

ORIGINAL ARTICLE

Personality in anaesthesiologists, a systematic review of the literature

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BACKGROUND As a central part of their job, anaesthesiologists often have to perform demanding tasks under high-stakes conditions. Yet, some anaesthesiologists seem better able to deal with the demands of the profession than others.

OBJECTIVES This review aims to answer the following questions. What are the necessary or desirable qualities of an anaesthesiologist? Which personality traits or characteristics have been found in anaesthesiologists? How does personality relate to job performance and work stress among anaesthesiologists?

DESIGN Systematic review of studies that examined anaesthesiologists' personality or personality characteristics. We performed our synthesis in terms of the five-factor model of personality.

DATA SOURCES The search was conducted in the PubMed, EMBASE and Web of Science databases. Literature was included until December 2020.

ELIGIBILITY CRITERIA We included qualitative and quantitative studies that examined anaesthesiologists' personality; also, we included studies that focused on

anaesthesiologists' stress, performance or mental health but only if these topics were examined from the perspective of personality.

RESULTS We included 6 qualitative and 25 quantitative articles. Synthesis of the qualitative articles revealed two classes of desirable technical and nontechnical personality characteristics. Synthesis of the quantitative articles suggested that anaesthesiologists do not essentially differ from other medical specialists. Moreover, our synthesis revealed several personality traits that predict good performance, low stress and good mental health among anaesthesiologists: lower Neuroticism, higher Extraversion, higher Openness and higher Conscientiousness.

CONCLUSION Those personality traits that predict performance, stress or mental health in anaesthesiologists, also predict performance, stress or mental health in other high demand/high stakes environments (both medical and non-medical). The ideal anaesthesiologist would be lower on Neuroticism, higher on Extraversion and higher on Conscientiousness.

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KEY POINTS

- There is no evidence for meaningful differences in personality between physicians of different specialties.
- In anaesthesiologists, there are consistent correlations between personality traits on the one hand, and performance, stress and well being on the other.
- Those personality traits that predict performance, stress or mental health in anaesthesiologists, also predict performance, stress or mental health in other (medical and nonmedical) high-demand/high-stakes environments.

Introduction

Personality is defined as the set of psychological traits of a person that are relatively enduring and that influence how that person interacts with his or her environment. In line with this definition, behaviour is assumed to be a function of personality and circumstances.¹ In other words: personality describes tendencies to display certain behaviour, experience certain emotions, or have certain cognitions in given circumstances. As the psychologist Raymond Cattell put it, personality is: ‘that which permits a prediction of what a person will do in a given situation’. The psychology of personality has several applications, e.g. in the domains of individualised education, targeted mental health prevention and personnel selection.

It is a compelling intuition that specific jobs require specific behavioural attributes.² For example, astronauts need to be psychologically resilient and flexible under the most extreme circumstances, while artists need to be creative.^{3,4} Anaesthesiologists, like other physicians, need to be able to stay calm and collected at all times, including when they are confronted with patient-related crisis situations.⁵ If we assume that most anaesthesiologists face similar working circumstances, personality should be a key predictor of anaesthesiologists’ behaviour, and thus, their performance. Moreover, anaesthesiologists’ personality may have an impact on how they cope with intense work-related stress, and thus, predict mental wellbeing during their careers. So, anaesthesiologists need personality characteristics that empower them to adequately handle the high-demand/high-stakes nature of their job and the stress that comes with it.

To the knowledge of the authors, the personality of the anaesthesiologist in relationship to their work and its implications on performance and stress have not yet been systematically reviewed. With this article, we aim to fill that void. First, we discuss qualitative studies to answer the question: what are the necessary or desired qualities

of an anaesthesiologist? Second, we discuss quantitative studies to answer the following questions. Do anaesthesiologists differ in personality from the general population? Do anaesthesiologists differ in personality from other physicians? Does personality predict anaesthesiologists’ performance? Does personality predict anaesthesiologists’ mental health?

Methods

The research questions and the methods were registered in PROSPERO (ID: CRD42020154863).

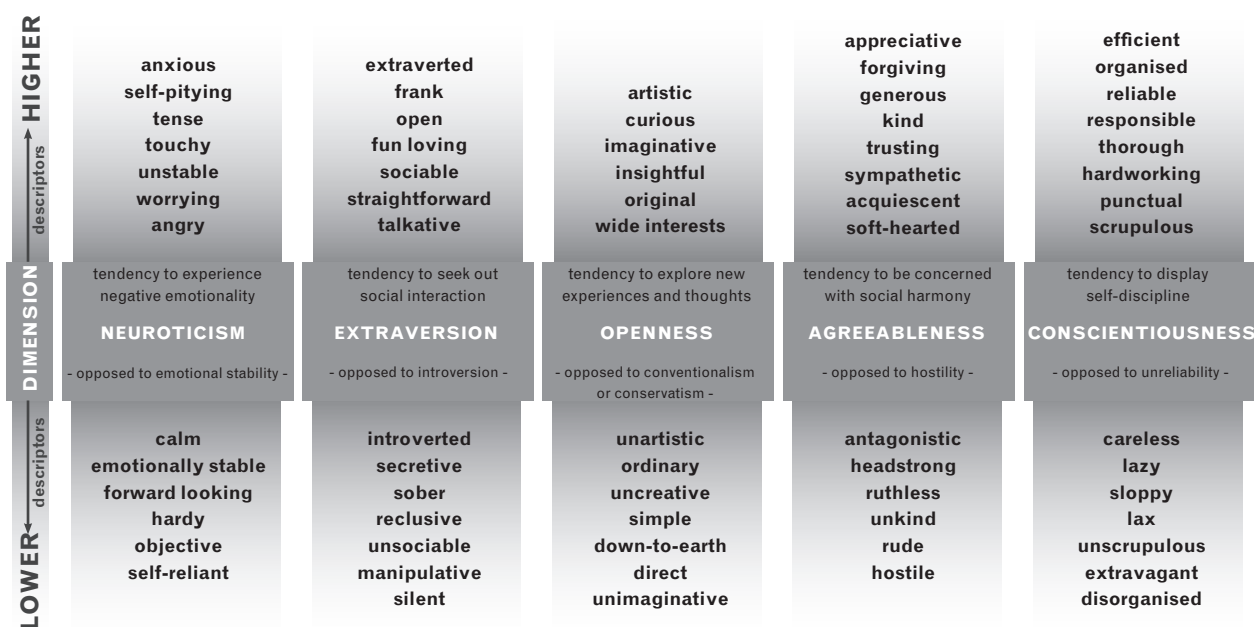
The search was conducted in the PubMed, EMBASE and Web of Science databases. We searched these databases for ‘personality’ in relationship to ‘anaesthesia’. Medical Subject Headings (MESH-terms) and keywords used for our search were: ‘Anesthesiology’[MeSH] OR ‘Anaesthesiology’ OR ‘Anaesthesia’ OR ‘Anaesthetist’ OR ‘Anaesthesiologist’ OR ‘Anesthesiologist’ AND ‘Personality’[MeSH] OR Human characteristics[MeSH] OR ‘Personal characteristics’ OR ‘Stress, Psychological’[-MeSH] OR ‘Stress’ OR ‘distress’ OR ‘Burnout’. The last systematic search was conducted on 31 December 2020. No time limit was set. Languages were limited to Germanic and Roman languages.

