Examining the association of career stage and medical specialty with personality preferences – a cross-sectional survey of junior doctors and attending physicians from various specialties

Yu-Che Chang¹,²,³, Hsu-Min Tseng¹,⁴, Xaviera Xiao¹, Roy Y. L. Ngerng⁵, Chiao-Lin Wu⁶ and Chung-Hsien Chaou¹,²,³*

Abstract

Background: Personality preference research on medical students and physicians demonstrates that personality preferences may affect one’s choice of specialty and transform over the course of one’s academic career as well as during one’s time spent in the clinical setting. The literature offers valuable methods for evaluating medical curricula, understanding medical specialties, and rethinking communication techniques between educators and learners. In line with this encompassing body of work, this study examines the personality preferences of junior doctors and attending physicians from various specialties to investigate how career stage and medical specialty are associated with personality preferences.

Method: The Myers–Briggs Type Indicator (MBTI) was applied to assess the personality preferences of junior doctors (postgraduates year 1–3) and attending physicians from six major medical specialties. Participants completed a self-administered 93-item questionnaire, while a certified MBTI practitioner explained the personality dichotomies as well as facilitated the self-evaluation process and the questionnaire’s interpretation. Contrasted dichotomous scores and radar plots were employed to illustrate the distinction between junior doctors and attending physicians’ personality preferences. All analyses were performed using the SAS statistical software, while a Wilcoxon rank-sum test was used to quantify the polarisation of personality preferences between junior doctors and attending physicians.

Results: In total, 98 participants were recruited, of whom 59 were attending physicians and 39 were junior doctors. The most common personality types among the junior doctors were ESTJ (15.4%), INTP (12.8%), and ESFJ (10.3%), while among the attending physicians, the most common types were ISTJ (23.7%) and ESTJ (18.6%). Both junior doctors and attending physicians expressed personality preferences for sensing, thinking, and judging. However, compared to the junior doctors, more polarised personality preferences were noted among the attending physicians for sensing ($p = 0.038$), thinking ($p = 0.032$), and judging ($p = 0.024$). Moreover, junior doctors exhibited less distinct personality preferences in this study.

(Continued on next page)
Conclusion: Attending physicians and junior doctors exhibited greater personality inclinations for sensing, thinking, and judging, although the former expressed these personality preferences more strongly than the latter. These findings highlight that, amongst physicians, career stage is strongly associated with the expression of personality preferences.

Keywords: Personality preference, Personality type, Clinical training, Myers–Briggs type Indicator, Cross-sectional survey, Career stage, Specialty

Background
Previous studies reveal distinct differences in the personality preferences among physicians and the general population—that is, physicians’ potential patients [1, 2]. Namely, medical students and physicians express greater personality preferences for thinking and judging [3–5]. Several studies have found that the personality preference for thinking is attributed to physicians in specialties such as surgery [6–8] and emergency medicine (EM) [2, 9, 10]. Even among healthcare executives, the preference for thinking was more pronounced than among their general business counterparts [11]. A greater understanding of physicians’ personality preferences can enhance their professional awareness [12] and, by extension, improve their approach to patient care [1]. Personality preferences also speak to physicians’ capacity for risk tolerance and shed light on their decision-making processes in the clinical setting [13, 14]. For instance, Higgs’s study reveals that the intuition preference is associated with higher levels of emotional intelligence [15]. The literature also demonstrates that a greater understanding of personality preferences may affect medical training curricula insofar as personality preferences can illuminate learners’ support needs and learning styles [4, 16]. Moreover, personality preference research has led to a more comprehensive understanding of how faculty evaluations of residents’ performances should be approached [17, 18].

Within research on physicians’ personality preferences, some opportunities have been overlooked. Relatively few studies interrogate the differences in personality preferences among physicians at different career stages and across various medical specialties. As such, our research aims to determine how career stage and medical specialty are associated with personality preferences by examining those preferences among junior doctors and attending physicians. Although many junior doctors in our study had nominated a specialty, their specialty choices were exclusively provisional and were therefore not considered; conversely, attending physicians’ specialty choices were considered an area of interest. We referred to previous findings on the personality preferences of emergency physicians (EPs), physicians from surgical specialties, and physicians from non-surgical specialties to determine whether or not similar trends may be identified among our study population.

