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Exploring the surgical personality

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ABSTRACT

Surgery is a demanding field, requiring determination and emotional stability. This review explores the surgical personality, addressing international personality differences between surgical and non-surgical specialties. Across the globe, surgically-interested individuals (i.e., medical students, residents, surgeons) generally scored higher on conscientiousness, open mindedness, and extraversion, and lower on neuroticism compared to non-surgically-interested contemporaries. Extraversion was inversely correlated to burnout in surgical residents and open mindedness to reduced competence in giving feedback. Although additional region- and/or country-specific research is warranted, being or becoming a surgeon appears to correlate to personality traits such as high conscientiousness and low neuroticism.

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Introduction

Personality may be defined as that what characterizes an individual, expressing itself via behaviors, emotions, and thoughts. Personality is both innate and acquired, as twin studies have shown heritability to explain about 50% of variance in character traits.^{1,2} In cohorts that are followed for over 50 years, personality is found to be relatively invariable throughout life,^{3,4} although other studies suggest some influence of decreased memory capacity and forming life events in elderly and children respectively.^{5,6}

A long history exists regarding the identification of character traits that collectively and accurately describe personality types.⁷ Currently, the golden standard taxonomy for personality traits is the five-factor model, popularly known as the ‘big five’ personality traits or by the acronym OCEAN, identifying five large domains of personality: (i) Openness to experience/Open mindedness, (ii) Conscientiousness, (iii) Extraversion, (iv) Agreeableness, (v) Neuroticism/Negative emotionality.

Traditionally, prejudices exist about different medical specialties. For instance, pediatricians may generally be considered as being extraverted and surgeons as competitive. Although these stereotypes certainly do not hold true for

individuals—or whole groups for that matter— dominant personality traits could determine (self)selection in certain specialty groups.

With surgery being regarded as one of the most demanding specialties in terms of working hours and encompassing stresses, personality could be a defining factor for proper functioning and coping with these particular demands.⁸ For example, high conscientiousness and low neuroticism could be argued to be crucial to cope with acute, highly stressful, and demanding situations, and invaluable for any surgeon. In the context of changing demographics of medical students and surgeons as seen in universities and the shifting attention for improved work-life-balance and working conditions, one can imagine that the average surgical personality is potentially changing.

Therefore, in this review, we aim to describe the current state of ‘the surgical personality’ across the globe, after which these results will be related to the authors’ view on the Dutch context of intergenerational, societal, and professional preferences in surgery. Moreover, the matching and well-being of surgeons will be placed in the context of personality profiles, with the purpose of giving a complete overview of current literature.

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Personality characterization

Big five tests

To assess and measure personality profiles, multiple inventories have been developed and validated in various settings. Currently, there exist two dominant families of personality inventories: 'Big Five Inventory (BFI)' and 'NEO' questionnaires. Both offer different versions, which may feature updated norms, revised questions, and a varying number of items. Importantly, the most commonly used versions, the BFI [44 items], BFI-2 [60 items], BFI-10 [10 items], NEO Five-Factor Inventory (3) [NEO-FFI-(3); 60 items], NEO Personality Inventory-3/R [NEO-PI-R, NEO-PI-3; 240 items], generally show high alpha reliabilities ($\geq .7$) and considerable intercorrelations for the original big five domain scales.^{9–12} Although these big five measures are generally convergent, nuances and differences in constructs remain and should be considered.^{11,13} The choice of personality inventory is largely dependent on expected participant response and completion rates, validation of the test in the country and/or culture of target, and availability and/or distribution of the test. Regarding availability, the International Personality Item Pool (IPIP) has been created as a publicly accessible domain of items that measure personality traits. Validated combinations of these items are used in the literature to assess the big five domains of personality.

The surgical personality

The surgical personality across the globe

Internationally, a multitude of comparisons have been made between surgically-interested individuals, other medical specialists, or normal population samples. For the purpose of providing a manageable overview, these studies will be discussed in a concise manner. A detailed, more comprehensive description of all articles is available in the supplementals ([Appendices A and B](#)).