Study selection

After removing duplicates, two authors (RvdW and JW) independently analysed titles and abstracts and made inclusion decisions (see below). When in doubt, the full text article was obtained. Consensus was reached through discussion.

We included qualitative articles that reported research on anaesthesiologists’ personal qualities. We included quantitative articles that reported prospective or cross-sectional research on anaesthesiologists’ personality, provided that these studies used well established psychometric instruments, either prospective or cross-sectional.

Exclusion decisions were made in three steps. In the first step, we excluded articles that were not related to anaesthesia as a medical specialty (e.g. studies about dentists and veterinarians). Also, at this step, we excluded papers that researched patients or animals. In the second step, we excluded articles that reported research on nonphysician anaesthesia providers, such as nurse anaesthetists and anaesthesia technicians. In the third step, we excluded articles that focused on stress-related states, such as burnout or fatigue but did not relate these states to personality or individual differences. The remaining articles were obtained in full text, and assessed for eligibility (by RvdW and JW, who worked independently). Also here, consensus was reached through discussion. Comments on other articles, editorials, reviews, conference abstracts and letters to the editor were excluded.

Fig. 1 Dimensions of the Five Factor Model with examples of descriptors

The five dimensions of the Five-Factor Model are mutually exclusive and bipolar (i.e. they cover a high to low continuum). These five traits are widely assumed to be both necessary and sufficient to describe people's personality.

Two authors (RvdW and JW) independently evaluated the included articles accordingly using a data extraction form. For quality-assurance purposes, a third author (EB) reviewed a random sample of 5 articles using the same form. We searched for measures of personality, performance, stress and mental health. We assessed the quality of the articles using an appraisal tool for cross-sectional studies (AXIS), while also considering the guidelines for quality of psychological research.^{6,7} An interrater reliability analysis using a pooled Kappa statistic was performed.⁸

Synthesis of results and summary measures

The findings from qualitative studies were synthesised in a narrative way. Because of the heterogeneity of psychometric instruments used in literature for quantitative studies, it was not possible to pool data and to conduct a formal meta-analysis. Therefore, we related the findings of those instruments to the Five Factor Model of personality (FFM) whenever feasible. Whenever results were mixed, we refrained from drawing a synthesised conclusion. The FFM has become the dominant model of personality in psychological science. The five mutually exclusive, bipolar dimensions (i.e. traits) are: Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness.^{9,10} There is evidence that these FFM traits predict real-world outcomes.¹¹ An explanation of the FFM dimensions with examples of

descriptors is given in Fig. 1. Correlations between other psychometric instruments and the FFM have been studied, the relevant ones for this review are given in Supplemental Digital Content 1, <http://links.lww.com/EJA/A674>.

