Health Professions Education

Volume 6 | Issue 1 Article 13

2020-03-01

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Recommended Citation

Ramachandran, Vignesh; Loya, Asad; Shah, Kevin P.; Goyal, Shreya; Hansoti, Esha A.; and Caruso, Andrew C. (2020) "Myers-Briggs Type Indicator in Medical Education: A Narrative Review and Analysis," *Health Professions Education*: Vol. 6: Iss. 1, Article 13.
DOI: 10.1016/j.hpe.2019.03.002
Available at: https://hpe.researchcommons.org/journal/vol6/iss1/13

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Available online at www.sciencedirect.com

ScienceDirect

Health Professions Education 6 (2020) 31–46

www.elsevier.com/locate/hpe

Myers-Briggs Type Indicator in Medical Education: A Narrative Review and Analysis☆

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Received 30 October 2018; revised 25 March 2019; accepted 26 March 2019
Available online 11 April 2019

Abstract

Purpose: Health professionals are moving beyond traditional roles as vessels of science and are expected to exhibit excellence in psychosocial sciences, communication, and humanities. Medical education has shifted focus to non-cognitive aspects of training, which have been correlated with clinical performance, professionalism, interpersonal skills, and in-service exam scores. Psychometric tests are a means to gauge an individual's personality and behavioral characteristics. They have been used in various professional settings. The Myers-Briggs Type Indicator (MBTI) is an introspective psychometric questionnaire explaining an individual's decision-making, perception, and interactions. Medicine has used the MBTI by surveying providers and trainees. Particular interest is paid to its use in medical education. This review aims to provide a comprehensive review and analysis of MBTI use in medical education.

Method: A PubMed search (1975–2018) was performed to identify studies addressing MBTI in medical education using a combination of Boolean and MeSH search terms. Forty articles were included in the final review.

Results: Overall, 30% (12/40) of articles addressed MBTI in specialty/training setting selection, 52.5% (21/40) addressed MBTI in medical curricula, and 17.5% (7/40) addressed MBTI in evaluation/selection of trainees. MBTI preferences of different specialties showed inconsistencies. MBTI improves trainee communication skills, identifies those at risk for burnout, directs use of personalized study resources, among other domains. Biases in medical school and residency admissions processes are unearthed with MBTI. Furthermore, certain MBTI traits show stronger correlation with trainee clinical evaluations than board exam scores.

Conclusion: MBTI is a potentially powerful tool for medical education. However, a large portion of studies (30%) investigate its role in specialty choice, a domain with inconsistent results. Instead, MBTI may be better served to provide trainees with individualized study environments/resources, enhance communication skills, and provide burnout screening and support. Furthermore,

☆ None of the five above authors have competing interests.

Peer review under responsibility of AMEEMR: the Association for Medical Education in the Eastern Mediterranean Region.

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https://doi.org/10.1016/j.hpe.2019.03.002

it may address biases in the subjective medical school and residency interview processes and increase class psychodynamic diversity. New era problem-based learning and team-based learning may be enhanced with MBTI. In these ways, the application and interpretation of this psychometric tool may advance personalized medical education in the 21st century.

Keywords: Curriculum; Medical education; Myers-Briggs; Resident; Student

Contents

1. Introduction

The role of health professionals has evolved over the last century. Health professionals are no longer merely vessels of science. They are expected to exhibit excellence in psychosocial sciences, communication, and humanities. Health professions education has also evolved to fit these new roles.[1] From the addition of a combined psychology-sociology section to the Medical College Admission Test (MCAT) to incorporation of problem and team-based learning activities into medical curricula, educators have given weight to these traits.[2–4] From the admissions standpoint, non-cognitive (personality, self-efficacy, empathy) aspects of the application process are given increasing importance compared to cognitive determinants (MCAT and grade point average).[5,6] Furthermore, non-cognitive factors have been associated with increased clinical performance, professionalism, interpersonal skills, and board scores in medical students and residents.[7–9] Furthermore, assessing psychosocial aspects of individuals reduces implicit bias in the application process and increases admission of underrepresented minority students.[10]

