite stable over time **23**. Nonetheless, systematic changes in personality do take place with age. The development of the Big Five personality traits has been studied throughout adult life¹⁰. “Conscientiousness” appears to increase with age (most strongly during the 20s), whereas “agreeableness” increases most during the 30s. On the other hand, “neuroticism or negative affectivity” declines with age for females, but not as much for males, and “openness” and “extraversion” show only minor changes with age. In another report, increases in “conscientiousness” and “agreeableness” and decreases in “negative affectivity” in adulthood were interpreted as indicating increasing maturity (persons becoming, on average, better adapted to adult tasks in work and relationships as they get older) **19, 24**. Such changes predominate in young adulthood (age range 20-40 years) but can continue into middle, and even old, age. Thus, if it is not possible (or, in the view of some, desirable) to select medical students according to their “agreeableness” or “openness” (however beneficially this might be to patients or even to their teachers), at the very least the attempt should be made to encourage students to develop these characteristics. Accordingly, while greater “agreeableness” may come to the fore with age, it would be necessary to see early signs of desirable personality development perhaps by personality profiling as the students (or early practitioners) begin

their careers. Indeed, in some countries “fitness to practise” issues are treated most seriously. For example, in the United Kingdom, the General Medical Council’s guidelines, “Tomorrow’s Doctors”, lays important stress on attitudes and behavioural development.

It could be argued that, since medicine is multidisciplinary, different specialties require different personalities. Thus, it has been reported that general surgeons are more tough-minded, resolute, and less empathetic than general practitioners and anaesthetists **25**. This characterization of surgeons tends to be pervasive throughout the literature and also in the medical community. Surgery is perceived as one of the most stressful medical specialties **26** and students who choose surgery are described as being more resistant to stress and as having high self-esteem; to quote an oft used saying - surgeons are required to be “bloody, bold and resolute”. And yet, there is no evidence to show that these are the personality traits required for a surgeon to be clinically efficient. Sex (gender) differences relating to specialty interest can also be attributed to personality traits. For example, among first-year medical students (as well as physicians), consistent with the “agreeableness” differences reported here, females consistently score significantly higher than males on empathy 1-3. This personality difference can lead females to choose primary care, or a “people-oriented” specialty, more than males 4. Clearly, much future work is required to assess the attributes required of practitioners in different specialties but, until such research is undertaken, it is perhaps expedient to maintain attitudes and personality traits that are empathetic and show “agreeableness” and “openness”.

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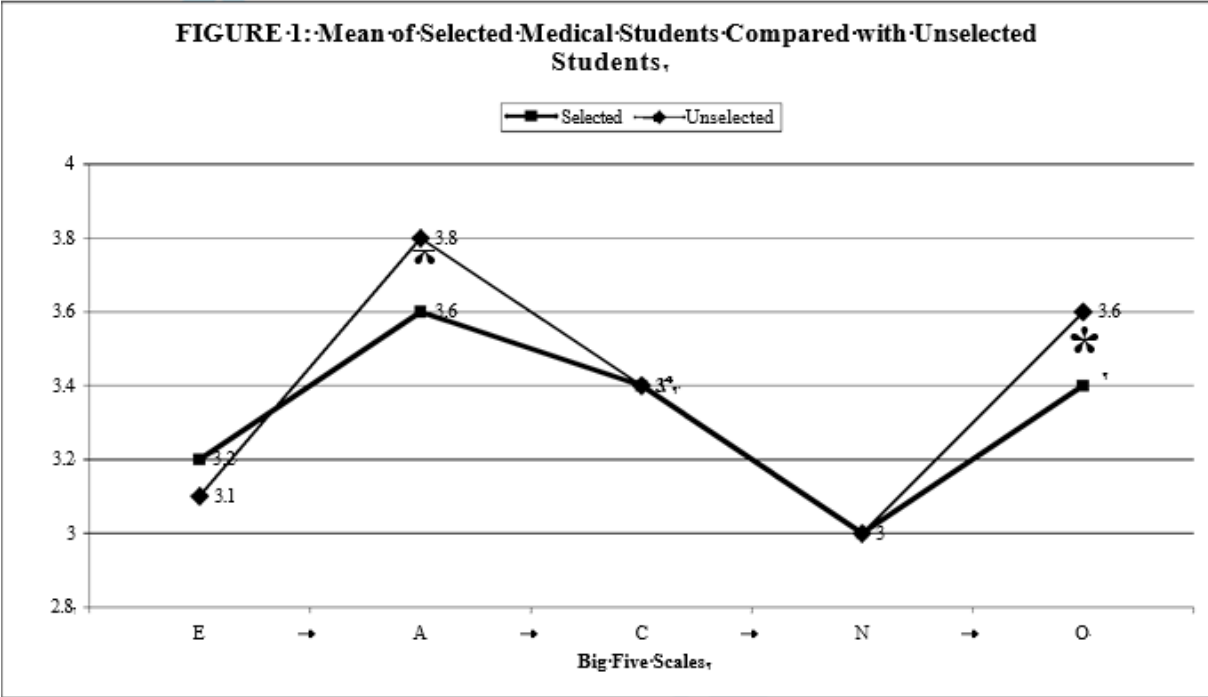
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TABLE 1: Comparison of Selected Third-Year Medical Students (n=403) with Unselected First-year Medical Students (n=1332). E (Extraversion, Energy, Enthusiasm), A (Agreeableness, Altruism, Affection), C (Conscientiousness, Constraint, Control of impulse), N (Neuroticism, Negative affectivity, Nervousness), and O (Openness, Originality, Open-mindedness)

