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Citation

Sier, V. Q., Schmitz, R. F., Putter, H., Schepers, A., & Vorst, J. R. V. (2022). The big five: studying the surgical personality. *Surgery*, 172(5), 1358-1363.
doi:10.1016/j.surg.2022.08.003

Version: Publisher's Version

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Downloaded from: <https://hdl.handle.net/1887/3566727>

Note: To cite this publication please use the final published version (if applicable).



The big five: Studying the surgical personality

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ARTICLE INFO

Article history:

Accepted 5 August 2022

Available online 3 September 2022

ABSTRACT

Background: The challenging nature of performing surgery on a personal and professional level demands specific characteristics. Personality traits play an important role in the nature and behavior of humans, which are studied using the five-factor model. Therefore, we investigated the personality of 3 surgical generations.

Methods: Three distinct surgical populations were approached. The Dutch Big Five Inventory-2 was sent out online to 126 surgical residents (response: $n = 69$) and 104 surgeons (response: $n = 60$) in a teaching region in the Netherlands. Moreover, medical students interested in surgery were approached via the students' surgical society (response: $n = 54$). To obtain a normative Dutch population sample, the Longitudinal Internet studies for the Social Sciences panel was used, creating groups of the following age categories: 18 to 25 ($n = 84$), 26 to 35 ($n = 101$), 36 to 67 ($n = 432$). One-way analysis of variance with Bonferroni correction was used to assess differences in personality scores.

Results: Individuals interested in surgery (ie, surgically-oriented medical students, surgical residents, and surgeons) generally scored significantly higher on extraversion, conscientiousness, agreeableness, open-mindedness, and lower on negative emotionality compared with the normative population sample. Across the surgical generations, surgical residents scored significantly lower on open-mindedness (3.60) compared with surgeons (3.92) and surgically-oriented medical students (3.82). Surgically-oriented medical students scored significantly higher in negative emotionality (2.44) compared with surgical residents (2.12) and surgeons (2.07).

Conclusion: Being a surgeon demands particular levels of determination and emotional stability. The surgical population shows a distinct personality pattern compared with the normative population, and more modest differences exist between persons in different stages of their surgical career.

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Introduction

The presumed existence of a surgical personality continues to fascinate surgeons and nonsurgeons around the globe. Although stereotypes do certainly not always hold true, a typical surgeon is oftentimes seen as confident and decisive, but also as dominant and less agreeable.^{1,2} To understand the manifestations of the professional surgical identity and its potential implications on performance, it is important to objectively characterize the occurrence

and/or extent of a surgical personality. In other highly demanding fields such as aviation and astronautics, the relevance and value of personality research has already been embraced, as illustrated by the attention for personality profiling in candidate selection and trainees.^{3,4}

Personality encompasses the combination of character traits, patterns, and their expression, which may be quantified via standardized inventories. Most personality inventories are based on the five-factor or 'Big Five' model, identifying 5 distinct domains: (1) openness to experience/open-mindedness; (2) conscientiousness; (3) extraversion; (4) agreeableness; and (5) neuroticism/negative emotionality. An important, readily accessible inventory that is suited to study aforementioned domains is the Big Five Inventory (BFI), as developed by John and Srivastava,⁵ of which its latest iteration (BFI-2) is available in many languages, including Dutch.^{6,7}

Author contributions: Conceptualization—VQS, RFS, AS, JRvdV; Statistical analyses—VQS, HP; Writing—all authors; Critical appraisal/revisions—all authors.