Psychometric tests gauge an individual's personality and behavioral characteristics. They are used various professions such as business, sports, and law.[11–13] The Myers-Briggs Type Indicator (MBTI) is one of the most widely known and used.[14] MBTI constitutes a method of explaining an individual's decision-making, perception, and interactions in the world.[15,16] The standard MBTI consists of 93 questions branching results into four dichotomies: Extraversion versus Introversion, Sensing versus Intuition, Thinking versus Feeling, and Judging versus Perceiving, producing 16 distinct types or preferences.[14] This framework has popularized its use as a vehicle for team-building, communication, leadership, conflict resolution, and career advancement in various academic and professional settings, including healthcare. [17–19]

One area of particular use of MBTI in healthcare is within medical education. In students, MBTI has

been used to enhance introspection, awareness of others, specialty selection, communication, and leadership.[20–23] It may also predict student performance, decrease evaluative bias, and cater educational programs to personality types.[24–27] Despite this widespread use in the literature spanning decades, a review of the literature and with subsequent analysis of its utility is strikingly lacking.

In this study, we provide such a comprehensive review and critical analysis of MBTI use in medical trainee education (medical students and resident physicians). In doing so, we aim thorough describe the literature present and provide frameworks for refining and advancing the use of such psychosocial personality indices in medical education.

2. Methods

2.1. Search strategy

A literature review was conducted using PubMed to curate studies addressing MBTI in medical education. Literature review was performed on August 29, 2018 for studies between 1975 and 2018. PubMed was searched using the following Boolean search operations: MBTI OR Myers-Briggs OR Myers Briggs. MeSH analysis was used to identify the following additional search terms that were added to increase sensitivity and specificity: Myers-Briggs Type Indicator OR Myers Briggs Type Indicator OR Indicator Myers-Briggs Type.[28]

2.2. Selection criteria

Titles and abstracts of all papers were read by two independent authors (V.R. and A.C.) for inclusion: (1) use of MBTI in medicine/medical practice/medication education; (2) qualitative or quantitative analysis. Articles were excluded if: (1) full-text manuscripts not available; (2) full-text manuscripts not in English; (3) full-text manuscripts solely focused on dental/nursing/pharmacy non-medicine health professions. Discrepancies resolved by consensus between authors V.R. and A.L. with third reviewer (A.C.C.) available for adjudication.

2.3. Data extraction

After initial selection of manuscripts (Section selection criteria), authors V.R. and A.L. independently extracted qualitative and quantitative data from each paper independently into Microsoft Excel spreadsheets. Upon completion of independent data extraction, authors V.R. and A.L. consolidated the independently-derived spreadsheets. At this time, V.R. and A.L. identified preliminary themes in the data which were amenable to categorization. Categorization was completed independently by V.R. and A.L. with discrepancies resolved by consensus between authors V.R. and A.L. with third reviewer (A.C.C.) available for adjudication. Extracted quantitative data included all MBTI personality trends within included studies. Both quantitative and qualitative data were categorized into one of seven sections: specialty/practice setting selection, evaluation/selection of trainees, student performance, burnout, clinical skills and communication classes, student study methods, and clinical practice. Additionally, other information extracted for eligible studies included: authors, year, study design, population traits, study setting, results, and analytical findings. Microsoft Excel 2016 (Microsoft Corporation, Redmond, Washington, U.S.) was used as a software to extract, compile, and store data.

2.4. Analysis

An extensive literature search identified 695 total articles. After removing duplicates, 239 articles remained. Review of these articles' titles and abstracts removed 185 additional articles meeting exclusion criteria (158 articles were grossly out of scope discussing MBTI outside of medicine altogether, 16 articles discussing MBTI use in faculty not trainees, 11 articles not in English language) leaving 54 articles eligible for full manuscript review. Of these, 13 more were excluded (8 articles not in English language, 3 articles out of scope discussing MBTI use in faculty not trainees, 2 articles were opinion pieces). In the end, a final count of 40 articles were used to conduct the review article herein and presented in (Fig. 1). The 41 articles were reviewed and grouped: 32% (13/41) addressed MBTI in specialty/training setting selection, 51% (21/41) addressed MBTI in medical curricula, and 17% (7/41) addressed MBTI in evaluation/selection of trainees (Table 1).

3. Results and discussion

An overview of the studies extracted can be found in Table 1.