Results

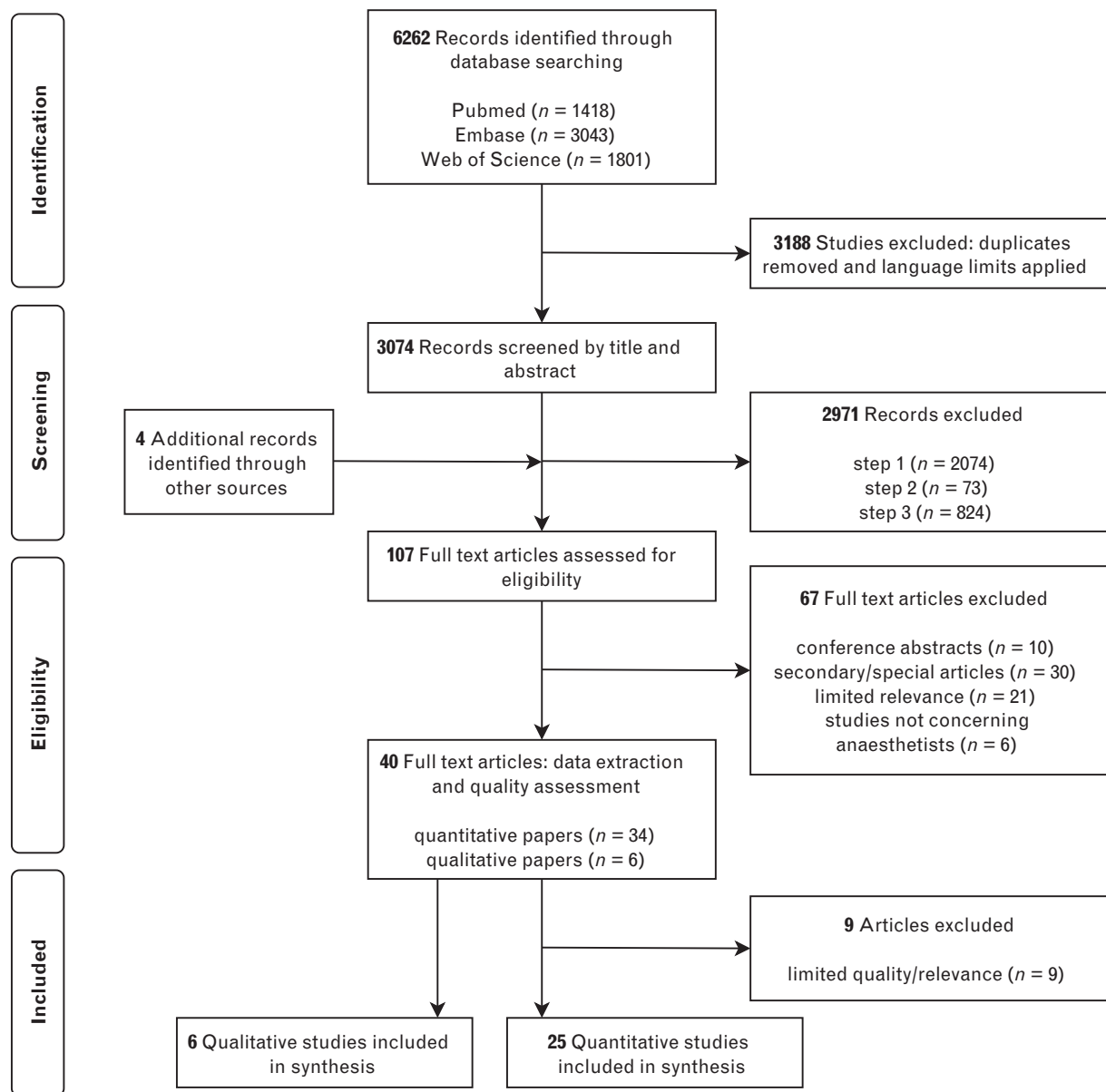
Study selection

The flow of articles is depicted in Fig. 2. After removal of duplicates and articles in nonwestern languages, the search until December 2020 yielded a total of 3074 unique articles. After analysis per title and abstract, 107 articles remained for full text analysis. Following a manual search of the references, four more articles were added. Detailed full text evaluation resulted in 40 articles for data extraction and quality assessment. The interrater reliability was found to be Kappa = 0.65 (95% confidence interval (CI), 0.57–0.72). In total 6 qualitative and 25 quantitative articles remained for inclusion in our systematic review.

Qualitative research (e.g. interview studies)

To answer the question 'what are necessary or desirable personality qualities of an anaesthesiologist', questionnaires and qualitative research methods have been used. Qualitative research is ideally suited as it explores phenomena in the complex interactions between people and their environment.¹² The various qualitative research

Fig. 2 Flow of articles through the study



methods, which often involve in-depth interviews, have been previously discussed in our literature.¹³

Study characteristics

Most participants were consultant anaesthesiologists but residents participated as well. Also anaesthesia nurses (people who regularly observe anaesthesiologists' behaviour) were asked to define excellence in anaesthesiologists. The studies used the (modified) Delphi method, focused interviews or questionnaires as their key methods. The results of the individual studies are presented in Supplemental Digital Content 2, <http://links.lww.com/EJA/A675>.

Synthesis of results

With regard to necessary or desired personality characteristics, we identified two themes. On the one hand, studies highlighted qualities related to cognition and intellectual capabilities; on the other hand, studies highlighted qualities that are related to personality. The ideal anaesthesiologist is capable of performing complex tasks. He or she recognises potential problems in an early stage as he or she has an eye for detail, while at the same time, maintaining a bird's eye perspective. Moreover, the ideal anaesthesiologist is vigilant and practical.^{14–17} Professionally, he or she is self-aware, confident, socially competent but able to accept criticism (from senior and junior staff), and strives for excellence.^{14–16}

Emotionally, he or she is in control, alert and calm, and communicates with clarity, especially in critical situations, and is compassionate and empathic.^{14–19} Having good relationships with patients and being altruistic were sometimes lower ranked than good clinical skills.^{14,15,19} However, in these studies, it is also often recognised that the patient is the centre of the anaesthesia universe.^{16,17} A shift in emphasis is noticeable in the literature: from the focus primarily on clinical skills and intellectual capabilities, to the recognition that superior clinical skills and knowledge may be fundamental but that personal qualities are essential.¹⁵

Quantitative research (psychometric studies)

To answer the question, which personality traits have been found in anaesthesiologists, one should keep in mind that several methods can be used to assess personality. These methods include (experimental) behavioural observations or diagnostic interviews by psychologists. However, for practical or statistical reasons, self-report questionnaires are often used. These questionnaires have been validated by assessing their convergence with other measurements of personality, such as reports by others.^{20,21}

Study characteristics

Sample sizes ranged from 22 to 655 individuals: consultant and/or resident anaesthesiologists. To assess personality, several instruments were used (Supplemental Digital Content 1, <http://links.lww.com/EJA/A674>). The results of individual studies are given in Supplemental Digital Content 3, <http://links.lww.com/EJA/A676>.

Syntheses of results

In 1980, Reeve was the first to examine personality in anaesthesiologists, or any medical specialty for that matter.²² After that, several initiatives followed. Anaesthesiologists' personality has been compared with the general population and with other specialties, under the assumption that, if differences in personality were to be established, this could aid selection procedures. Later, the focus of studies shifted to the relationship of personality with performance or mental health. We categorised the studies by these aims. We interpreted studies in terms of the FFM, not in terms of the original instruments (supplemental digital content 1; for a brief explanation of these instruments, supplemental digital content 1). However, for the sake of transparency, we do report the dimensions or facets of the original instruments; these are *italicised* in the text. The corresponding FFM-traits are Capitalised.

Do anaesthesiologists differ in personality from the general population?