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<https://doi.org/10.1016/j.surg.2022.08.003>

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It is known that certain traits generally seem to be more present than others in different stages of surgical careers (ie, surgically-oriented medical students, surgical residents, surgeons).⁸ However, when focusing on specific countries and/or cultures, it becomes apparent that factors such as medical school selection and hierarchical structures require us to study the surgical personality in a more regional context.^{9,10} In the Netherlands, studies on personality traits in surgically-interested individuals are rare.⁸ In a group of Dutch surgical residents, it was shown that extraversion was inversely correlated with burnout.¹¹ The absence of cross-generational data on personality characteristics in Dutch surgically-interested individuals is unfortunate, as the Netherlands comprises atypical (ie, more loose) hierarchical structures, different from many of its surrounding countries. Moreover, the surgical demographics in the Netherlands are changing, with the percentage of female surgeons having increased from 5% to almost 25% in the last 2 decades, and expected to raise further in the coming years.¹²

To fill the current knowledge gap on the surgical personality in the Netherlands, the aim of this study is to identify the surgical personality across 3 distinct surgical generations by using the Dutch adaptation of the BFI-2.

Methods

Measures

The Dutch BFI-2 is a validated translation of the original 60-item BFI-2.⁷ This inventory uses 60 short phrases that are answered on a Likert scale (1–5; strongly disagree–strongly agree), designed to determine the respondent's score on the Big Five personality dimensions. For the calculation of these scores, a readily available SPSS (SPSS Inc, Cary, NC) syntax was used.¹³

Respondents

Surgically-oriented medical students were approached via the newsletter of the surgical society for medical students, resulting in 54 responses. Moreover, 126 surgical residents and 104 surgeons from 1 of the 8 teaching regions in the Netherlands (hospitals in The Hague, Leiden, Leiderdorp, and Gouda) were approached by e-mail, with a response rate of 54.8% and 57.7%, respectively.

Ethical statement

This study was conducted in compliance with the Dutch ethical and privacy regulations. The scientific committee of the department of Surgery of the Leiden University Medical Center gave its approval before sending out the questionnaire to intended

respondents. Moreover, the regional Medical Ethics Assessment Committee decided that this study is not subject to the Medical Research Involving Human Subjects Act.

Longitudinal Internet studies for the Social Sciences database

In addition to our data on surgically-interested individuals, a normative population personality dataset was acquired from the Longitudinal Internet studies for the Social Sciences (LISS) panel.¹⁴ The LISS panel is a representative sample of Dutch individuals who participate in monthly internet surveys. The panel is based on a true probability sample of households drawn from the population register. Households that could not otherwise participate are provided with a computer and internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains (eg, health, work, education, income, housing, time use, political views, values, and personality).

For our study, the BFI-2 LISS dataset, as originally requested by Denissen et al⁷ (<https://osf.io/nwtx7/>), was used and adopted as a normative population sample. This dataset consisted of 824 respondents. Of these respondents, the following age categories were identified and included for the current study: (1) 18 to 25 ($n = 84$); (2) 26 to 35 ($n = 101$); (3) 36 to 67 ($n = 432$).

Statistical analysis

One-way analysis of variance was used to assess differences in personality scores between surgically-oriented medical students, surgical residents, and surgeons. For the assessment of differences between the surgical population and normative population samples, one-way analysis of covariance (ANCOVA) was used with gender as covariate. R version 4.1.2. (R Foundation for Statistical Computing, Vienna, Austria), GraphPad Prism 8 (GraphPad Software Inc, La Jolla, CA), and Statistical Package for the Social Sciences (SPSS, version 25; IBM SPSS Inc., Armonk, NY) software were used for statistical analyses and data visualization. A Bonferroni correction for multiple testing was applied in all tests.

Results

Respondents

The total number of respondents was 183, consisting of 54 surgically-oriented medical students, 69 surgical residents, and 60 surgeons with a mean age of 23, 30, and 49 years, respectively (Table 1). The medical student group consisted of 18 males (33.3%), 35 females (64.8%), and 1 individual identifying as nonbinary (1.9%). In the surgical resident and surgeon groups, respectively, 32 (46.4%) and 46 (76.7%) individuals identified as male and none