3.1. Specialty/practice setting selection

The MBTI has been utilized in medical students' specialty choice and resident physicians' selection of

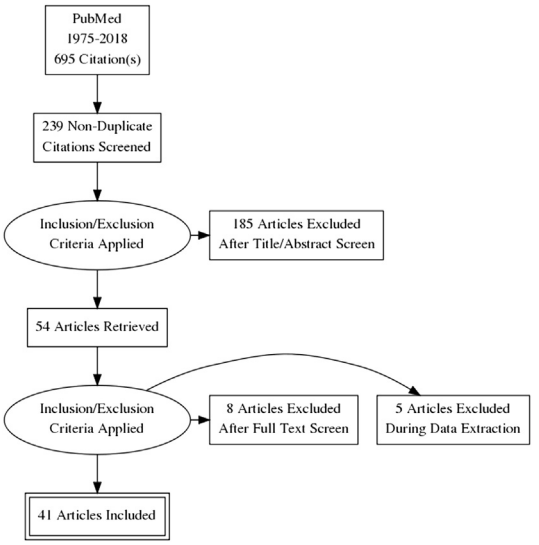

Fig. 1. Diagram of search strategy yielding 41 articles used in construction of this review of the use of the Myers-Briggs Type Indicator in medical education.

practice setting for decades. Multiple studies show that different MBTI preferences are associated with different specialty choice.[21,22,39,43,46,55,64] These studies are limited and studies are often not reproduced. Despite being a focus of MBTI use within medical education, distributions in MBTI preference by specialty choice in longitudinal and cross-sectional investigations are inconsistent calling into question its utility in this realm.[35,38,40,42,52] For instance, compared with data from the 1960s, the preference of resident physicians in all specialties between 1980s and 1990s indicate a shift towards Thinking (55%; 44% in 1950s) and Judging types (59%; 53% in 1950s) from Feeling and Perceiving.[36] Furthermore, evaluation of practice setting by MBTI preference are lacking and insufficient to make conclusions. For instance, isolated studies by Taylor et al. showed that there were significant differences in MBTI between civilian and military family practice residents, but not between the community-based and university-based residents. Meanwhile, Royston et al. notes that Extraverted type students were more likely intend on practicing in a rural setting.[30,55] These studies are not large enough or reproduced to warrant definitive conclusions.

A person's MBTI type may also change within a few years. Taylor et al. showed that within a few years significant preference differences developed amongst Family Medicine residents, highlighting the ever-changing personalities of individuals during training.[55] Therefore, evidence-based research is needed to best guide students if the MBTI or other personality indices are used for specialty selection. Brown et al. show that fifty-seven percent of medical students change their MBTI preferences between first and fourth years. Thus, if the MBTI is useful for specialty selection, students should be administered the MBTI prior to the residency application period in fourth year.[40] Regardless, findings vary between studies (Table 1), suggesting that the MBTI requires re-evaluation in aiding students' specialty selection.

Colloquially, certain specialties have been characterized by personalities. Surgeons are depicted as needing to be more Extroverted and Conscientious.[66] Alternatively, Internal Medicine physicians are considered more Introverted, “thinkers”, and empathetic.[67] These generalizations, however, lack depth as medicine becomes further subspecialized.[68,69] For example, Park et al. demonstrated that procedural Internal Medicine fields (Cardiology and Gastroenterology) have different personality traits than Endocrinology and Primary Care.[70,71] Similarly, General Surgery was the gateway to subspecialized fields like Orthopaedics and Otolaryngology; however, direct-entry residencies now exist for such fields. The personality preferences of students entering these fields may vary greatly and could explain why studies have failed to identify significant differences between personality traits/preferences of those entering surgical subspecialties or even between surgical and nonsurgical fields.[72] Additionally, Family Medicine residents have varying MBTI preferences by training setting, further limiting MBTI utility in specialty selection as medical students with different types likely seek different characteristics in selecting training programs.[55] Lastly, female medical students with Feeling preferences were more likely to choose Family Medicine than Thinking types, highlighting the impact of gender differences in specialty choice.[36] A lack of literature on MBTI preferences of rural practitioners and military physicians limits conclusions for these populations.

3.2. Evaluation/selection of trainees

Medical school admissions committees are to admit qualified students broadly representing the communities they serve. The necessity for social accountability and diversity is widely discussed in academic medicine.[73] As such, much research and call-for-action has focused on ethnic and socioeconomic underrepresentation.[74,75] However, psychological diversity should also be considered as personality preferences may

Table 1
Summary of papers studying Myers-Briggs Type Indicator in medical education.