		Total sample		Male students		Female students	
		3rd year	1 st year	3rd year	1 st year	3rd year	1 st year
E	Mean	3.2	3.1	3.2	3.2	3.2	3.2
	SD	.67	.76	.64	.77	.69	.76
A	Mean	3.6	3.8*	3.5	3.7**	3.7	3.9*
	SD	.51	.61	.55	.64	.48	.58
C	Mean	3.4	3.4	3.2	3.2	3.5	3.5
	SD	.60	.71	.56	.68	.59	.70
N	Mean	3.0	3.0	2.8*	2.6	3.0	3.1
	SD	.66	.84	.62	.81	.67	.81
O	Mean	3.4	3.6*	3.5	3.6*	3.4	3.6*
	SD	.54	.62	.56	.63	.53	.61

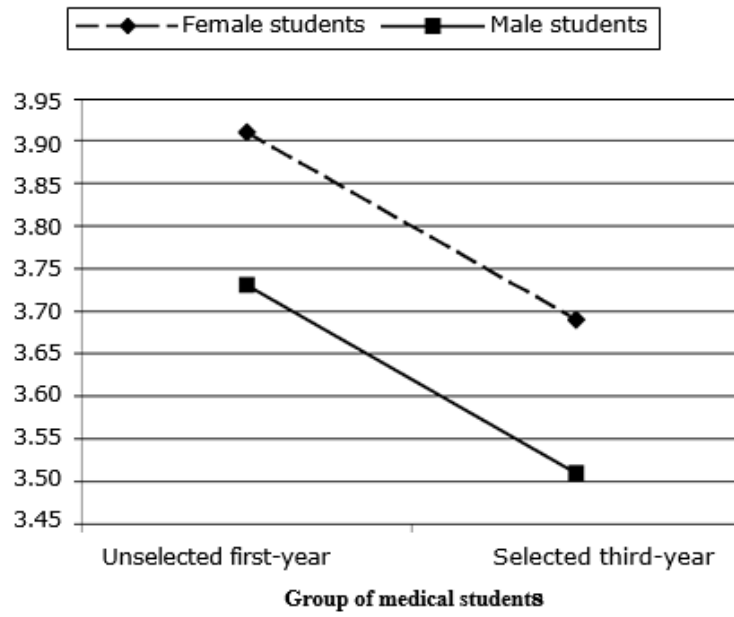
Note: Asterisks refer to the results of t tests comparing the means of the selected students with the unselected students and appear next to the higher of the two means. (* $p < 0.05$; ** $p < 0.01$)

FIGURE 1: Mean of Selected Medical Students (n=403) Compared with Unselected (n= 1332) Students. E (Extraversion, Energy, Enthusiasm), A (Agreeableness, Altruism, Affection), C (Conscientiousness, Constraint, Control of impulse), N (Neuroticism, Negative affectivity, Nervousness), and O (Openness, Originality, Open-mindedness).



Note: Asterisks refer to the results of t tests comparing the means of the selected students with the unselected students and appear next to the higher of the two means. (*p<0.05)

**FIGURE 2: Replication of A (Agreeableness, Altruism, Affection)
Effect in Male and Female Medical Students**



**FIGURE 3: Replication of O (Openness, Originality, Open-mindedness)
Effect in Male and Female Medical Students**

