Emotional Intelligence in Medical Students is Inversely Correlated with USMLE Step 1 Score: Is there a Better Way to Screen Applicants?

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Abstract

Background: The primary aim of this study was to investigate whether USMLE board scores correlate with the emotional intelligence of medical students. We hypothesized that higher Step 1 scores would be associated with lower emotional intelligence.

Methods: This prospective study included medical students who self-reported their USMLE Step 1 score and completed a survey designed to measure their emotional intelligence. The survey was composed of a Grit Scale, a Hardiness-Resilience quiz, and the "Reading the Mind in the Eyes" quiz. For participants who completed all three instruments, a composite score was equal to the sum of the three scoresThis study was performed at Emory University School of Medicine in Atlanta, Georgia. Of the 85 medical students who were recruited to participate, 72 completed all aspects of this study (85% completion rate).

Results: Pearson correlation analyses showed that grit (r=-0.105, P=0.34), hardiness-resilience (r=-0.230, P=0.04), the eye quiz (r=-0.033, P=0.79), and the composite score (r=-0.187, P=0.12) were inversely correlated with USMLE scores. Participants who scored higher than the national average had a lower mean hardiness score compared to those who scored lower than the national average (P=0.03). Those who scored at least one standard deviation above the national average had a lower mean hardiness score (P=0.05) and a lower composite score (P=0.04).

Conclusion: Higher USMLE Step 1 scores are associated with lower emotional intelligence, namely hardiness, in medical students.

Keywords: EMOTIONAL INTELLIGENCE, USMLE STEP 1, HARDINESS, GRIT, RESIDENCY SELECTION

Introduction

Each year, residency programs devote a considerable amount of resources to select the next class of residents. Much like the arduous application process to gain acceptance into medical school, residency applications are often screened on the basis of board scores, medical school grades, class rank, and medical student performance evaluations. For many programs, board scores serve as a primary screening tool because of their universal availability and the standardized process by which the exam is administered. As such, these scores are often weighted heavily in the screening process and some applications are discarded without any formal review, solely on the basis

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of failing to meet a minimum board score. While this process is widely accepted and fairly uniform across the country, there is no consensus on whether United States Medical Licensing Exam (USMLE) board scores are predictive of success during residency. Although some data shows that scores below 200 are predictive of in-training exam failure (1-3), many residency programs have instituted minimum Step 1 board cutoff scores that are higher than the mean. Due to this paradigm, it stands to reason that residency programs may be missing out on qualified applicants with the current application screening system or may need to alter their system to account for non-cognitive skills.

Emotional intelligence (EI), a concept that has gained considerable popularity since the 1990s, warrants further study to determine if it correlates with USMLE board scores and to investigate whether it has utility in projecting success of resident physicians. EI is defined as the ability to perceive, use, understand, and manage emotions (4), and is often considered a combination of "soft skills" including self-awareness, self-regulation, social skills, motivation, and empathy. As evidenced by the fact that effective communication and the ability to form a good patient-physician relationship are two important skills that medical schools are trying to teach their students, EI is gaining traction as an important aspect of medical education. Despite the apparent importance of EI, it has yet to make its way into the application screening process. One study found participant's Step 1 score to be a slightly negative predictor of emotional intelligence (5); however, no other studies looking into this correlation have been conducted to our knowledge.

The primary aim of this study is to investigate whether United States Medical Licensing Exam (USMLE) Step 1 board scores correlate with emotional intelligence of medical students at a top accredited United States medical school. If the negative correlation holds true, specialties and residency programs that select for high board scores may be inadvertently selecting a group of physicians with diminished soft skills, which could have implications in areas such as patient satisfaction and medico legal liability.