Although some studies found that anaesthesiologists were higher on Neuroticism because they were more *Apprehensive* and *Tense*,^{22,23} most studies found that anaesthesiologists were lower on Neuroticism because they were less *Apprehensive*, more *Emotionally stable* and more

Confident,^{23–25} or more *Self-directed*.²⁶ Anaesthesiologists were lower on Extraversion because they were more *Serious*, *Reserved*, *Shy* or *Self-sufficient*^{22–24} or less *Reward Dependent*.²⁶ Two studies found that anaesthesiologists were higher in Openness because they were less *Traditional*, more *Sensitive* and more *Tolerant*.^{23,24} It was also found that anaesthesiologists were lower on Agreeableness as they were more *Dominant*^{22,23}; however, some suggested that anaesthesiologists should be higher on Agreeableness as they were more *Cooperative*.²⁶ Most studies found that anaesthesiologists were higher on Conscientiousness as they were more *Serious*, *Practical* and *Perfectionistic*^{22,23,25} or less *Novelty seeking*.²⁶ One study found that anaesthesiologists were lower on *Persistence*, which might point to lower Conscientiousness.²⁶ Others found no evidence for differences with the general population; however, these studies only reported rather small sample sizes.^{27,28}

In summary, taking into account sometimes contradictory findings, compared with the general population, anaesthesiologists were found to be lower in Neuroticism, lower in Extraversion, higher in Openness, higher in Conscientiousness and not markedly different in Agreeableness.

Do anaesthesiologists differ in personality from other physicians?

Studies have compared anaesthesiologists' personality with general physicians, family practitioners, psychiatrists and surgeons.^{22,24,26,29–31} Compared with general physicians or family practitioners, some differences were found: for example, anaesthesiologists were lower on Agreeableness as they were more *Dominant*²² and less *Cooperative*.²⁶ However, others found differences were not consistent between those studies. When compared with psychiatrists and surgeons, articles concluded that there were more similarities than differences (i.e. even when between-group differences were statistically significant, and they often were not, the magnitude of these differences was usually small).^{24,29–31}

In summary, although some differences in general personality between anaesthesiologists and other medical specialists have been found, these were not consistent between studies. Furthermore, most studies concluded they identified similarities rather than differences in personality.

Does personality predict anaesthesiologists' performance?

When Reeve first studied anaesthesiologists' personality, a subgroup was peer-assessed on performance. In an exploratory fashion it was found that: Anaesthesiologists who performed better were lower on Neuroticism as they were more *Emotionally Stable*, less *Apprehensive* and less *Tense*.²² In a later study, Reeve found significant differences between accepted and nonaccepted applicants: Accepted applicants were lower on Neuroticism as they

were more *Self-Confident*, less *Anxious*, more *Emotionally Stable* and less *Tense*; and accepted applicants were lower on Agreeableness as they were more *Dominant*. When the accepted applicants were later assessed for performance, personality explained a fair proportion of variance: They performed better when they were lower on Neuroticism as they were more *Emotionally Stable* and *Relaxed* and when they were higher on Extraversion as they were more *Warm* and *Socially Bold*.³²

Other researchers found comparable results. Better performance was predicted by lower Neuroticism because of more *Independence* and *Well-being*^{33,34} or lower *Anxiety*, *Anger* and *Vulnerability*,³⁵ higher Extraversion because of more *Socialisation*^{33,34} and lower *Introversion*.³⁶ higher Agreeableness, because more *Cooperation*,³⁵ and by higher Conscientiousness, because of more *Achievement via Conformance*^{33,34} and less *Flexibility*.³⁶ *Extraverts* (higher on Extraversion) got higher global performance ratings than *Introverts*, *Sensing*-people (Higher on Openness) got higher supervisor ratings than *Intuition*-people, both on daily ratings and on a global performance score.³⁷ A complementary approach is the use of an instrument to measure emotional intelligence. Several aspects of emotional intelligence were associated with performance dimensions. *Self-Regard* and *stress tolerance*, corresponding to lower Neuroticism, *assertiveness and optimism*, corresponding to higher Extraversion and *Independence, Self-actualisation* and *Reality testing*, corresponding to higher Openness, were especially linked to ratings of patient care.^{38,39}

Anaesthesia simulations have proven to be an effective training tool, as documented by a well developed literature. As anaesthesia simulations closely resemble the real work, they provide an excellent opportunity to study performance as well. However, in this body of literature, only one study examined anaesthesiologists' personality. In this study, during anaesthesia simulations, performance was found to be positively related to Conscientiousness and Agreeableness.⁴⁰

The studies on anaesthesiologists' performance described above used a range of approaches to measure performance (e.g. faculty ratings and peer ratings, for technical and nontechnical skills, in both real-life and simulated settings). The measurement of anaesthesiologists' performance, and relatedly, the development of performance criteria, are topics of ongoing research.^{41–44} However, despite the variety of approaches, the studies in this section show consistent results: Good performance was related to lower Neuroticism, higher Extraversion, higher Openness and higher Conscientiousness. Overall, Agreeableness seemed to be somewhat less predictive.

Does personality predict anaesthesiologists' mental health?

The relationship between low job-satisfaction and mental health problems is plausible.^{45,46} An early study found significant positive correlations between Job satisfaction

and *Emotional Stability* (lower on Neuroticism) and *Trust* (higher on Agreeableness).²³ It was also found in anaesthesiologists that exhibiting *Type A behaviour* was related to low job satisfaction and mental health.⁴⁶ Individuals with *Type A behaviour* are characterised as ambitious, competitive, impatient and aggressive or hostile. This is theoretically related to a combination of higher Neuroticism, higher Conscientiousness but lower Agreeableness. Indeed, in more recent studies where the FFM was used, lower Neuroticism, lower Introversion and higher Agreeableness were found positively related to job satisfaction.^{47,48} Concerning the physiological component of stress, the personality trait of emotional intelligence was not found to predict long-term cortisol response.⁴⁹ With respect to burnout; however, it was found that in anaesthesiologists, personality traits were strongly related to the presence of distress and burnout, with Neuroticism as the most important correlate. Protective personality traits were Extraversion and Agreeableness.⁵⁰ Concerning general psychological health in resident anaesthesiologists, overall a normal psychological structure was found. However, about a third showed a tendency towards *negative emotionality* (higher on Neuroticism), and therefore, at risk.⁵¹ Although an older study, this number corresponds to incidences of burnout found recently.⁵²

Summarising, several studies looked into the relationship between personality and job satisfaction or mental health. Also here, the results are consistent: Higher Neuroticism is a risk factor for low job satisfaction and mental health problems, whereas higher Extraversion and Agreeableness seem to be protective.