Table 1
Summary descriptive statistics surgical and normative population

	Surgically-oriented medical students ($n = 54$)	Surgical residents ($n = 69$)	Surgeons ($n = 60$)	Normative population 18–25 y ($n = 84$)	Normative population 26–35 y ($n = 101$)	Normative population 36–67 y ($n = 432$)
Invited individuals, response rate, n (%)	n.a., newsletter	126 (54.8)	104 (57.7%)	LISS panel		
Age, mean, y (SD)	23.4 (2.7)	30.3 (3.1)	49.0 (8.0)	21.45 (2.320)	30.55 (2.685)	52.07 (9.172)
Gender identification, n (% of total)						
Male	18 (33.3)	32 (46.4)	46 (76.7)	41 (48.8)	44 (43.6)	225 (52.1)
Female	35 (64.8)	37 (53.6)	14 (23.3)	43 (51.2)	57 (56.4)	207 (47.9)
Nonbinary	1 (1.9)	0	0	0	0	0
Years of experience, mean, y (SD)	-	-	13.9 (8.305)	-	-	-

identified as nonbinary or other. The mean number of years of experience as a surgeon was 13.9 years. In the normative population sample, 3 age groups were categorized, of which respectively: 18 to 25 (mean age: 21, $n = 84$), 26 to 35 (mean age: 31, $n = 101$), and 36 to 67 (mean age: 52, $n = 432$). In all age groups of the normative population sample, the male to female ratio was approximately 1:1 (Table 1).

Personality traits of Dutch surgically-oriented medical students, surgical residents, and surgeons differ from Dutch normative population samples across all personality domains

To determine the presence of a distinct surgical personality compared with the normative population, BFI-2 personality scores of surgically-interested individuals (ie, surgically-oriented medical students, surgical residents, and surgeons) were compared to those of a Dutch normative population sample (LISS panel), matched per age category (ie, 18–25, 26–35, and 36–67 years old) and corrected for gender (Table 1, Figure 1). Regarding open-mindedness, it became apparent that both surgically-oriented medical students and surgeons scored significantly higher compared with their corresponding normative samples, whereas no differences were observed in the surgical residents (Figures 1 and 2, A; $P < .01$, $P < .0001$).

Considering conscientiousness and extraversion, surgically-interested individuals scored significantly higher on these domains for every age category in comparison to the normative scores (Figures 1 and 2, B and C; $P < .0001$, $P < .0001$, $P < .0001$, $P < .0001$, $P < .0001$, $P < .0001$). Moreover, agreeableness scores between surgically-interested individuals and the normative sample were larger in the former in all 3 age categories (Figure 1 and 2, D; $P < .001$, $P < .01$, $P = .049$). Concerning negative emotionality, significant lower scores were observed in the surgical residents and surgeons compared with their normative sample, whereas no differences were observed in surgically-oriented medical students (Figures 1 and 2, E; $P < .0001$, $P < .0001$).

Personality traits of surgically-oriented medical students, surgical residents, and surgeons

To identify intergenerational differences in personality profiles of surgically-interested individuals in the Netherlands, a

comparison was made between the Big Five domain scores of surgically-oriented medical students, surgical residents, and surgeons.

With regard to open-mindedness, surgical residents scored significantly lower (3.60) in compared with surgically-oriented medical students (3.82) and surgeons (3.92) (Figure 3, A; Supplementary Table S1; $P = .029$, $P = .0003$). The mean conscientiousness, extraversion, and agreeableness scores did not differ significantly between the 3 groups (Figures 3, B, C, and D). However, surgically-oriented medical students scored significantly higher on negative emotionality (2.44) compared with surgical residents (2.12) and surgeons (2.07) (Figure 3, E, Supplementary Table S1; $P = .007$, $P = .002$).

Discussion

In this study, the personality domain scores of Dutch surgically-interested individuals (ie, surgically-oriented medical students, surgical residents, and surgeons) were identified, compared, and related to the personality profile of a normative population sample. Using age-matched groups, it was shown that surgically-interested individuals generally scored higher on extraversion, conscientiousness, agreeableness, open-mindedness and lower on negative emotionality as related to the general public. Comparing personality scores across the surgical generations, it became apparent that surgical residents scored significantly lower on open-mindedness compared with surgeons and surgically-oriented medical students. Moreover, the latter group showed significantly higher scores in negative emotionality compared with surgical residents and surgeons.