Paper Name	Author(s)	Year of Publication	Total Participants of Study	Study Duration	Nature of Study	Subject group	Location of study	Study type	Experiment Type
The association between Myers-Briggs Type Indicator and Psychiatry as the specialty choice.	Yang et al.[22]	2016	835	N/A	Multi-Institutional	Medical Students	Data from 2011 AAMC surveys of multiple instituitions	Retrospective	Other
A standardized patient model to teach and assess professionalism and communication skills: the effect of personality type on performance	Lifchez et al.[29]	2014	40	N/A	Single-institutional	Residents	Johns Hopkins University School of Medicine	Prospective	Other
Medical student characteristics predictive of intent for rural practice	Royston et al.[30]	2012	141	N/A	Single-institutional	Medical Students	Pacific Northwest University of Health Sciences College of Osteopathic Medicine.	Retrospective	Other
Do personality differences between teachers and learners impact students' evaluations of a surgery clerkship?	Bell et al.[31]	2011	complex	2004–2009	Single-institutional	Medicat Students	Indiana University School of medicine	Prospective	Quasi-experimental
The personal interview: assessing the potential for personality similarity to bias the selection of orthopaedic residents.	Quintero et al.[20]	2009	complex	2004–2006	Single-institutional	Medical Students	Penn State College of Medicine	Prospective	Other
Personality types and performance on aptitude and achievement tests: implications for osteopathic medical education.	Sefcik et al.[32]	2009	263	2006–2007	Single-institutional	Medical Students	Midwestern University/Chicago College of Osteopathic Medicine in Downer's Grove Illinois	Prospective	Quasi-experimental
Non-cognitive variables and residency choice.	Neral et al.[33]	2008	98	3 years (unspecified)	Single-institutional	Medical Students	University of Mississippi Medical Center	Prospective	Other
Personality preference influences medical student use of specific computer-aided instruction (CAI).	McNulty et al.[34]	2006	116	N/A	Single-institutional	Medical Students	Loyola University Stritch School of Medicine	Prospective	Other

(*continued on next page*)

Table 1 (*continued*)

Paper Name	Author(s)	Year of Publication	Total Participants of Study	Study Duration	Nature of Study	Subject group	Location of study	Study type	Experiment Type
Personality type and medical specialty choice.	Wallick et al.[35]	1999	1262	N/A	Single-institutional	Medical Students	Lousiana State University School of Medicine	Retrospective	Other
Myers-Briggs type and medical specialty choice: a new look at an old question.	Stilwell et al.[36]	2000	3987	N/A	Multi-Institutional	Medical Students	Lousiana State University School of Medicine	Retrospective	Other
Does the admissions committee select medical students in its own image?	Wallick et al.[37]	2000	complex	N/A	Single-institutional	Medical Students	Louisiana State University Health Sciences Center	Prospective	Quasi-experimental
Personality types in academic medicine.	Wallick et al.[38]	1999	1797	1988–1998	Single-institutional (but compared to past data from multiple instituitions)	Medical Students	Louisiana State University Health Sciences Center	Prospective	Other
Physician personality types in physical medicine and rehabilitation as measured by the Myers-Briggs Type Indicator.	Sliwa et al.[39]	1994	78	N/A	Single-institutional	Residents	Northwestern University Medical School	Prospective	Quasi-experimental
Changes in medical students' Myers-Briggs "preferences" between their first and fourth years of school.	Brown et al.[40]	1994	35	1992–1993	Single-institutional	Medical Students	University of Tennessee, Memphis, College of Medicine	Prospective	Other
Personality, clinical performance and knowledge in paediatric residents.	Lacorte et al.[41]	1993	30	N/A	Single-institutional	Residents	Department of Pediatrics, Brooklyn Hospital center and Department of Surgery, North Shore University Hospital	Prospective	Other
New results relating the Myers-Briggs Type Indicator and medical specialty choice.	Friedman et al.[42]	1988	521 students	N/A	Single-institutional	Medical Students	University of North Carolina at Chapel Hill School of Medicine	Retrospective	Other