Risk of bias

Several biases should be considered: Most studies were exploratory; some studies drew conclusions from relatively small samples and several studies focused on *P* values rather than effect sizes. Moreover, *P* values were not always corrected for multiple testing. More study participants were male compared with female, especially in the earlier studies. This changes in later studies, reflecting the M/F ratio in the current population of the anaesthesiology workforce. Furthermore, there was a large timeframe over which studies were conducted. The quality of the older articles was not always up to current standards. Moreover, most studies did not report a nonresponder analysis. And importantly, the personality inventories were heterogenous and varied in quality. We will return to this issue in the limitation section of our discussion.

Discussion

This is the first systematic review of the correlates of anaesthesiologists' personality. Qualitative research revealed generally two distinct sets of desirable personal qualities for the anaesthesiologist. The first set of desirable qualities can be described as *technical*, that is, having

skills and knowledge. The second set can be described as *nontechnical*, that is, especially when under stress having the ability to deploy the aforementioned skills and knowledge, having the will to excel, being a good communicator and genuinely empathising with patients. These implicate a personality profile of the ideal anaesthesiologist: obtaining and maintaining the necessary technical skills should require higher Openness and Conscientiousness. The desired nontechnical skills should be associated with lower Neuroticism, higher Extraversion and higher Agreeableness.

Quantitative personality research was undertaken to examine the usefulness for personality-based selection processes and to examine the relationship between personality and mental health. Although some differences in personality between anaesthesiologists and physicians from other medical specialties have been found, findings suggest that anaesthesiologists' personality profile is similar to that of other physicians. Findings indicate that good performance is related to lower Neuroticism, higher Extraversion, higher Openness and higher Conscientiousness. Agreeableness seems less important. From the perspective of low job-satisfaction and occupational health problems, higher Neuroticism is a risk factor, whereas higher Extraversion and higher Agreeableness seem to be protective.

Differences in personality compared with the general population

The differences between anaesthesiologists and the general population likely exist as physicians, as a professional group, differ from the general population. A recent study where a large international cohort of doctors was tested using the FFM, found physicians lower on Neuroticism but higher in Extraversion, Agreeableness and Conscientiousness compared with the general population.⁵³

Differences in personality compared with other specialties

It is a common intuition among the medical profession that there must be differences in personality between medical specialties.⁵⁴ Physicians also like to exaggerate these supposed differences by jokes.^{55,56} However, meaningful differences in personality between specialties were not found.^{29,53} Perhaps, the psychometric instruments that are commonly used are not sensitive enough, but again, it is more likely that physicians share personality traits, regardless of their specialty.⁵³ As behaviour is a function of personality *in given circumstances*, it is possible that any differences in behaviour of physicians of different specialties are because of differences in the work context, rather than to differences in personality.⁵⁷

It has been suggested that personality testing could be a useful tool to match residents with specialties.^{58,59} However, it is also often emphasised that different personalities can succeed in the same specialty, and that there are

many more factors than personality that determine specialty choice.^{29,58,60} For these reasons, we question whether personality testing would be a helpful tool to aid early-career physicians with their choice of specialty.

Nevertheless, we believe personality testing in medical professions may be useful but for different reasons. However, we emphasise that personality reflects merely a *tendency* to exhibit certain behaviours, experience certain emotions or have certain cognitions in given circumstances. In other words: behaviours, emotions and cognitions are not set in stone for any given personality.

Associations between personality, performance and mental health

First, personality predicts performance among anaesthesiologists: our synthesised findings indicate that good performance is related to lower Neuroticism, higher Extraversion, higher Openness and higher Conscientiousness. This is in line with literature from other disciplines. For example, a review found higher Conscientiousness predicting better performance in medical students. Later in medical training, Neuroticism and Agreeableness became predictive as well.⁶¹ Similarly, surgery residents were found to perform better when they were lower in Neuroticism, higher in Extraversion and higher in Conscientiousness.⁶² Finally, in orthopaedic residents, lower Neuroticism and higher Agreeableness predicted better performance.⁶³

As anaesthesia is a high demand/high stakes profession, it makes sense to compare our literature with research about performance (when under stress) and personality from high demand/high stakes professions but outside of medicine. With respect to anaesthesia, an often-made analogy is that of aviation. Some have argued this analogy is overstretched and perhaps used by anaesthesiologists to co-opt some of the glamour that used to be associated with flying.⁶⁴ Still, we suggest the analogy is useful, not only just as the phases of flight resemble the phases of anaesthesia but also as in aviation, there is a large body of literature into personality characteristics and performance. Results are consistent with our synthesised findings, a meta-analysis of personality traits associated with success in military aviation programs showed a negative effect for Neuroticism and a positive effect for Extraversion.⁶⁵ However, one should keep in mind that correlations between personality and occupational performance are typically small to medium.⁶⁶

Because of these modest correlations, during selection processes, the value of personality testing to predict future performance is limited. If used at all, it should be considered in combination with other measures, such as measures of academic and cognitive performance. On the other hand, personality testing could be used to gain insight in one's weaker points, for example, in order to determine a specific training schedule to be used in a simulated

anaesthesia environment.⁶⁷ Again by analogy to aviation, the value of simulation (team) training is beyond doubt in anaesthesia. Personality testing could potentially be used to optimise team performance, by matching potentially complementary personalities.⁶⁸ The dimensions of the FFM that contain information about social interactions, especially agreeableness and extraversion, may serve as a starting point for future research.