Methods
Study design and setting
Our cross-sectional study utilised the Myers–Brigg Type Indicator (MBTI) instrument to assess the personalities of our participating junior doctors (post-graduate years 1–3) and attending physicians. The sample size was predetermined according to previous studies wherein the MBTI was deployed [19, 20]. Convenience sampling was used, and the study was conducted between August 1, 2015 and July 31, 2016 at Chang Gung Memorial Hospital, Linkou branch—a large, 3800-bed, tertiary, private, multispecialty medical centre located in an urban area in North Taiwan. Ethical approval for this study was obtained from the Chang Gung Memorial Hospital and Chang Gung University Institutional Review Board (103–7538B). Participation was voluntary, informed consent was acquired, and participants’ anonymity was guaranteed.

Participants
Attending physicians from internal medicine, paediatrics, surgery, obstetrics, and gynaecology (OB/GYN), EM, and family medicine were recruited. These six key medical specialties were chosen because they tend to encompass a high proportion of attending physicians. Notably, these six specialties are among the top nine in the United States in terms of the number of physicians employed therein [21]. These specialties encompass 66% of all working physicians in the United Kingdom [22] and 72% in Australia [23]. In Taiwan, these medical specialties are similarly prominent, and all medical graduates are in fact required to participate in a clinical rotation curriculum in the aforementioned specialties [24]. When considering the prominence of these six medical specialties, their inclusion in our sample of attending physicians was an important element of building a representative sample of attending physicians’ personality preferences. Hereafter, these specialties will be referred to as surgical specialties (i.e., surgery and OB-
GYN), EM, and non-surgical specialties (i.e., family medicine, paediatrics, and internal medicine). By differentiating between surgical, non-surgical, and EM, our study attempts to consider whether or not any distinctions between attending physicians may be noted. Although junior doctors make provisional specialty choices, these provisional choices are not considered in our research.

Instrument and data collection
Developed in 1962, the MBTI questionnaire is a personality assessment tool based on Carl Jung’s theory of psychological types. The questionnaire has been used extensively for the purposes of career assessment and leadership development as well as to understand communication approaches, learning styles, counselling orientations, and methods of coaching and teambuilding [19, 25]. The MBTI instrument’s value and use in psychotherapy, the clinical setting, career development, and research settings are based on its reliability and validity [26]. The MBTI comprises four dichotomies of personality preferences: extraversion/introversion (E/I); sensing/intuition (S/N); thinking/feeling (T/F); and judging/perceiving (J/P) [27]. These four axes form sixteen different combinations, such as ESTJ (extroverted, sensing, thinking, judging) or INFP (introverted, intuition, feeling, perceiving), that are also known as personality types. A detailed description of these dimensions is summarised in Table 1 [27]. Despite the clarity of these dichotomies, Lloyd [28] cautions that the personality preferences within each of the MBTI’s four dimensions should not be perceived as wholly distinct; namely, an individual is constitutionally neither an extrovert nor an introvert.

We engaged CCP Asia Pacific—which has been certified by the Myers and Briggs Foundation—to administer the MBTI instrument to our participants. A certified MBTI practitioner facilitated the administration and interpretation process, starting with an introduction to the four dichotomies and an explanation of the sixteen personality types. Participants self-evaluated their personality preferences before filling out the 93-item MBTI questionnaire and were rated on each dimension to produce their four-letter personality types. The MBTI results were delivered via a conversation facilitated by a trained practitioner who clarified any ambiguity regarding the MBTI typology and helped the respondents reach a consensus for their personality types.

Table 1 Summary of MBTI four pairs of dichotomies of preferences

| Dichotomy                        | Description                                                                 |
|----------------------------------|-----------------------------------------------------------------------------|
| Extraversion (E) – Introversion (I) | Look at whether people prefer to focus their perceptions and judgment on the outer (E) or inner (I) worlds |
| Sensing (S) – Intuition (N)       | Look at whether people absorb information by observing facts using their five senses (S) or via using their intuition and looking at meanings (N) |
| Thinking (T) – Feeling (F)       | Look at whether people logical think through their decisions (T) or rely on their feelings and values to make decisions (F) |
| Judging (J) – Perceiving (P)     | Look at whether people deal with the outer world using a judgment (J) or perceptive (P) process. |

Statistical analysis
All analyses were performed using the SAS statistical software. Numerical data were presented as the mean (standard deviation, SD), and categorical data for the personality preference distribution were presented as the count (percentage). A comparison of contrasted dichotomous scores on individual MBTI profiles between the junior doctors and attending physicians was made using a Wilcoxon rank-sum test to quantify the polarisation of personality preferences between the two groups. Radar plots were also created to illustrate the differences in the MBTI results between the junior doctors and attending physicians from various specialties.