Surgical personality and the normal population

The existence and/or identification of a surgical personality depends on its relative difference in comparison to the normal population. In this context, multiple Anglo-Saxon studies compared the big five traits of surgical residents and surgeons to normative population data ([Table 1](#)). In an American and English study, surgeons and surgical residents respectively scored lower on openness to experience and neuroticism but higher on conscientiousness and extraversion in comparison to normative data.^{14,15} Remarkably, a second study from the UK showed incongruent results, with higher openness, agreeableness, and neuroticism in surgeons compared to the normal population.¹⁶ Furthermore, surgeons showed a trend toward scoring higher on neuroticism as they aged, while this age-related effect is known to be reversed in the normal population. A possible explanation for this phenomenon could be the high workload and relatively higher and prolonged exposure to morbidity and mortality in patients, and emotional situations in surgical practice.

Regional differences

The currently largest available study on the surgical personality was performed in European and Canadian surgical and non-surgical medical students, residents, and specialists ([Table 1](#)).¹⁷ It was found that, by using the Ten-Item Personality Measure (TIPI), surgically-oriented individuals scored generally significantly higher on openness to experience, extraversion and lower on neuroticism as compared to their non-surgical peers. While supporting the evidence for differences in neuroticism, multiple Scandinavian studies primarily identified distinctions in other personality traits between surgical and non-surgical specialists, with the former demonstrating lower agreeableness and higher conscientiousness.^{18,19} Interestingly, both an American and Jordanian study showed that both conscientiousness and extraversion was higher in a population of surgical as compared to non-surgical interested individuals, while only the latter study demonstrated an additional lower score in neuroticism.^{15,20} Moreover, the same American study also identified a higher score in agreeableness in the surgical population. Together, these results suggest that variances in personality profiles between surgical and non-surgical specialists may entail a cultural origin, either on a more societal or institutional level.

Generational differences

Comparing personality profiles across surgical generations constitutes an attractive approach to identify (surgical) sociocultural changes over time, in addition to identifying crucial traits to succeed in the field. In literature, limited evidence exist regarding this matter. Two UK-based studies identified dissimilar differences between surgical residents and surgically-oriented medical students, with results respectively showing a primarily higher score on conscientiousness or a lower score on neuroticism with regard to the surgical residents ([Table 1](#)).^{14,21}

Matching and well-being of surgeons

The pursuit of matching individuals that are best suited to the demanding, confronting, and precise nature of surgery is of great importance. Similar to the interest of other challenging career fields, such as aviation or space travel, in researching character traits,^{22,23} attention for the association between personality and different skills has been noticeable in the surgical literature.

An obvious application of personality testing in surgery would entail resident selection. A notable study from the University of Texas Medical Branch addressed this topic by retrospectively reviewing the performance of 34 surgical residents in relation to conventional selection measures and big five domain scores (TIPI).²⁴ The residents were categorized in either a low ($n = 12$) or non-low ($n = 22$) performance group, based on residency performance (residency milestones, attrition status, remediation). The researchers found that the non-low performing group scored on average significantly higher on extraversion, conscientiousness, and emotional stability as compared to their low performing peers. Interestingly, neither the conventional selection metrics nor the final ranking positions were able to discern between non-low and low performers. These results coincide well with a study from 2010, in

Table 1 – Overview of studies on personality traits in surgery.