Another reason why personality testing may be useful, is that it could potentially be used to identify individuals at risk of developing occupational health problems, with the aim to offer these individuals individualised support (e.g. through tailored continuing education).^{5,69} We hasten to add that work-related mental health problems should never be reduced to individual susceptibility, as it is well established that unfavourable working conditions are a key cause of burnout.^{52,70} Thus, organisations are primarily responsible for providing healthy working conditions to their workers, to monitor these conditions, and if necessary, improve them.^{70,71} We nevertheless suggest that it is potentially useful to identify individuals at risk, as the stressful nature of anaesthesia can have negative consequences on mental and physical health in the long-term.^{52,72,73} A recent meta-synthesis provided evidence that personality predicts mental, and to some extent also physical, health.⁷⁴ Relatedly, another meta-analysis found significant relationships between personality and burnout.⁶⁹ That is, lower Neuroticism, higher Agreeableness and higher Conscientiousness and to a lesser extent higher Extraversion, are favourable. One should keep in mind that the latter relationships are complex and reciprocal: that is, FFM-traits may predict (facets of) burnout but burnout may also affect emotion-related aspects of personality.⁷⁵ With that said, the evidence from these previous studies is in line with what we found in anaesthesiologists.

There are several limitations concerning our review. First, because of the heterogeneity of the instruments used, we chose to interpret all results in terms of the FFM, which allowed us to combine the findings of the reviewed studies in a meaningful way. However, the broad personality traits of the FFM possibly have too much bandwidth and provide too little fidelity, which are inversely related to each other (analogous to ultrasound, where a lower frequency probe will provide deeper penetration and a larger image but with less detail).⁷⁶ Therefore, loss of nuance and detail of the individual studies was inevitable. However, to our best judgment, we believe that the advantage of using a common nomenclature of the FFM, which allowed us to synthesise results, outweighs the disadvantages. Second, the level of evidence of the included studies is medium at best. That is, most studies were exploratory instead of hypothesis-based and most studies were not preregistered. Furthermore, most studies focused on statistical differences based on *P* values, which were not always corrected for

multiple testing. Nevertheless we believe that the consistent findings, despite that the studies used different personality questionnaires and outcome measures, triangulate convergent validity of these findings.

We have several recommendations for future research. First, being a model with a high resemblance to the real situation, anaesthesia simulation is not just a useful tool to foster professional growth but it is also a promising setting for research that aims to explore the relationships between personality and performance. Second, the FFM traits are meaningful but also rather general. For this reason, research should aim at identifying more narrow predictors for specific outcomes that have incremental validity above the Big Five Model as a criterion.¹¹ Other personality constructs are of interest, such as, for example, Emotional Intelligence, which when seen as a personality trait encompasses emotional-related aspects from within several of the Big Five traits.^{77,78} Similarly, the construct of risk seeking or sensation-seeking behaviour is potentially of interest. This trait has been hypothesised to predict the risk for substance abuse, a known occupational hazard for anaesthesiologists.^{79–81}

Conclusion

There have been substantial efforts to examine anaesthesiologists' personality, from several perspectives, for different aims and with various instruments. Anaesthesiologists' general personality does not essentially differ from that of other medical specialists. Furthermore, those personality traits that predict good performance and good mental health in anaesthesia, also predict good performance and good mental health in other high-stakes/high-demand medical and nonmedical environments. The ideal anaesthesiologist would be lower on Neuroticism, higher on Extraversion and higher on Conscientiousness.

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References

- 1 Larsen RJ, Buss DM. *Personality psychology, chapter 1*. London: McGraw-Hill Education; 2017; 2–6.
- 2 Caldwell DF, O'Reilly CA III. Measuring person-job fit with a profile-comparison process. *J Appl Psychol* 1990; **75**:648.
- 3 Musson DM, Sandal G, Helmreich RL. Personality characteristics and trait clusters in final stage astronaut selection. *Aviat Space Environ Med* 2004; **75**:342–349.