Results
Participants’ characteristics
The study involved 59 attending physicians, including 23 non-surgical physicians (12 internists, 6 paediatricians, and 5 family medicine physicians), 18 EPs, and 18 physicians from surgical specialties (14 surgeons and 4 OB-GYNs). The attending physicians comprised 45 males and 14 females, with a mean age (±SD) of 41.6 ± 6.4 years, thus averaging 9.92 ± 5.71 years of experience. Of the 39 junior doctors, 32 were in their post-graduate year 1 (PGY1) and 7 were in their post-graduate year 2–3 (PGY2–3). Amongst the 39 junior doctors, 25 were male and 14 were female, and the mean age was 27.6 ± 1.77 years.

Distribution of participants’ personality preferences
A detailed list of scores for each personality type for the various participant groups is provided in Table 2. With

Myers, I., & Myers, P. (2010). Gifts differing: Understanding personality type. Nicholas Brealey Publishing
the exception of the E/I dimension, the mean score difference between the two personality types in each dichotomy was distinct between the junior doctors and attending physicians. The most notable difference was the J/P dichotomy, which grew from 2.67 among junior doctors to 9.08 among attending physicians.

At the bottom of Table 2, the participants were categorised according to their higher scores for each personality dichotomy. Overall, junior doctors and attending physicians were more likely to express ISTJ. However, in comparison to junior doctors, attending physicians expressed stronger preferences for the latter three (sensing, thinking, and judging). The frequency distribution for the personality type combinations is presented in Table 3. The most common personality types were ESTJ (15.4%), INTP (12.8%), and ESFJ (10.3%) among the junior doctors and ISTJ (23.7%) and ESTJ (18.6%) among the attending physicians.

When breaking down the specialties, attending physicians from surgical specialties stood out among the attending physicians in the E/I and T/F dimensions. Attending physicians from surgical specialties (77.8%) expressed stronger preferences for thinking, while the attending physicians from non-surgical specialties (52.2%) and EPs (55.6%) had broadly similar preferences for thinking as did the junior doctors (56.4%). Additionally, junior doctors, attending physicians from non-surgical specialties, and EPs were more likely to be introverted (56.4–61.1%), while attending physicians from surgical specialties were more likely to be extroverted (61.1%). Although all attending physicians exhibited a greater preference for sensing, EPs demonstrated the lowest preference (61.1%) compared to attending physicians from both surgical specialties (83.3%) and non-surgical specialties (78.3%). Lastly, while all attending physicians exhibited a high preference for judging, physicians from surgical specialties (83.3%) expressed a higher preference for judging than did the EPs (66.7%) and physicians from surgical specialties (66.7%).

### Table 2 Descriptive and demographic results

|                  | Junior Doctors (n = 39) | Attending physicians Overall (n = 59) | Non-surgicalb (n = 23) | Surgical (n = 18) | EM (n = 18) |
|------------------|------------------------|-------------------------------------|------------------------|------------------|------------|
| Gender           |                        |                                     |                        |                  |            |
| M (%)            | 25 (64.1)              | 45 (76.3)                           | 16 (69.6)              | 15 (83.3)        | 14 (77.8) |
| F (%)            | 14 (35.9)              | 14 (23.7)                           | 7 (30.4)               | 3 (16.7)         | 4 (22.2)  |
| Age (yrs)        | 27.6 (1.77)            | 41.6 (6.4)                           | 44.0 (6.92)            | 40.6 (5.09)      | 39.6 (6.20) |
| Seniority (yrs)  | NA                     | 9.92 (5.71)                          | 11.6 (6.47)            | 8.78 (4.26)      | 8.89 (5.70) |
| MBTI results     |                        |                                     |                        |                  |            |
| Extrovert        | 9.90 (6.91)            | 9.31 (5.95)                          | 8.35 (6.24)            | 10.22 (6.23)     | 9.61 (5.44) |
| Introvert        | 11.0 (6.94)            | 11.7 (5.95)                          | 12.65 (6.24)           | 10.78 (6.23)     | 11.39 (5.44) |
| Sensing          | 14.5 (4.96)            | 16.7 (4.99)                          | 17 (4.83)              | 17.44 (5.14)     | 15.61 (5.14) |
| Intuition        | 11.5 (4.96)            | 9.24 (4.95)                          | 8.91 (4.79)            | 8.56 (5.14)      | 10.33 (5.08) |
| Thinking         | 12.2 (5.41)            | 14.8 (5.47)                          | 13.61 (5.85)           | 15.94 (4.87)     | 15.28 (5.51) |
| Feeling          | 11.8 (5.41)            | 9.15 (5.47)                          | 10.39 (5.85)           | 8.06 (4.87)      | 8.67 (5.52) |
| Judging          | 12.3 (6.94)            | 15.5 (6.27)                          | 16.87 (6.70)           | 14.28 (6.09)     | 15.11 (5.89) |
| Perceiving       | 9.67 (6.94)            | 6.46 (6.27)                          | 5.13 (6.70)            | 7.72 (6.09)      | 6.89 (5.89) |