With multiple studies identifying distinct personality traits in surgeons relative to both normative population data and nonsurgical specialists,^{15–20} the question arises by which factors and to what extent a ‘surgical personality’ is shaped. Because evidence suggests an interplay between selection methods for medical school,^{9,10} professional culture,²¹ and personality characteristics, the relatively informal Dutch hospital environment is interesting in this context. Moreover, the personality traits of surgical populations have primarily been conducted in Anglo-Saxon countries, with less attention for the north of Europe, especially in an intergenerational setting.⁸ Our data supported the notion that medical students with an interest in surgical specialties have similar

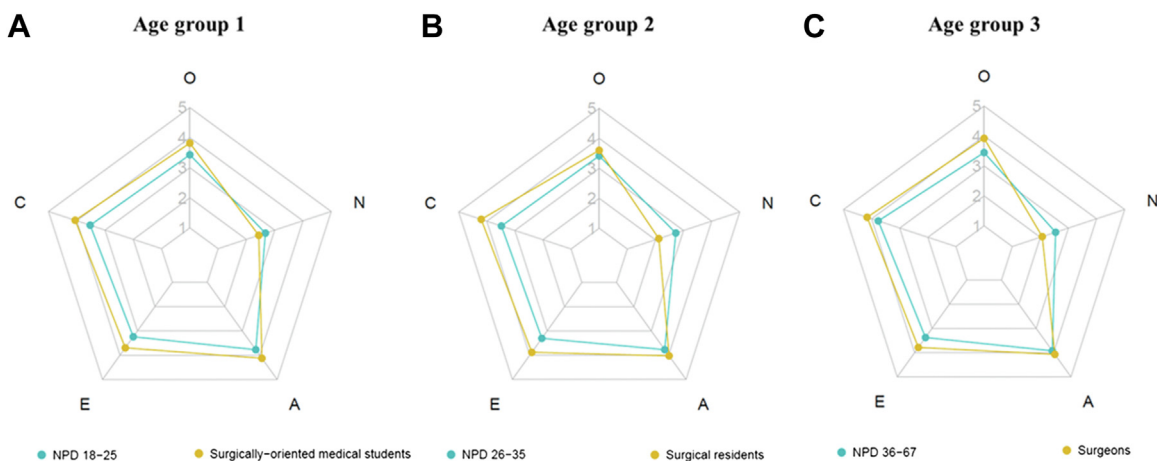


Figure 1. Average personality domain scores of surgically-oriented medical students, surgical residents, and surgeons, plotted against age-matched normative population samples. Average Big Five domain scores were calculated per age group (A, B C) and visualized in a radar plot for an age-matched normative population sample (blue) and surgically-interested individuals (yellow). Age group 1: 18- to 25-years-old/medical students; Age group 2: 26- to 35-years-old/residents; Age group 3: 36- to 67-years-old/surgeons. Normative population data: Longitudinal Internet studies for the Social Sciences panel.