Personality types of family practice residents as measured by the Myers-Briggs type indicator.	Harris et al.[43]	1985	75	1977–1980	Single-institutional (but compared to area physicians)	Residents	University of Utah Family Practice residency program	Prospective	Quasi-experimental
Teaching Communication Skills to Radiology Residents.	Itri et al.[44]	2017	21	2015	Single-institutional	Residents	University of Virginia	Prospective	Other
The influence of surgeon personality factors on risk tolerance: a pilot study.	Contessa et al.[45]	2013	27	N/A	Single-institutional	Residents	Saint Raphael campus of Yale New Haven Hospital in New Haven, Connecticut.	Prospective	Other
Anesthesiology resident personality type correlates with faculty assessment of resident performance.	Schell et al.[27]	2012	36	N/A	Single-institutional	Residents	University of Kentucky College of Medicine	Prospective	Other
Personality types of otolaryngology resident applicants as described by the Myers-Briggs Type Indicator.	Zardouz et al.[21]	2011	137	2008–2009	Single-institutional	Medical Students	University of California, Irvina	Prospective	Quasi-experimental
Personality profiling of the modern surgical trainee: insights into generation X.	Swanson et al.[46]	2010	39	2009	Single-institutional	Residents	Department of Surgery, University of Minnesota	Prospective	Other
Personality type and clinical evaluations in an obstetrics/gynecology medical student clerkship.	Davis et al.[47]	2005	63	N/A	Single-institutional	Medical Students	University of Arkansas	Prospective	Quasi-experimental
Resident physicians who continue Balint training: a longitudinal study 1982–1999.	Johnson et al.[48]	2003	206	N/A	Single-institutional	Residents	Medical University of South Carolina	Retrospective	Quasi-experimental
Residents' formal knowledge acquisition and preferred learning styles.	Blake et al.[49]	1995	36	N/A	Single-institutional	Residents	Department of Family Medicine, University of Mississippi Medical Center	Prospective	Other
Family practice residents' perspectives on Balint group training: in-depth interviews with frequent and infrequent attenders.	Musham et al.[50]	1994	16	N/A	Single-institutional	Residents	Department of family medicine, University of South Carolina	Cross-sectional	Quasi-experimental

(*continued on next page*)

Table 1 (*continued*)

Paper Name	Author(s)	Year of Publication	Total Participants of Study	Study Duration	Nature of Study	Subject group	Location of study	Study type	Experiment Type
Examining whether certain Myers-Briggs "personality preferences" can be used as criteria to select standardized patients.	O'Connell et al.[51]	1993	57	1991	Single-institutional	Standardized Patients	University of Illinois College of Medicine and Dentistry	Prospective	Quasi-experimental
A comparative view of the Myers-Briggs type indicator.	Eicke et al.[52]	1993	44	1988–1991	Single-institutional	Residents	University of Mississippi Medical Center	Prospective	Other
Osteopathic medicine and primary care practice: plan or serendipity?	Melnick[53]	1990	n/a	N/A	N/A	N/A		N/A	Other
Factors associated with the frequency of after-hours in-person patient consultations.	Martin et al.[54]	1990	26	N/A	Single-institutional	Residents	Medical University of South Carolina Family Medicine Center	Retrospective	Other
Personality types of family practice residents in the 1980s.	Taylor et al.[55]	1990	778	N/A	Single-institutional (but used national data)	Residents	Department of Family Medicine, Oregon Health Sciences University School of Medicine	Cross-sectional	Other
Correlates of burnout among family practice residents.	Lemkau et al.[56]	1988	67	1984	Single-institutional	Residents	Family practice residencies associated with Wright State University.	Prospective	Quasi-experimental
The effect of physician personality on laboratory test ordering for hypertensive patients.	Ornstein et al.[57]	1988	53	N/A	Single-institutional	Residents	Family practice residencies associated with Wright State University.	Retrospective	Other
A comparison of personality types among female student health professionals	Rezler et al.[58]	1977	complex	1973–1974	Single-institutional	Medical Students (and other healthcare profession students)	University of Illinois Medical Center	Prospective	Quasi-experimental
Types of family practice teachers and residents: a comparative study.	Quenk et al.[59]	1975	complex	N/A	Multi-Institutional	Residents	University of New Mexico, School of Medicine	Prospective	Quasi-experimental