### Table 3

| Dichotomy | I (I, %) | II (S, %) | III (T, %) | IV (J, %) |
|-----------|----------|----------|-----------|-----------|
| I         | 22 (56.4)| 32 (54.2)| 14 (60.9) | 7 (38.9)  |
| II        | 23 (59.0)| 44 (74.6)| 18 (78.3) | 15 (83.3) |
| III       | 22 (56.4)| 36 (61.0)| 12 (52.2) | 14 (77.8) |
| IV        | 20 (51.3)| 42 (71.2)| 18 (78.3) | 12 (66.7) |

aPGY1–3
bEM physician was not included in non-surgical physicians
Abbreviation: EM Emergency medicine, NA Non-accessible
doctors in dichotomy II–S/N (7.47 vs 2.92, \( p = 0.038 \)),
dichotomy III–T/F (5.68 vs 0.41, \( p = 0.032 \)), and
dichotomy VI–J/P (9.08 vs 2.67, \( p = 0.024 \)). These re-
sults indicate that, in our cross-sectional survey,
junior doctors possess notably balanced personality
preferences, while attending physicians have more
pronounced preferences for sensing, thinking, and
judging. In Fig. 1, radar plots stratified by specialties
for the junior doctors and attending physicians illus-
trate the distinction between the personality prefer-
ences of both. A more circular-shaped figure was
presented in the junior doctors’ plot, which indicates
relatively balanced personality preferences. This result
stands in contrast against the attending physicians
’ plot, which contains multiple spikes and demonstrates
that attending physicians express the same personality
preferences as their counterparts albeit to a greater
degree.

Discussion
Our study determined that junior doctors and attend-
ing physicians from different specialties are most
likely to exhibit the sensing, thinking, and judging
preferences, thus reaffirming what has been identified
in previous research [3–5, 29, 30]. More importantly,
this study makes a valuable contribution to the med-
ical field by revealing that, in three of four personality
preferences (sensing, thinking, and judging), the
attending physicians expressed stronger personality
preferences than did the junior doctors. The latter
were remarkably more neutral in their preferences for
sensing, thinking, and judging, thus indicating a sta-
tistically significant difference.

This finding suggests that clinical experience may be a
factor in the personality preferences of junior doctors
and attending physicians alike, which reflects prior re-
search on personality preferences and their development.
Medical and dental students have been tested with the
MBTI to demonstrate that students’ personality prefer-
ences change over time [31–33], while other research
identifies that teachers possess more polarised personal-
ity preferences than their students [18]. Considering the
impact of clinical experience is important in any study
that tackles personality preferences insofar as personality
and its development can be affected by major or minor
life events. Notably, work-related events have a signifi-
cant effect in changing the behavioural or cognitive traits
of one’s personality [34]. As Martinou’s [35] work re-
veals, junior trainees are likely to enjoy human inter-
action and may therefore exhibit a greater preference for
feeling; however, as their careers progress, they may
begin expressing a greater preference for thinking as
they reflect upon their practice. Indeed, physicians are
trained to use scientific evidence when exercising their
judgment, and clinical experiences allow physicians to
refine their critical thinking and decision-making skills,
which may accentuate their thinking and judging per-
sonality preferences.