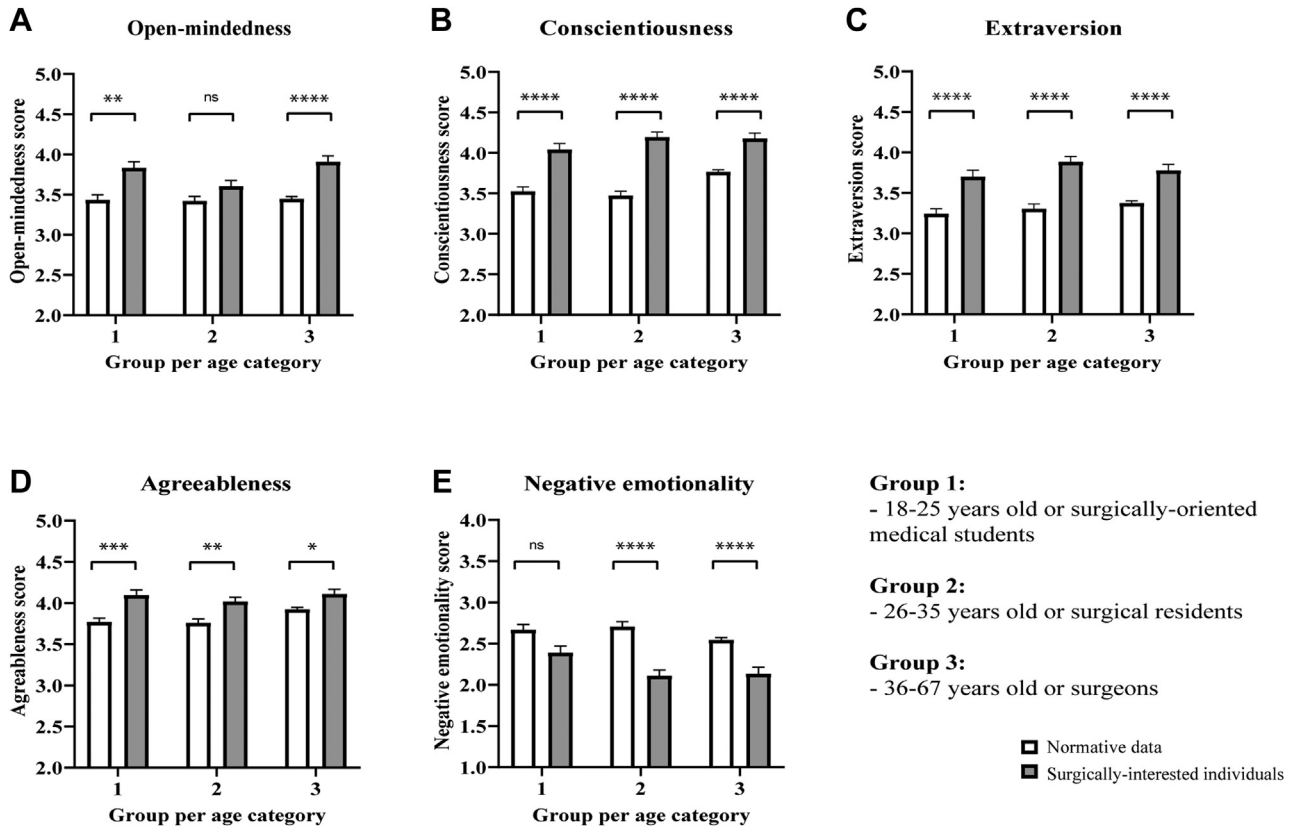


Figure 2. Average personality domain scores of surgically-oriented medical students, surgical residents, and surgeons, compared to age-matched normative population samples. The average domain scores (Mean, SEM), consisting of (A) Open-mindedness, (B) Conscientiousness, (C) Extraversion, (D) Agreeableness, and (E) Negative emotionality, were split per career phase of the surgically-interested individuals and compared with corresponding age groups from a normative population sample (Longitudinal Internet studies for the Social Sciences panel). Statistics: One-way analysis of covariance (covariate = gender), corrected for multiple testing (Bonferroni); * $P < .05$, ** $P < .01$, *** $P < .001$, **** $P < .0001$.