- 4 Puryear JS, Kettler T, Rinn AN. Relationships of personality to differential conceptions of creativity: a systematic review. *Psychol Aesthet Creat Arts* 2017; **11**:59.
- 5 Kuhn CM, Flanagan EM. Self-care as a professional imperative: physician burnout, depression, and suicide. *Can J Anaesth* 2017; **64**:158–168.
- 6 Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open* 2016; **6**:e011458.
- 7 Asendorpf JB, Conner M, De Fruyt F, et al. Recommendations for increasing replicability in psychology. *Eur J Pers* 2013; **27**:108–119.
- 8 De Vries H, Elliott MN, Kanouse DE, et al. Using pooled kappa to summarize interrater agreement across many items. *Field methods* 2008; **20**:272–282.
- 9 McCrae RR, John OP. An introduction to the five-factor model and its applications. *J Pers* 1992; **60**:175–215.
- 10 Johnson JA, Ostendorf F. Clarification of the five-factor model with the Abridged Big Five Dimensional Circumplex. *J Pers Soc Psychol* 1993; **65**:563.
- 11 Ozer DJ, Benet-Martinez V. Personality and the prediction of consequential outcomes. *Annu Rev Psychol* 2006; **57**:401–421.
- 12 Shelton C, Smith A. On the qualities of qualitative research. *Can J Anaesth* 2015; **62**:3–7.
- 13 Shelton C, Smith A, Mort M. Opening up the black box: an introduction to qualitative research methods in anaesthesia. *Anaesthesia* 2014; **69**:270–280.
- 14 Kearney RA. Defining professionalism in anaesthesiology. *Med Educ* 2005; **39**:769–776.
- 15 Smith AF, Glavin R, Greaves JD. Defining excellence in anaesthesia: the role of personal qualities and practice environment. *Br J Anaesth* 2011; **106**:38–43.
- 16 Larsson J, Holmstrom IK. How excellent anaesthetists perform in the operating theatre: a qualitative study on nontechnical skills. *Br J Anaesth* 2013; **110**:115–121.
- 17 Wong A. From the front lines: a qualitative study of anesthesiologists' work and professional values. *Can J Anaesth* 2011; **58**:108–117.
- 18 Khan FA, Minai F. A national survey into desirable personality traits in anaesthesia trainees in a developing country. *J Pak Med Assoc* 2010; **60**:162–166.
- 19 Gassner S, Oubaid V, Hampe W, et al. Personality traits in anaesthesiology: results from a questionnaire-based requirements analysis. *Der Anaesthesist* 2020; **69**:803–809.
- 20 Watson D. Strangers' ratings of the five robust personality factors: evidence of a surprising convergence with self-report. *J Pers Soc Psychol* 1989; **57**:120.
- 21 Goldberg LR. The development of markers for the Big-Five factor structure. *Psychol Assess* 1992; **4**:26.
- 22 Reeve PE. Personality characteristics of a sample of anaesthetists. *Anaesthesia* 1980; **35**:559–568.
- 23 Clarke IMC, Morin JE, Warnell I. Personality-factors and the practice of anaesthesia - a psychometric evaluation. *Can J Anaesth* 1994; **41**:393–397.
- 24 Bruce DL, Katz SE, Turndorf H, et al. Psychometric comparisons of trainees and consultants in anaesthesia and psychiatry. *Br J Anaesth* 1983; **55**:1259–1264.
- 25 Kluger MT, Laidlaw T, Khursandi DS. Personality profiles of Australian anaesthetists. *Anaesth Intensive Care* 1999; **27**:282–286.
- 26 Kluger MT, Laidlaw TM, Kruger N, et al. Personality traits of anaesthetists and physicians: an evaluation using the Cloninger Temperament and Character Inventory (TCI-125). *Anaesthesia* 1999; **54**:926–935.
- 27 Moro Boscolo E, Scargliarini I, Manani G, et al. Psychological study of a group of university anaesthetists. *Cah Anesthesiol* 1985; **33**:141–143.
- 28 Suarez Delgado JM, Romero Sanchez R, Sanchez Pena J, et al. Psychological profile of anaesthesia residents in the province of Andalusia. *Rev Esp Anesthesiol Reanim* 1998; **45**:8–11.
- 29 Borges NJ, Osmon WR. Personality and medical specialty choice: technique orientation versus people orientation. *J Vocat Behav* 2001; **58**:22–35.
- 30 Flores-Maldonado V, Zuniga-Oseguera V, Gutierrez-Samperio C. Trial of personality in three groups of residents (Anesthesiology, General Surgery, Internal Medicine) with Douglas N. Jackson inventory [Spanish]. *Rev Mex de Anesthesiol* 1985; **8**:99–103.
- 31 Mitra S, Sinha PK, Gombhar KK, et al. Comparison of temperament and character profiles of anesthesiologists and surgeons: a preliminary study. *Indian J Med Sci* 2003; **57**:431–436.
- 32 Reeve PE, Vickers MD, Horton JN. Selecting anaesthetists - the use of psychological-tests and structured interviews. *J R Soc Med* 1993; **86**:400–403.
- 33 McDonald JS, Lingam RP, Gupta B, et al. Psychologic testing as an aid to selection of residents in anaesthesiology. *Anesth Analg* 1994; **78**:542–547.
- 34 Gough HG, Bradley P, McDonald JS. Performance of residents in anaesthesiology as related to measures of personality and interests. *Psychol Rep* 1991; **68**:979–994.
- 35 Merlo LJ, Matveevskii AS. Personality testing may improve resident selection in anaesthesiology programs. *Med Teach* 2009; **31**:E551–E554.
- 36 Reich DL, Uysal S, Bodian CA, et al. The relationship of cognitive, personality, and academic measures to anaesthesiology resident clinical performance. *Anesth Analg* 1999; **88**:1092–1100.
- 37 Schell RM, DiLorenzo AN, Li HF, et al. Anaesthesiology resident personality type correlates with faculty assessment of resident performance. *J Clin Anesth* 2012; **24**:566–572.
- 38 Talarico JF, Metro DG, Patel RM, et al. Emotional intelligence and its correlation to performance as a resident: a preliminary study. *J Clin Anesth* 2008; **20**:84–89.
- 39 Talarico JF, Varon AJ, Banks SE, et al. Emotional intelligence and the relationship to resident performance: a multiinstitutional study. *J Clin Anesth* 2013; **25**:181–187.
- 40 Michelet D, Truchot J, De La Tour CDF, et al. The impact of psychological factors on the management of intraoperative haemodynamic events in children. *Anaesth Crit Care Pain Med* 2020; **39**:785–791.
- 41 Glavin R, Maran N. Editorial I: development and use of scoring systems for assessment of clinical competence. *Br J Anaesth* 2002; **88**:329–330.
- 42 Forrest F, Taylor M, Postlethwaite K, et al. Use of a high-fidelity simulator to develop testing of the technical performance of novice anaesthetists. *Br J Anaesth* 2002; **88**:338–344.
- 43 Jirativanont T, Raksamani K, Aroonpruksakul N, et al. Validity evidence of nontechnical skills assessment instruments in simulated anaesthesia crisis management. *Anaesth Intensive Care* 2017; **45**:469–475.
- 44 Chuan A, Wan A, Royse C, et al. Competency-based assessment tools for regional anaesthesia: a narrative review. *Br J Anaesth* 2018; **120**:264–273.
- 45 Rama-Maceiras P, Kranke P. Working conditions and professional wellbeing: a link easy to imagine but difficult to prove. *Eur J Anaesthesiol* 2013; **30**:213–215.
- 46 Cooper CL, Clarke S, Rowbottom AM. Occupational stress, job satisfaction and well being in anaesthetists. *Stress Med* 1999; **15**:115–126.
- 47 Kisten P, Kluyts H. An evaluation of personality traits associated with job satisfaction among South African anaesthetists using the Big Five Inventory. *South Afr J Anaesth Analg* 2018; **24**:9–15.
- 48 van der Wal RAB, Bucx MJL, Hendriks JCM, et al. Work stress and satisfaction in relation to personality profiles in a sample of Dutch anaesthesiologists: a questionnaire survey. *Eur J Anaesthesiol* 2016; **33**:800–806.
- 49 van der Wal RAB, Bijleveld E, Herwaarden AEV, et al. Chronic stress indicated by hair cortisol concentration in anaesthesiologists and its relationship to work experience and emotional intelligence: a cross-sectional biomarker and survey study. *Eur J Anaesthesiol* 2020; **39**:26–32.
- 50 van der Wal RAB, Bucx MJL, Hendriks JCM, et al. Psychological distress, burnout and personality traits in Dutch anaesthesiologists: a survey. *Eur J Anaesthesiol* 2016; **33**:179–186.
- 51 Breton-Marquez JH, Zuniga-Oceguera V, Perez-Tamayo L, et al. Study of personality in two groups of medical residents in anaesthesiology [Spanish]. *Rev Mex Anesthesiol* 1985; **8**:13–22.
- 52 Sanfilippo F, Noto A, Foresta G, et al. Incidence and factors associated with burnout in anaesthesiology: a systematic review. *Biomed Res Int* 2017; **2017**:8648925.
- 53 Stienen MN, Scholtes F, Samuel R, et al. Different but similar: personality traits of surgeons and internists—results of a cross-sectional observational study. *BMJ Open* 2018; **8**:e021310.
- 54 Pappas P, Gouva M, Gourgoulis K, et al. Psychological profile of Greek doctors: differences among five specialties. *Psychol Health Med* 2016; **21**:439–447.
- 55 Maurin D, Pacault C, Gales B. The jokes are vectors of stereotypes. Example of the medical profession from 220 jokes. *Presse Med* 2014; **43**:E385–E392.
- 56 Harendza S, Pyra M. Just fun or a prejudice? - physician stereotypes in common jokes and their attribution to medical specialties by undergraduate medical students. *BMC Med Educ* 2017; **17**:128.
- 57 Burford B, Rosenthal-Stott HE. Stereotyping and the development of clinicians' professional identities. *Self and social identity in educational contexts*. New York, NY, USA: Routledge/Taylor & Francis; 2017 ; 279–296.
- 58 Makert RJ, Rodenhauer P, El-Baghadi MM, et al. Personality as a prognostic factor for specialty choice: a prospective study of 4 medical school classes. *Medscape J Med* 2008; **10**:49.
- 59 Borges NJ, Savickas S. Work style preferences among medical specialties. *J Vocat Behav* 2014; **84**:303–306.