In addition to comparing junior doctors and attending
physicians, our study makes a unique contribution to
medical field by considering how one’s specialty choice
might play a role in one’s personality preferences. As is

| Table 3 Distribution of personality preference |
| --- |
| **Junior Doctors (n = 39)** | **Attending Physicians (n = 59)** |
| Sensing (S) | Intuition (N) | Sensing (S) | Intuition (N) |
| Thinking (T) | Feeling (F) | Thinking (T) | Feeling (F) |
| Introvert (I) | Judging (J) | ISTJ 3 (7.69) | ISFJ 0 (0.00) | INTJ 2 (5.13) | INFJ 3 (7.69) | ISTJ ² 14 (23.7) | ISFJ 5 (8.47) | INTJ 2 (3.39) | INFJ 2 (3.39) |
| Perceiving (P) | ISTP 3 (7.69) | ISFP 3 (7.69) | INTP 5 (12.8) | INFP 1 (2.56) | ISTP 1 (1.69) | ISFP 5 (5.08) | INTP 2 (3.39) | INFP 3 (5.08) |
| Extrovert (E) | Perceiving (P) | ESTP 2 (5.13) | ESFP 2 (5.13) | ENTP 2 (5.13) | ENFP 2 (5.13) | ESTP 2 (3.39) | ESFP 3 (5.08) | ENTP 1 (1.69) | ENFP 2 (3.39) |
| Judging (J) | ESTJ ⁶ 6 (15.4) | ESFJ ⁴ 4 (10.3) | ENTJ 0 (0.00) | ENFJ 1 (2.56) | ESTJ ¹ 11 (18.6) | ESFJ 5 (8.47) | ENTJ 2 (3.39) | ENFJ 1 (1.69) |

| Data presented as number (%) |

| Table 4 Comparisons of contrasted dichotomous scores on MBTI profiles between junior doctors and attending physicians |
| --- |
| **Attending physicians** | **Junior Doctors** | **p-value** |
| Dichotomy I (Introvert - Extrovert) | 2.39 (11.9) | 1.21 (13.8) | 0.727 |
| Dichotomy II (Sensing - Intuition) | 7.47 (9.94) | 2.92 (9.91) | 0.038* |
| Dichotomy III (Thinking - Feeling) | 5.68 (10.9) | 0.41 (10.8) | 0.032* |
| Dichotomy IV (Judging - Perceiving) | 9.08 (12.5) | 2.67 (13.9) | 0.024* |

Data presented as mean (SD)

*Contrasted dichotomous scores, namely the difference of two aspect of score measurements within the same dichotomy, between junior doctors and attending physicians

*Statistically significant (\( p < 0.05 \)) using independent Wilcoxon rank-sum test
illustrated in Fig. 1, our study considers how attending physicians across key medical specialties (i.e., physicians from surgical specialties, EPs, and physicians from non-surgical specialties) may differently emphasise certain personality preferences. To our knowledge, ours is the first study to incorporate attending physicians from various specialties and junior doctors. Several personality assessment tools have been implemented to explore the relationship between personality preferences and medical specialty amongst undergraduates in order to facilitate tailored career coaching and help students evaluate the many existing specialties [7, 8]. Bell [18] examines the diverse personality styles of post-graduate medical students and their teachers as well as their impact on learning. To our knowledge, large-scale studies concerning personality preferences in healthcare focus on medical students [17], and very few have been conducted with clinical teachers, senior physicians, or other medical staff [36, 37]. Although the case number of enrolled physicians from various specialties is relatively limited in our research, we identified interesting trends that are noteworthy for future studies.

Compared to EPs and attending physicians from non-surgical specialties, attending physicians from surgical specialties expressed the strongest preferences for extraversion and thinking. This result affirms studies wherein the MBTI and alternative personality assessment tools reveal similar findings [7, 8, 38, 39]. The overall consistency of surgeons’ personality preference for extraversion suggests that it is worthwhile to consider how surgical training in their work context might require extraversion; additional thorough research might inform how such a work culture affects surgeons who express a greater personality preference for introversion. The EPs in our study were more likely to exhibit the ISTJ preferences; with the exception of the E/I profile, the main difference between EPs and attending physicians from surgical and non-surgical specialties was highlighted in the S/N dichotomy. Although all attending physicians in our study expressed a preference for sensing, EPs exhibited less preference for sensing (61.1%) than did attending physicians from both surgical specialties (83.3%) and non-surgical specialties (78.3%). In other
words, the characteristics of an intuitive personality preference are not diametrically oppositional in understanding how EPs process information. Within Boyd and Brown’s study of EPs’ personality types, the single most common personality preference in their study cohort was the ENTP type ($n = 12; 17.7\%$); in fact, 58.8% of the EPs in the study exhibited the intuitive trait [2]. One possible explanation for this finding may be that, as outlined in the 2016 Model of the Clinical Practice of Emergency Medicine [40], when patients in the emergency department present ambiguous symptoms rather than a known illness or disease, EPs must use pattern recognition to diagnose conditions during such time-constrained encounters [41]. Paying attention to patterns and deconstructing their meanings are tasks associated with intuition [27]. Moreover, multitasking—a core skill in EM—requires the intuitive trait of pattern recognition [40, 42].