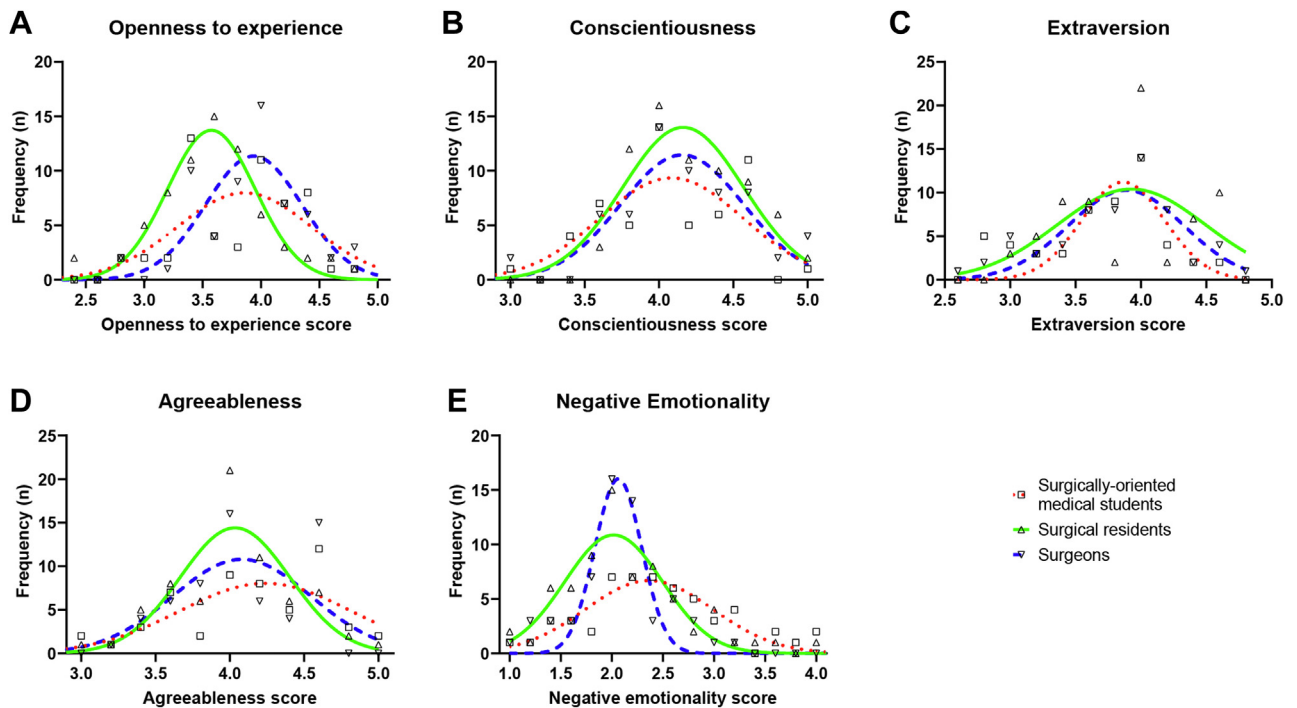


Figure 3. Personality domain frequency plots of Dutch surgically-oriented medical students, surgical residents, and surgeons. Frequency plots of the Big Five personality domain scores of surgically-interested individuals. (A) Open-mindedness, (B) Conscientiousness, (C) Extraversion, (D) Agreeableness, and (E) Negative emotionality, were plotted for surgically-oriented medical students, surgical residents, and surgeons.

personality traits to surgical residents and surgeons, although several key differences between these groups have been observed. Similar findings have been explained by complex models, attributing personality development of young adults to environmental, innate, and generational factors.²² In terms of social processes, the corresponive principle, which represents the reinforcement of traits that originally drew an individual to certain experiences throughout life, has been suggested as a notable driver of changes in personality.²³ Nevertheless, it is well described that personality traits remain relatively stable from early in adulthood onwards.^{24,25} To further explain differences in personality of the surgical population, such as the identified lower score on open-mindedness in the surgical resident cohort, qualitative research is required to describe (surgical) intergenerational experiences in professional culture and social values.