Comparison of the abbreviated and original versions of the Myers-Briggs Type Indicator personality inventory.	Leiden et al.[60]	1986	81 students	N/A	Single-institutional	Medical Students	University of Nevada School of Medicine	Prospective	Other
A small-group instruction experiment in medical education.	Brinton et al.[61]	1984	Complex	N/A	Single-institutional	Medical Students	University of Utah School of Medicine	Prospective	Quasi-experimental
Evaluation of computer-aided instruction in a gross anatomy course: a six-year study.	Mcnulty et al.[62]	2009	811	N/A	Single-institutional	Medical Students	Loyola University Chicago Stritch School of Medicine	Prospective	Other
Advanced communication skills: conflict management and persuasion.	Ang[63]	2002	n/a	2001	Single-institutional	Medical Students	University of Chicago Hospitals	Prospective	Other
Square pegs in round holes: has psychometric testing a place in choosing a surgical career? A preliminary report of work in progress.	Gilligan et al.[64]	1999	complex	1994−1997	Single-institutional	Medical Students and Residents	St. George's Hospital in London, U.K.	Prospective	Quasi-experimental
Using a personality inventory to identify risk of distress and burnout among early stage medical students.	Bughi et al.[65]	2017	185	N/A	Single-institutional	Medical Students	Keck School of Medicine	Prospective	Other

N/A = not applicable.

underlie performance, empathy, clinical skills, and career choices.[76–80] MBTI use has revealed peculiar findings in admissions processes. The MBTI types of 175 first-year medical students were the same as the MBTI types of the admissions committee on all dichotomies, reflecting a possible bias in the committee.[37] On the other hand, longitudinal assessment of the MBTI types of 1797 first-year Louisiana State University School of Medicine medical students between 1988 and 1998 show no significant changes in MBTI types apart from a preference for Intuition over Sensing compared to 9 other schools within a dataset of 12 schools. This may signify that committees prefer certain characteristics/traits in their accepted applicants that limits personality diversity. [35]

The personality similarities between friends increase the likelihood of shared likes, dislikes, and activity preferences, reinforcing behavior patterns.[81–83] As such, admitting students with preferences mirroring those of the committee is detrimental. Increasing psychological diversity may enrich the learning environment and produce more well-rounded physicians who can better interact and care for diverse patient populations. Admissions committee biases should be addressed. To this end, some medical schools have integrated Computer-based Assessment for Sampling Personal characteristics (CASPer), a tool assessing interpersonal skills and decision-making, to account for psychological differences between applicants.[84,85] Such tools should be considered more widely in medical school admissions to promote diversity.

At the resident level, Orthopaedic faculty physicians ranked Orthopaedic residency interviewees more favorably when they shared particular personality preferences ($P = 0.044$), highlighting innate bias. This bias was not present in interview rankings by basic scientists or orthopaedic resident interviewers.[20] This questions the validity/weight given to the subjective components of medical school/residency admissions, such as interviews where biases may manifest and applicants may not project their true personality traits.[21,86] However, Powis et al. do show that interviews may predict academic performance and may hold value in candidate selection.[87] Therefore, a more uniform approach to the trainee interview process may be required to limit biases and increase validity, fairness, and reliability.[88]

3.3. Student performance

Grading on clinical rotations have been analyzed using MBTI. Clinical evaluations of medical students in an Obstetrics/Gynecology clerkship did not correlate with National Board of Medical Examiners (NBME) scores ($P > 0.05$). Additionally, while NBME scores do not correlate with the MBTI Extraversion type ($P > 0.05$), a correlation was observed between Extraversion preference and clinical evaluation ratings ($P = 0.005$).[47]

While preclinical medical student performance is largely based on knowledge-based assessments, clinical performance is heavily determined by subjective evaluations by faculty and residents.[89] Clinical clerkship grades are important in residency selection with some specialty program directors citing it as one of the most crucial factors.[26] Thus, identifying variables associated with clinical clerkship grades is important. Lee et al. surveyed a cohort of 2395 medical students who completed one or more required clerkships (Internal Medicine, Surgery, Obstetrics/Gynecology, Pediatrics, Neurology and Psychiatry). The authors show that more reserved students (in patient presentations, answering questions) are more likely to report lower grades in Internal Medicine, Pediatrics, Psychiatry clerkships (all $P < 0.05$). Additionally, other associations with lower clerkship grades were: males in Obstetrics/Gynecology and Psychiatry; Asians in Obstetrics/Gynecology, Pediatrics and Neurology (all $P < 0.05$). Alternatively, more assertive students received lower grades less frequently in all clerkships ($P < 0.03$) except Internal Medicine.[89] These findings question the validity of clinical evaluations in assessing student performance due to possible biases and lack of correlation with objective evaluation through shelf exam scores. Extraversion may enable students to openly demonstrate enthusiasm, knowledge, teamwork, and communication with evaluators and patients, which may help to better subjective grading. Furthermore, the MBTI may explain findings by Lee et al. as a student's response to a particular clerkship environment may influence how they are perceived. The authors postulate males may respond to the Obstetrics/Gynecology clerkship setting with an Introversion preference (projecting greater reticence), but with equivalent clinical skills and knowledge to females.[89,90]