In our study cohort, attending physicians from non-surgical specialties were more likely to exhibit the judging (78.3%) preference than the attending physicians from surgical specialties (66.7%) and EPs (66.7%). Making decisions in a planned and organised manner with as much control as possible is a hallmark of attending physicians from non-surgical specialties. By contrast, EPs and attending physicians from surgical specialties may prefer flexibility and spontaneity in their decision making due to the nature of their work [27, 43, 44]. Indeed, we identified that attending physicians from surgical specialties and EPs scored higher in tough-mindedness and in impulsive sensation seeking than family medicine residents; the former were more likely to be ‘adrenaline junkies’ who expressed greater stress resistance and risk-taking abilities [42, 45, 46]. Overall, a scarce number of studies investigate the personality preferences of attending physicians from non-surgical specialties, and thus future research must be conducted to reveal more favourable comparisons and to construct a greater understanding of physicians from heavily staffed non-surgical specialties.

**Conclusion**

Our study demonstrates that junior doctors and attending physicians exhibit personality preferences for sensing, thinking, and judging. Attending physicians express these personality preferences more strongly than do junior doctors, and these findings highlight that, amongst physicians, career stage is associated with the accentuation of personality preferences. Furthermore, a more thorough understanding of personality preferences amongst physicians at varying career stages and across specialties can promote greater self-awareness amongst physicians as they negotiate workplace challenges and seek to improve their communication skills.

**Appendix**

| Career stage | Specialty group | No. |
|--------------|-----------------|-----|
| Junior doctors | | 39 |
| PGY1 | | 32 |
| PGY2 | Psychiatry | 1 |
| PGY3 | Emergency Medicine | 1 |
| | Nuclear Medicine | 1 |
| | Laboratory Medicine | 1 |
| | Family Medicine | 2 |
| | Physical Medicine and Rehabilitation | 1 |
| Attending Physicians | Surgery | 14 |
| | Obstetrics and Gynecology | 4 |
| | Emergency Medicine | 18 |
| | Pediatrics | 6 |
| | Family Medicine | 5 |
| | Internal medicine | 12 |

*Abbreviation: PGY1, postgraduate year 1

*Qualified specialist, attending hospital in particular specialty

*PGY1 Participants make provisional specialty choices
Abbreviations
E/A: Extraversion/Introversion; EM: Emergency medicine; EP: Emergency physician; ESTJ: Extraversion, sensing, thinking, judging; INTP: Introversion, intuition, thinking, perceiving; JP: Judging/perceiving; MBTI: Myers–Briggs Type Indicator; PGY1: Post-graduate year one; S/N: Sensing/Intuition; T/F: Thinking/feeling

Acknowledgements
All authors thank Chien-Da Huang for his help in manuscript peer-review prior to submission for improving the quality of this article.

Authors’ contributions
Author Contributions: conceptualization: YCC, CHC. Author Contributions: methodology: YCC, HMT. Author Contributions: software: RNYL, CLW. Author Contributions: validation: HMT, CHC. Author Contributions: formal analysis: YCC, MHT. Author Contributions: investigation: YCC, CLW. Author Contributions: resources: YCC, CLW. Author Contributions: data curation: YCC, CLW. Author Contributions: writing (original draft preparation): YCC, RNYL, XX. Author Contributions: writing (review and editing): HMT, CHC, XX. Author Contributions: visualization: HMT, CHC. Author Contributions: supervision: CHC. Author Contributions: project administration: RNYL, CLW. Author Contributions: funding acquisition: YCC. All authors read and approved the final manuscript.

Funding
This work was supported by funding from the Chang Gung Medical Foundation (Funding Number CDPRG3B061).

Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
Ethical approval for this study was obtained from the Chang Gung Memorial Hospital and Chang Gung University Institutional Review Board (103-7538B). Written informed consent was obtained from the study participants.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
1Chang Gung Medical Education Research Center (CG-MERC), Chang Gung Memorial Hospital, Linkou, Taiwan. 2Department of Emergency Medicine, Chang Gung Memorial Hospital, Linkou, Taiwan. 3Chang Gung University College of Medicine, Taoyuan, Taiwan. 4Department of Health Care Management, Chang Gung University, Taoyuan, Taiwan. 5Risk Society and Policy Research Center, National Taiwan University, Taipei, Taiwan. 6Department of Otorhinolaryngology, Head and Neck Surgery, Chang Gung Memorial Hospital, Linkou, Taiwan.