Methods

Approval was obtained from the institutional review board prior to initiation of the study. Once approval was granted, all second, third, and fourth year medical students enrolled at a single institution who had completed USMLE Step 1 by May 1, 2017 were invited to participate in this study and participants were sent an online survey via email. Due to the nature of the survey, the response goal was 70 students. The individuals who indicated a willingness to participate were given information about the benefits and risks of participation and the purpose of the study. Demographic information collected through the survey included gender, medical school graduation year, USMLE Step 1 score, and projected subspecialty. Participants additionally completed three instruments to capture their emotional intelligence – a Grit Scale, "Reading the Mind in the Eyes" quiz (Eyes Test), and a Hardiness-Resilience quiz (DRS-15). The primary outcome was a composite Emotional Intelligence score that was computed by adding up the scores from the three instruments.

The distribution of EI scores amongst all patients was examined in descriptive histograms and box plots, and a Kolmogorov Smirnov test was used to confirm a normal distribution. For descriptive analysis, absolute mean values for each score were expressed as a nominal point value with standard deviation (SD). A Pearson bivariate correlation analysis was performed to evaluate the correlation between EI scores and USMLE Step 1 scores, and the product-moment correlation coefficient (r) was reported with associated p-value. Correlation was characterized as poor (0.00-0.20), fair (0.21-0.40), moderate (0.41-0.60), good (0.61-0.80), or excellent

(0.81-1.00) in accordance with previously accepted guidelines. Based upon published national outcomes for the 2014 USMLE Step 1 exam, the USMLE Step 1 data was subsequently converted to categorical data. An independent samples t-test was used to explore differences in mean EI scores for those who scored above versus below the published 2014 USMLE Step 1 national average, and again to compare those who score at least one standard deviation above the national average compared to the remaining cohort who score below the one standard deviation level. All data was de-identified before analysis and confidentiality was maintained.

Results

Of the 85 medical students who were recruited to participate, 72 completed all aspects of this study (85% completion rate). There were 50 males and 35 females. There were 24 participants in the class of 2017 (mean Step 1 score 244), 31 in the class of 2018 (mean Step 1 score 241), and 30 in the class of 2019 (mean Step 1 score 240). Of the 85 participants, all participants completed the Grit Scale, 79 completed the DR-15 quiz, and 72 completed the eye quiz.

Pearson correlation analyses showed that grit (r=-0.105,P=0.34), hardiness-resilience (r=-0.230, P=0.04), the eye quiz (r=-0.033, P=0.79), and the composite score (r=-0.187, P=0.12) were inversely correlated with USMLE Step 1 scores. Independent samples t-test revealed that participants who scored higher than the national average, 229±20 had a significantly lower mean hardiness compared to those who scored lower than the national average (P=0.03) (Table 1). Those who scored at least one standard deviation above the national average had a significantly lower mean hardiness score (P=0.05) and a significantly lower composite score (P=0.04) (Table 2).

Discussion

The purpose of this study was to determine if a correlation exists between USMLE Step 1 score and emotional intelligence of medical students. This topic is especially relevant given the increasing number of applicants for a limited number of residency slots, coupled with the heavy weight that cognitive measures are given in the residency selection process. We hypothesized that higher Step 1 scores would be associated with lower emotional intelligence, and if true, may provide evidence to consider altering the selection process to include some non-cognitive measures and

Table 1: EI scores for participants who scored above versus below national average on USMLE Step 1 exam

EI modality	EI scores (mean±SD)		Sig
	USMLE Step 1 >229	**USMLE Step 1<=229**	
Grit	4.0±0.6	3.8±0.6	P=0.260
Hardiness	34.0±4.4	31.1±4.3	P=0.026
Eye test	27.6±5.2	28.5±4.1	P=0.462
Composite	65.6±1.8	63.4±0.9	P=0.295

Table 2: EI scores for participants who scored above versus below 1 SD above national average on USMLE Step 1 exam

EI modality	EI scores (mean±SD)		Sig
	USMLE Step 1 >249	**USMLE Step 1<=249**	
Grit	3.9±0.1	3.8±0.1	P=0.476
Hardiness	32.4±0.6	30.2±0.8	P=0.050
Eye test	28.8±4.2	27.4±4.5	P=0.202
Composite	65.0±5.8	61.5±8.2	P=0.044

emphasizing the development of soft skills in the medical school curriculum.