At the resident level, long-term clinical performance evaluations of Anesthesiology residents are higher for Extraverted and Sensing types than their counterparts ($P < 0.05$). However, daily performance scores are higher only for Sensing than Intuition types ($P < 0.05$).[27] Paediatric faculty physician evaluations of resident knowledge is directly associated with scores on in-training exams ($P < 0.01$) and Extraversion type ($P < 0.01$), but inversely associated

with age ($P < 0.01$).[41] For fellowship selection, personal knowledge of the applicant and recommendation letters are the most important factors.[91–93] As such, resident clinical evaluations, which may influence the quality of department recommendations, may need re-evaluation and validation of their utility.

While most MBTI and standardized testing literature show no association, a few studies do. Osteopathic Intuition-Feeling medical students have significantly lower scores on medical licensing exams than other types despite no difference in medical school entrance exam scores ($P = 0.002$).[32] At the resident level, first and third-year Family Medicine resident in-training exam scores showed significant differences for Feeling (score increase of 109.4 points) versus Thinking (72.2 points, $P = 0.02$) and Judging (101.0 points) versus Perceptive types (60.0 points, $P = 0.03$).[49] Similarly, Extraversion was independently predictive of in-service scores amongst Pediatrics residents.[41] Possibly, certain exams may be more conducive to particular personality types. These results may be hindered by sample size or selection bias.

3.4. Burnout

Burnout increases risk of depression, anxiety disorders, sleep abnormalities, fatigue/lethargy, substance use, divorce, and suicide.[94] U.S. physician burnout and satisfaction worsened between 2011 and 2014 and now more than 50% of U.S. physicians experience professional burnout.[95] However, burnout begins early in training. Between 28% and 45% of medical students and 27%–75% of residents experience burnout.[96] Such findings have led to policy changes, duty hour restrictions, and support for trainees within a culture of wellness.[97] However, limited in the discussion of trainee burnout is the role of personality types. Drummond discusses character traits that may manifest in physicians when they are burned out.[98] Trainees' perceptions of and reactions to stressors in the work environment may predispose them to burnout differently.[99] Fundamentally, the MBTI identifies how individuals interact with their environment as a product of their interests, needs, values, and motivations. One study examining MBTI and burnout in underclassmen medical students showed that Extraversion types have greater positive well-being, professional efficacy, and lower levels of depression compared to Introversion types (all $P < 0.05$).[65] Studies not using MBTI show introverted trainees are more likely to burnout than extroverts.[100–102] Hypothetically, introverts facing stress may be less likely to discuss their struggles, delaying therapeutic dialogue and mental health care. Additionally, Perceptive, Feeling, and Intuitive Family Medicine residents are less emotionally exhausted, show less depersonalization, and have greater sense of accomplishment compared to Judging, Thinking, Introverted and Sensing peers, respectively ($P < 0.05$).[56] The authors postulate Perceptive types may more readily recognize their burnout. Overall, the MBTI may serve as a preventative "screening" tool for first-year medical students and residents, identifying "risk factor" preferences for burnout.

3.5. Clinical skills and communication classes

Various industries use the MBTI to improve communication skills.[18,19] This has permeated into medical education as well. After a communication skills workshop incorporating the MBTI, fourth-year medical students reported increased confidence and attitudes towards conflict management and resolution.[63] Similarly, MBTI has been favorably utilized in communication workshops for Radiology residents.[44] In a majority of Intuitive-Thinking Surgery residents, self-reported comfort in delivering bad news correlated with evaluation by standardized patients (SP) and did not correlate with prior education on the topic.[103] With respect to SPs, another study showed the MBTI preferences of SPs do not significantly differ from those of the general population.[51] Educating and assessing interpersonal and professional communication skills is difficult.[104] Resident often indirectly learn these skills through observation of superiors.[103] Patients and physicians differ significantly in their MBTI dimensions; yet, current communication models assume all patients respond similarly.[105,106] To that extent, Allen et al. present the MBTI as the most suitable tool for this purpose as it is principally a psychometric test.[107] Early incorporation of the MBTI in clinical skills training of medical students may allow for an individualized communication framework that can be applied to patient care. This concept may extend to appropriate use of body language and emotional touch with patients, allowing for increased communication and emotional intelligence.[108]