Received: 3 May 2019 Accepted: 3 September 2019
Published online: 23 September 2019

References
1. Clack GB, Allen J, Cooper D, Head JO. Personality differences between doctors and their patients: implications for the teaching of communication skills. Med Educ. 2004;38(2):177–86.
2. Boyd R, Brown T. Pilot study of Myers Briggs type Indicator personality profiling in emergency department senior medical staff. Emerg Med Australas. 2005;17(3):200–3.
3. Kim S, Kim J-H, Hur Y. A proposal on educational method of studying by comparing medical Students’ personality types and class achievement. Korean J Med Educ. 2005;17(2):107–20.
4. Jesse SA, O’Neill PN, Dosch RD. Matching student personality types and learning preferences to teaching methodologies. J Dent Edu. 2006;70(6):644–51.
5. Royston PJ, Mathieson K, Leafman J, Qian-Sheehan O. Medical student characteristics predictive of intent for rural practice. Rural Remote Health. 2012;12(2):107.
6. Barches NR, Vavra AK, Miller A, Brunincardi FC, Goss JA, Sweeney JF. General surgery as a career: a contemporary review of factors central to medical student specialty choice. J Am Coll Surg. 2004;199(5):792–9.
7. Leong FTL, Hardin EE, Gaylor M. Career specialty choice: a combined research-intervention project. J Vocat Behav. 2005;67(1):69–86.
8. Stilwell NA, Wallick MM, Thal SE, Burleson JA. Myers-Briggs type and medical specialty choice: a new look at an old question. Teach Learn Med. 2000;12(1):14–20.
9. Risucci D, LaManTA J, Ryan J. Personality types and preferences of emergency medicine residents: correlation with clinical performance evaluations. Ann Emerg Med. 1999;34(4):525.
10. Alisalamah M, Alhamdani A, Albasam M, Alaska Y. Distribution of the Myers Briggs type Indicator types in an emergency medicine residency training program in Saudi Arabia; 2017.
11. O’Connor SJ, Shewchuk RM, Raab DJ. Patterns of psychological type among health care executives. Hosp Health Serv Adm. 1992;37(4):431–47.
12. Benbasat J, Baumal R. Enhancing self-awareness in medical students: an overview of teaching approaches. Acad Med. 2005;80(2):156–61.
13. Contessa J, Suarez L, Nirschl T, Nazdaz G. The influence of surgeon personality factors on risk tolerance: a pilot study. J Surg Educ. 2015;72(8):806–12.
14. Flynn KE, Smith MA. Personality and health care decision-making style. J Gerontol Ser B Psychol Sci Soc Sci. 2007;62(5):261–P7.
15. Higgins M. Is there a relationship between the Myers-Briggs type indicator and emotional intelligence? J Manag Psychol. 2001;16(7):509–33.
16. Shin SJ, Kim KS, Lee DS. The effect of personal character on the results of clinical performance skill tests. Korean J Med Educ. 2011;23(2):111–7.
17. Schell RM, Dillorenzo AN, Li HH, Fragneto KY, Bowe EA, Hessel EA. 2nd. Anesthesiology resident personality type correlates with faculty assessment of resident performance. J Clin Anesth. 2012;24(7):566–72.
18. Bell MA, Wales PS, Torbeck LJ, Kunzer JM, Thurston VC, Brokaw JJ. Do personality differences between teachers and learners impact students’ evaluations of a surgery clerkship? J Surg Educ. 2011;68(3):190–3.
19. Duke S. What’s your type? Using the Myers–Briggs personality inventory to improve team performance. Commun Teach. 2009;26(4):142–7.
20. McNulty JA, Espiritu B, Halsey M, Mendez M. Personality preference influences medical student use of specific computer-aided instruction (CAI). BMC Med Educ. 2006;6:7.
21. Association of American Medical Colleges. Active Physicians with a U.S. Doctor of Medicine (U.S. MD) Degree by Specialty, 2017 [Internet]. Association of American Medical Colleges; 2017. Available from: https://www.aamc.org/data/workforce/reports/492536/2018-physician-specialty-datatype.html.
22. Workforce and Facilities Team ND. NHS Hospital & Community Health Service (HCHS) monthly workforce statistics. Kew, Surrey, UK: NHS Digital, part of the Government Statistical Service; 2019.