Study	Population	Country	Test		Results	
International studies						
Stienen et al., 2018 ¹⁷	1350 medical students	Canada	TIPI	O	S > NSS	
	1453 residents	Belgium France		C	≡	
	2345 specialists	Austria Germany		E	S > NSS	
	- 465 surgeons (S)	Switzerland		A	≡	
	- 825 non-surgical specialists (NSS)			N	S < NSS	
Preece et al., 2016 ²¹	53 students (4th or 5th year) (St)	UK	Five factor marker (IPIP)	O	≡	
	37 surgical residents (SR)			C	≡	
				E	≡	
				A	≡	
				N	SR < St	
Hoffman et al., 2010 ¹⁴	39 students (1st year, MS1)	UK	BFI	O	SR < MS1, NPD	
	67 students (4th year, MS4)			C	SR > all	
				E	SR > MS1, NPD	
				A	≡	
				N	SR < NPD	
	119 non-surgical residents (NSR)					
	- 22 pediatric residents (PR)					
39 surgical residents (SR)						
Whitaker, 2018 ¹⁶	599 surgeons (S)	UK	Five Factor Personality Assessment (IPIP)	O	S > NPD	
	Normative population data (NPD)			C	S > NPD	
				E	≡	
				A	S > NPD	
				N	S > NPD	
Drosdeck et al., 2015 ¹⁵	150 surgeons (S)	USA	BFI	O	S < NPD	
	586 non-surgical specialists (NSS)			C	S > NSS, NPD	
				E	S > NSS, NPD	
				A	S > NSS	
				Normative population data (NPD)	N	S < NPD
Bexelius et al., 2016 ¹⁸	Specialty groups, incl. residents, specialists	Sweden	BFI	O	≡	
	- 67 primary care (PC)			C	S > PSY, HS	
				E	≡	
				A	S < PC, IM, HS	
				N	≡	
				- 71 internal medicine (IM)		
- 84 surgery (S)						
- 21 psychiatry (PSY)						
- 19 hospital service (HS)						
Mullola et al., 2018 ¹⁹	2837 physicians, incl.	Finland	s-BFI	O	≡	
	- 80 surgeons (S)			C	≡	
	- 120 anesthesiologists (AN)			E	≡	
	- 231 psychiatrists (PSY)			A	S < other specialists	
	- 155 OB/GYN			N	S < other specialists	
	270 'other' internists					
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Table 1 – (continued)

Study	Population	Country	Test	Results
Nawaiseh et al., 2020 ²⁰	5th & 6th year medical students Early postgraduate physicians - 502 surgically-oriented (SO) 512 medically-oriented (MO)	Jordan	BFI-2	O C E A N ≡ SO > MO SO > MO ≡ SO < MO
Dutch studies Prins et al., 2019 ³⁵	Dutch residents - 309 surgery - 654 medicine 268 supportive	The Netherlands	BFI	(i) Burnout associated with neuroticism (ii) Extraversion only inversely correlated with burnout in surgical residents
Scheepers et al., 2014 ³⁷	515 surgical and non-surgical attending physicians	The Netherlands	Adapted BFI-10 (BFI-11)	Surgical attending physicians scoring higher on openness were evaluated as less capable at giving feedback

which 412 trauma surgeons were asked to fill out a survey containing the TIPI and the Minnesota Satisfaction Questionnaire Short Form about job satisfaction.²⁵ This study demonstrated that more extraverted and emotionally stable trauma surgeons were likely to be more often satisfied with their job.

First and foremost, being a team player is considered as invaluable for any surgical specialist. In addition, proficient technical skills and manual dexterity are also considered to be important. Therefore, considering the utilization of big five domain scores in the context of surgical outcomes, and especially in team composition, might be of value.^{26,27} Within the University of Toronto, 15 urology residents (10 junior, 5 senior) filled in the BFI, and were subjected to technical and non-technical skill testing during a simulation of a laparoscopic nephrectomy, including a vasovagal response on a pneumoperitoneum and damage to the inferior caval vein.²⁸ No significant difference was found between the personality dimensions of junior and senior residents, i.e., respectively openness to experience (3.4, 3.6), conscientiousness (4.1, 4.4), extraversion (3.8, 3.4), agreeableness (4.0, 4.3), and

neuroticism (2.6, 3.0). Although the sample size of this study could skew its results, higher scores in conscientiousness correlated with superior technical skills and successfully completing the aforementioned simulation. Contrastingly, in a Swiss group of 54 residents with basic laparoscopic experience, 29 with intermediate proficiency and 12 medical students, none of the big five domains (NEO-FFI) were associated with technical performance in a VR-based surgical simulator.²⁹ The authors suggested that, while personality was not associated with technical aptitude, individual traits might play an important role in team performance. Regarding the latter, 24 orthopedic surgeons from the Massachusetts General Hospital in Boston received anonymous 360° feedback from multiple clinical and non-clinical colleagues.³⁰ After measuring each physician's personality profile using an adapted Delphi Consensus Technique, it became apparent that higher emotional stability was significantly associated with overall patient satisfaction, patient recommendation of the physician to other patients, and teamwork index score (effective surgical team, as assessed by team members).