3.6. Student study methods

Students have different learning styles, which may be due to their backgrounds and experiences.[109] While some literature has reported this not be true, other studies have shown that different/individual learning styles do exist.[110–116] Diverse educational programs

and instructional media accommodate individualized learning.[117,118] Medical students with Sensing preference utilize both online discussion-based and tutorial computer-aided instruction programs more than Intuitive types ($P < 0.05$). Judging types only prefer discussion-based applications relative to Perceiving types, who utilize multiple modalities. These studies emphasize that personality types can greatly influence preferred study methods.[34,62] Medicine demands lifelong learning and trainees and educators should explore individualized approaches.[106] The MBTI may assist in doing so, especially at transition points in training, such as for first-year medical students and post-graduate year one residents.[119]

Intuitive-Feeling medical students prefer small group courses over lectures ($P < 0.05$).[61] Numerous medical schools have incorporated problem-based learning, team-based learning, and flipped classroom models into curriculum instead of traditional large group lectures, improving medical student satisfaction and performance.[120–122] The MBTI could be used at the college level to identify medical schools with curriculum models best suited for students.

3.7. Clinical practice

The MBTI has also been used to examine how resident physicians practice medicine. No differences exist on in-person consultation frequency by MBTI temperament of Family Medicine residents;[54] however, Intuitive Family Medicine residents order 20.5% more tests than Sensing types in outpatient settings ($P < 0.05$). Surgical trainees with Thinking, Extraverted, and Perception personality types have higher risk tolerance than other types.[57] Family Medicine residents who completed short- and long-term Balint training, a form of medical communication emphasizing emotional and personal understanding and the therapeutic potential of the doctor-patient relationship, are significantly more likely to be Intuitive types ($P < 0.05$).[48,50] During medical school, students are exposed to new knowledge, models of reasoning, and perception of information, which often changes their MBTI preferences.[58] This may influence their practice of medicine later. As such, different training environments may lend to different practice behaviors, which ultimately determine the value of care provided to patients.[129]

3.8. Study limitations

Several limitations exist in our study. The MBTI, while the most commonly used personality index in medical education research, is one of many such tests, all of which are not validated. However, when compared to Sixteen Personality Factor Questionnaire and the abbreviated MBTI, the original MBTI form shows compared results.[52,60] Studies with small sample sizes limit generalizability of results. Observational studies and lack of longitudinal studies limit extrapolation of findings. The utility of results from older studies are questionable as specialties have evolved over time. From our standpoint, errors in data extraction and identification of papers may diminish findings or, theoretically, could contradict our results. Additionally, the majority of studies are American as we excluded manuscripts not published in English. This may be a source of potential bias given that teaching and learning may differ in different parts of the world. Thus, the role of MBTI and its findings within medical education may be different in different parts of the world. This makes our findings less generalizable. Furthermore, personality changes can occur over time and even throughout medical school. This concept, coupled with papers spanning decades, makes our review in some ways less applicable/translatable to everyday practice given that older findings may not necessarily hold true today in the ever-changing landscape of medical education. Lastly, it is difficult to make generalized claims based off one or two studies. However, given the limited scope of the literature, we have tried to make associations and provide insights that may probe these concepts further in more experimental studies.

4. Conclusion

The MBTI is a potentially powerful tool for medical education. However, its predominant role of assisting trainees with specialty choice is questionable. Instead, the MBTI may be better served to develop new-era curricula, provide trainees with personalized study environments (ex. Small groups), communication skills training, and burnout support, and unearth biases in admissions and evaluation processes. In these ways, the MBTI may advance personalized medical education in the 21st century.

Disclosures

None.

Ethical approval

Not applicable.

Funding

None.

Other disclosure

None.

Acknowledgements

The authors would like to acknowledge Assistant Professor of Medicine and Pediatrics Diana Ebere Stewart, MD for her guidance and support in this manuscript.

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