- 60 Milić J, Škrlec I, Vranješ IM, *et al.* Importance of the big-five in the future medical specialty preference. *BMC Med Educ* 2020; **20**:234.
- 61 Doherty EM, Nugent E. Personality factors and medical training: a review of the literature. *Med Educ* 2011; **45**:132–140.
- 62 Hughes BD, Perone JA, Cummins CB, *et al.* Personality testing may identify applicants who will become successful in general surgery residency. *J Surg Res* 2019; **233**:240–248.
- 63 Phillips D, Egol KA, Maculatis MC, *et al.* Personality factors associated with resident performance: results from 12 Accreditation Council for Graduate Medical Education accredited orthopaedic surgery programs. *J Surg Educ* 2018; **75**:122–131.
- 64 Notcutt W, Down M. Anaesthetists and stress. *Anaesthesia* 1996; **51**:1072–1073.
- 65 Campbell JS, Castaneda M, Pulos S. Meta-analysis of personality assessments as predictors of military aviation training success. *Int J Aviat Psychol* 2009; **20**:92–109.
- 66 Barrick MR, Mount MK, Judge TA. Personality and performance at the beginning of the new millennium: what do we know and where do we go next? *Int J Sel Assess* 2001; **9**:9–30.
- 67 Lambert JA, Vanderbilt AA, Papadimos TJ. Improved emotional intelligence in perioperative care through simulation-based medical education during anesthesiology residency training: a call for implementation. *Adv Med Educ Pract* 2019; **10**:39–42.
- 68 Timoney N, Procter L, Liau J, *et al.* The effects of surgeons and anesthesiologists on operating room efficiency. *Interdiscip Neurosurg Adv Tech Case Manag* 2016; **5**:38–42.
- 69 Alarcon G, Eschleman KJ, Bowling NA. Relationships between personality variables and burnout: a meta-analysis. *Work Stress* 2009; **23**:244–263.
- 70 West CP, Dyrbye LN, Erwin PJ, *et al.* Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *The Lancet* 2016; **388**:2272–2281.
- 71 Panagioti M, Panagopoulou E, Bower P, *et al.* Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. *JAMA Intern Med* 2017; **177**:195–205.
- 72 Zanaty OM, El Metainy S, Abdelmaksoud R, *et al.* Occupational stress of anesthesia: effects on aging. *J Clin Anesth* 2017; **39**:159–164.
- 73 Beilin B, Greenfeld K, Abiri N, *et al.* Anesthesiologists at work: an increase in pro-inflammatory and Th2 cytokine production, and alterations in proliferative immune responses. *Acta Anaesthesiol Scand* 2006; **50**:1223–1228.
- 74 Strickhouser JE, Zell E, Krizan Z. Does personality predict health and well being? A metasynthesis. *Health Psychol* 2017; **36**:797.
- 75 Armon G, Shirom A, Melamed S. The big five personality factors as predictors of changes across time in burnout and its facets. *J Pers* 2012; **80**:403–427.
- 76 Gruzca RA, Goldberg LR. The comparative validity of 11 modern personality inventories: predictions of behavioral acts, informant reports, and clinical indicators. *J Pers Assess* 2007; **89**:167–187.
- 77 Luedi MM, Doll D, Boggs SD, *et al.* Successful personalities in anesthesiology and acute care medicine: are we selecting, training, and supporting the best? *Anesth Analg* 2017; **124**:359–361.
- 78 Petrides KV. Psychometric properties of the trait emotional intelligence questionnaire (TEIQue). In: Parker J, Saklofske D, Stough C, editors. *Assessing emotional intelligence*. Springer: Boston, Massachusetts; 2009 . pp. 85–101.
- 79 Ersche KD, Turton AJ, Pradhan S, *et al.* Drug addiction endophenotypes: impulsive versus sensation-seeking personality traits. *Biol Psychiatry* 2010; **68**:770–773.
- 80 Garcia-Guasch R, Roige J, Padros J. Substance abuse in anaesthetists. *Cur Opin Anesthesiol* 2012; **25**:204–209.
- 81 Skipper GE, Campbell MD, DuPont RL. Anesthesiologists with substance use disorders: a 5-year outcome study from 16 state physician health programs. *Anesth Analg* 2009; **109**:891–896.