In this context, it is important to consider the influence of shifting surgical demographics,^{12,26} modernization of residency programs, and increased attention for work-life balance on regional surgical cultures and their ensuing implications for residency matching. In the current study, the average personality domain scores of 3 distinct age groups were compared, without correcting for apparent differences in male-to-female ratios, with the purpose of addressing our results in a generation-specific manner. Interestingly, in studies where personality characteristics of male and female surgeons have been compared, differences seem to exist but the nature and extent of these vary.^{17,19} This inconstancy might be caused by socio-economic factors as well as institutional and academic selection methods, which are known to play a role in medical school admission routes and might also influence later career stages.^{27,28}

Implementation of personality testing in resident/surgeon-to-team matching has been a point of debate throughout literature, especially due to the variety and context dependency of team-related and individual responsibilities and tasks in surgery. One of the key points to consider in this discussion, besides the (curvi) linearity of trait and job performance correlations,²⁹ is (diversity in) team composition. One can envision that the functioning of surgical teams requires balanced and complementary individuals, who are able to adequately collaborate with anesthesiologists, physician assistants, nurses, and other related professionals to improve the outcome of patient care. Although limited surgical literature is available on this matter, evidence from studies on group performance suggest that especially individual high levels of conscientiousness and agreeableness increase group effectiveness.^{30,31} Interestingly, heterogeneity in extraversion levels of individual group members has been related to team performance.^{32,33} Since surgically-interested individuals generally display similar levels of extraversion, the functioning and effectiveness of surgical teams could be affected via a higher risk of disputes and interpersonal debate. It could be interesting to further explore this phenomenon by allowing different formations of residency groups to make team assignments and measure parameters such as team cohesion, communication, and leadership.³⁴ Competency in other, more individual surgical tasks, such as accurateness in administrative work, decisiveness in context of limited information, and long-term multitasking, could also be influenced by various personality traits. Moreover, being a medical professional has been suggested to demand higher levels of agreeableness compared with other careers such as engineering and legal profession.³⁵ This need has been supported by a study relating patient-preferences to traits such as trustworthiness, respect and compassion,³⁶ although further available evidence regarding inter-surgeon differences in personality and patient-surgeon interactions is limited.³⁷

Considering the aforementioned, personality testing could be considered to become a part of the self-development toolbox for

surgical residents. In this case, not straightforward personality testing, but rather a combined approach with established tools would be advised. With introspection increasingly receiving more attention during surgical training and being suggested as a tool to improve awareness of one's progress and capabilities, personality profile-based self-reflection may serve as an interesting instrument.^{38,39} The combination of personality testing and self-reflection could be effectuated via differences and similarities between the resident's response on self-reflective questions and the personality test's outcomes. Similarly, personality tests may also benefit team building and growing mutual understanding in surgical teams through workshops and exercises. Therefore, in our opinion, it is of paramount importance to further examine the influence and application of personality characteristics on surgical professional development and practice.

Limitations

This study provided, for the first time to our knowledge, a comprehensive overview of personality trait distributions across 3 distinct surgical generations in the Netherlands. With a response rate of >50%, the usage of a recent inventory, and comparisons to a normative population dataset, our results formed a thorough insight in the Dutch surgical personality. Limitations existed in terms of the study's cross-sectional design, allowing for a comparison between generations but impairing the follow-up of individuals over time and resulting in differences in respondent characteristics. Moreover, a nonresponse bias was typically present and inherent to a response rate <100%. Another potential bias could have been introduced via respondent selection in only one surgical residency teaching region. Personality differences could be present between teaching regions in the Netherlands as other potential selection parameters are being used by different regions on a student and resident level.

In conclusion, surgically-oriented medical students, surgical residents, and surgeons show a distinct personality profile in comparison to the general public. Across surgical generations, more minor differences were observed. As surgery continues to progress as a profession, it is important to monitor personality traits and their implications for surgical teams.

Funding/Support

This research did not receive any specific funding from any agencies in the public, commercial, or not-for-profit areas.

Conflict of interest/Disclosure

The authors have no conflicts of interests or disclosures to report.

Acknowledgments

In this paper we make use of data that the Longitudinal Internet studies for the Social Sciences panel administered via CentERdata (Tilburg University, The Netherlands). The Longitudinal Internet studies for the Social Sciences panel data were collected by CentERdata (Tilburg University, The Netherlands) through its Measurement and Experimentation in the Social Sciences' project funded by the Netherlands Organization for Scientific Research, the Netherlands.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [<https://doi.org/10.1016/j.surg.2022.08.003>].

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