23. The Medical Board of Australia. Medical Board of Australia Registrant data [Internet]. The Medical Board of Australia; 2019. Available from: https://www.medicalboard.gov.au/registration.aspx.
24. Chang YC, Lee CH, Chen CK, Liao CH, Ng CJ, Chen JC, et al. Exploring the influence of gender, seniority and specialty on paper and computer-based feedback provision during mini-CEX assessments in a busy emergency department. Adv Health Sci Educ Theory Pract. 2017;22(1):57–67.
25. Salter D, Evans N, Forney DS. A longitudinal study of learning style preferences on the myers-briggs type indicator and learning style inventory. J Coll Stud Dev. 2006;47:173–84.
26. Tseng OC, Outcalt D, Boyer SL, Ware R, Landis D. Item validity of the Myers-Briggs type Indicator. J Pers Assess. 1984;48(3):255–6.
27. Myers-briggs.org. MBTI Basics. [online]. 2019. Available at: https://www.myers-briggs.org/my-mbti-personality-type/mbti-basics/. [Accessed 9 Sept 2019;2018].
28. Lloyd J. The Myers-Briggs type Indicator * and mainstream psychology: analysis and evaluation of an unresolved hostility, 2012. p. 23–34.
29. Kim S. A study on the relationship between personality, study satisfaction and academic achievement of medical students. Korean J Med Educ. 1999;11(2):271–84.
30. Budakoglu II, Karabacak O, Coskun O, Karabacak N. Personality and learning styles of final-year medical students and the impact of these variables on medical specialty choices; 2014. p. 138–41.
31. Brown F, Pepperd RD. Changes in medical students’ Myers-Briggs ‘preferences’ between their first and fourth years of school. Acad Med. 1994;69(3):244.
32. Silberman SL, Freeman I, Lester GR. A longitudinal study of dental students’ personality type preferences. J Dent Educ. 1992;56(6):384–8.
33. Sliwa JA, Shade-Zeldow Y. Physician personality types in physical medicine and rehabilitation as measured by the Myers-Briggs type Indicator. Am J Phys Med Rehabil. 1994;73(5):308–12.
34. Bleidorn W, Hopwood CJ, Lucas RE. Life events and personality trait change. J Pers. 2018;86(1):83–96.
35. Martinou E, Allan H, Vig S. Personality differences among junior postgraduate trainees in the United Kingdom. J Surg Educ. 2015;72(1):122–7.
36. Swanson JA, Antonoff NB, D’Cunha J, Maddaus MA. Personality profiling of the modern surgical trainee: insights into generation X. J Surg Educ. 2010;67(6):417–20.
37. Taylor AD, Clark C, Sinclair AE. Personality types of family practice residents in the 1980s. Acad Med. 1990;65(3):216–8.
38. Borges NJ, Savickas ML. Personality and medical specialty choice: a literature review and integration. J Career Assess. 2002;10(3):362–80.
39. Hoffman BM, Coons MJ, Kuo PC. Personality differences between surgery residents, nonsurgery residents, and medical students. Surgery. 2010;148(2):187–93.
40. Counselman FL, Babu K, Edens MA, Gorgas DL, Hobgood C, Marco CA, et al. The 2016 model of the clinical practice of emergency medicine. J Emerg Med. 2017;52(6):846–9.
41. Core Content Task, Force, II. The model of the clinical practice of emergency medicine. Acad Emerg Med Off J Soc Acad Emerg Med. 2001;8(6):660–81.
42. Heng KW. Teaching and evaluating multitasking ability in emergency medicine residents - what is the best practice? Int J Emerg Med. 2014;7:41.
43. Borges NJ, Osmon WR. Personality and medical specialty choice: technique orientation versus people orientation. J Vocat Behav. 2001;58(1):22–35.
44. Myers IB. MBTI manual: a guide to the development and use of the Myers Briggs type Indicator. 3rd ed. Palo Alto: California Consulting Psychologists; 1998.
45. Bascom E, Nerland M, Corsi D, Huber L, Kangas J, Kangas M, et al. 97: are emergency medicine residents adrenaline junkies? A comparison of risk taking traits and behaviors between emergency medicine and family practice residents. Ann Emerg Med. 2007;50(2):531.
46. Hojat M. Empathy in patient care: antecedents, development, measurement, and outcomes. Philadelphia: Springer; 2007.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.