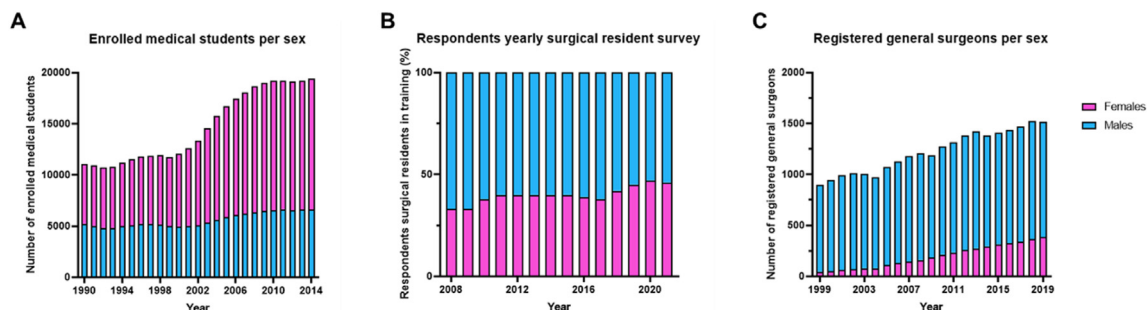


Fig. 1 – Number of enrolled medical students and registered general surgeons by sex. In both medical students (A), surgical residents in training (B) and general surgeons (C), a steady increase in the proportion of females can be observed over the past decades. Graphs (A) and (C) based on freely accessible data, available from Netherlands Statistics (CBS).^{31,32} The data used for graph (B) are courtesy of the Dutch Surgical Residents Society (VAGH) and based on their annual survey.³³

Surgical identity in the Netherlands

Although globalization and multiculturalism have changed many organizational cultures, the medical profession has always seemed to lag behind most other occupations by relying more on traditional hierarchical structures. Instead of philosophically discussing the origin and morality of this phenomenon, we would like to describe the implications of personality characteristics for the medico-surgical identity in the Netherlands, a country which is known for its divergent, almost nonhierarchical (academic) social structures as compared to its neighboring countries.

The influence of sex disparities

To comprehend general trends of a profession's predominant personality types, it is imperative to zoom in on its developments and members during different generations. For this purpose, demographical datasets of Dutch medical students and general surgeons were obtained via Statistics Netherlands (CBS), a Dutch government institution that gathers and publishes statistical information. Upon analyzing the data, it became apparent that a 2-fold increase in female medical students can be observed from 1990 to 2014, relative to the total number of medical students in the Netherlands (Fig. 1A).³¹ Accordingly, this resulted in a relative decrease in the proportion of male medical students from 47% in 1990 to 34% in 2014. In a similar timeframe, the proportion of registered female general surgeons has drastically increased, from 5% in 1999 to 25% in 2019 (Fig. 1C).³² Less data are available on surgical residents.

Nevertheless, the respondents of the annual survey amongst surgical residents demonstrated an equal distribution in sex in recent years (Fig. 1B).³³ Together, the increase in the percentage of female medical students, more attention for work-life balance, and changing societal norms might explain the relative growth in the number of registered female general surgeons.

Interpretation. International studies may provide valuable information to answer the question whether the perceived stereotype of a low neurotic and agreeable but conscientious surgeon is essentially a required personality or rather a function of a high proportion of males in surgery. Australian researchers asked second year medical students (267 males, 304 females, 2 unknown) to fill out the NEO-FFI, as well as a set of general demographic and specialty choice questions.³⁴ Males were significantly more interested in surgery than females, while also indicating a significant higher interest in prestige and financial rewards in the context of specialty choice. With regard to personality scores, females scored significantly higher on neuroticism, openness, and agreeableness. Congruent with the latter trait score, females rated the ability to help people significantly higher in their road to choosing a specialty. When comparing individuals from both groups with an interest in surgery, it appeared that females scored higher on their interest in the ability to help people, neuroticism, and agreeableness and gave less weight to prestige and financial rewards. Notably, females interested in surgery demonstrated lower agreeableness and more attention for prestige and less for lifestyle than their female

colleagues not interested in surgery. Altogether, the popular trait characteristics ascribed to surgeons might not necessarily apply to women within surgery. However, the acceptance of more diverse personality profiles might (partially) explain the growing number of female surgeons.

Surgical residency

Regarding surgical residency, a recent study researched the association between personality traits (BFI) and burnout in Dutch surgical ($n = 309$) and non-surgical residents (medical, $n = 654$; supportive, $n = 268$) (Table 1).³⁵ After adjusting for multiple factors, including overtime, learning environment, and gender, the researchers found that neuroticism was associated with burnout in residents of surgical (odds ratio: 4.37) as well as medical (odds ratio: 1.99) and supportive (odds ratio: 6.19) fields of medicine. Remarkably, extraversion was found to be inversely associated with burnout in residents of surgical disciplines but not in individuals of other medical fields. The authors mentioned in their discussion that surgical residents worked significantly more overtime than residents from supportive medical fields, suggesting that extraverted surgical trainees might be more content with their working milieu.

While surgical training in the Netherlands has evolved from the classic master-trainee dogma into more structural, regionally organized residency programs, supervisor-trainee evaluations remain the cornerstone of the latter's development into a competent surgeon.³⁶ Moreover, the most recent development in surgical training is competency-based learning, in which surgical trainees are expected to demonstrate the knowledge and skills that they should be capable of at certain stages of their training. In this context, 515 surgical and non-surgical attending physicians and 560 residents from 18 different medical centers in the Netherlands respectively filled out an evaluation for teaching performance and an adapted version of the BFI-10 (BFI-11) (Table 1).³⁷ More specifically, the System for Evaluation of Teaching Qualities (SETQ) was used by residents to assess the attending physicians' teaching performance. The results showed that extraverted attending physicians were generally gauged to be more competent in overall teaching performance, while surgical attending physicians who scored higher on openness were evaluated as less proficient in giving feedback. In a subsequent study employing the same ongoing multicenter survey, the authors studied the association between work engagement, teaching performance, and personality profiles.³⁸ Using the Utrecht Work Engagement Scale (UWES-9), they demonstrated that supervisors with higher work engagement were generally graded as better performing teachers by residents. Moreover, higher work engagement was linked to higher scores in extraversion, agreeableness, and conscientiousness, suggesting that individuals with these traits are more suited to occupy clinical teaching positions.

Discussion

In this review, the surgical personality was studied by means of exploring its nature, applications, and consequences in a global fashion. In the international, non-Dutch studies, it became apparent that, in general, surgically-interested individuals (i.e., medical students, residents, and surgeons)

demonstrated higher levels of conscientiousness, openness and extraversion, and lower levels of neuroticism, as compared to their non-surgically-interested peers. Across generations, current data remain scarce and inconclusive. Regarding surgical residents in the Netherlands, it was found that burnouts were unsurprisingly associated with higher scores on neuroticism and that extraversion correlated inversely with burnout in surgical but not in medical residents. In surgical attending physicians, openness to experience was related to less proficiency in giving feedback.

Although multiple studies have established several dominant traits to be associated with a surgical identity, these results might differ based on country- or region-specific hierarchical and cultural structures. As an example, a competitive pyramidal selection procedure in medical schools has been suggested to result in different personality types of French medical students in comparison to other countries.³⁹ In the Netherlands, shifting medico-social values could influence the perception of what defines an archetypical surgeon in the future, but comprehensive datasets are currently lacking.

Therefore, to truly identify (the existence of) the surgical personality, it would be advised to design regional studies in the near future, while considering significant factors such as demographics and selection processes.

Conclusion

The demanding nature of surgical specialties requires certain levels of willpower and emotional stability, represented by traits such as high conscientiousness and low neuroticism. Besides the necessity of fairly high levels of emotional stability and conscientiousness, there should always be room for a varied range of personality traits, enabling the formation of strong, capable, and diverse surgical teams in the future.

Ethical approval

Not applicable.

Author contribution

Conceptualization, VQS, JRvdV; Writing, all authors; Critical appraisal/revisions: all authors.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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Appendices A & B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.surge.2022.01.008>.

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