Previous studies have investigated the relationship between USMLE scores and success in residency (3, 6-9); however, to our knowledge, there are a paucity of studies that have examined the relationship between USMLE scores and emotional intelligence. While there are a number of published measures designed to measure EI, our goal was to combine multiple instruments to encompass all aspects of the soft skills that make up emotional intelligence – motivation, self-awareness, self-regulation, social skills, and empathy. Each individual instrument was selected to measure at least one component of the aforementioned soft skills.

The 12-item Grit Scale (10) was selected to capture participant's motivation, as it has been validated in multiple populations to measure "trait-level perseverance and passion for long-term goals" (11). In this scale, participants answered 12 questions on a 5-point Likert scale from "very much like me" to "not at all like me". Each response is associated with a point from 1 to 5 and the points were added up and divided by 12. The maximum score on this scale is 5 (extremely gritty) and the minimum score is 1 (not at all gritty). The average grit of our cohort was 3.84 (0.57). While there was no statistically significant difference in grit between participants who scored above the national average versus those who scored below the national average on USMLE Step 1, overall there was a negative association noted (r=-0.105). Additionally there was no difference when comparing those who scored more than at least one standard deviation above the mean to those who scored lower than one standard deviation below the mean.

The Hardiness-Resilience (DRS-15) quiz, designed and validated to measure how people see the world and make sense of experiences, was chosen to capture the soft skills of self-awareness and self-regulation. The DRS-15 is comprised of 15 questions that are answered on a scale of "not at all true" to "completely true". Each answer is scored from 0 to 3 and added together, for a maximum score of 45 and a minimum score of 0 (average 29.2±4.6). Scores 39 and above are considered very high in hardiness, scores 34-38 are considered high, scores 28-33 are considered average, scores 22-27 are considered low, and scores below 22 are considered very low. DRS-15 was negatively associated with Step 1 score (r=-0.230, P=0.04). Participants who scored higher than the national average, 229±20, had a significantly lower mean hardiness score, 31.1±4.3 vs. 34.0±4.4, compared to those who scored lower than the national average (P=0.03). In fact, the two means fall into different categories of hardiness, as the participants who scored below average on Step 1 had "high" hardiness and those that scored higher than average on Step 1 had "average" hardiness. Those who scored at least one standard deviation above the national average also had a significantly lower mean hardiness score, 30.3±4.4 vs. 32.4±4.3, P=0.05.

The "Reading the Mind in the Eyes" quiz is a 36 question quiz that shows pictures of faces between the nose and the brow and asks participants to name the emotion of the person from looking at their eyes. The quiz, which measures a person's ability to understand and recognize others' emotions, was selected to capture participants' social skills and empathy. The average score has been reported to be between 26-28 (12, 13). The average score in our cohort was 28.3±4.3, which is comparable to previous studies. There was no statistically significant difference found between groups; however, there was a slightly negative correlation observed (r=-0.033, P=0.79).

The composite score was calculated by adding the three individual instrument scores together in an attempt to test each component of a participant's emotional intelligence. The maximum score is 86 and the minimum score is 1. The average composite score in this cohort was 63.9±6.8. Those who scored at least one standard deviation above the national mean on Step 1 had a statistically significantly lower

composite score, 61.5±8.2 compared to those who scored less than one standard deviation above the national mean, 65.0±5.8 (P=0.04). This finding is interesting given that each individual instrument was not statistically significantly correlated with Step 1 scores and provides evidence that the EI composite score may be useful to measure emotional intelligence.

It is important to note that the methodology and expected follow-up in this study are consistent with a survey, not a clinical trial. While clinical studies generally require an 80% response rate, the response rate achieved in this study was 20%, consistent with response rates noted in other studies that have emailed surveys to participants (14). Because this study was performed at a single institution, there may be limitations in the generalizability of the results, especially given the small sample size and that the average Step 1 score in this cohort was higher than the national average. Despite this, we feel as though this study warrants further investigation into a better screening process for applicants, especially in competitive fields that require high USMLE Step 1 scores to progress beyond the initial screening process. Future studies should include multiple institutions to examine if these trends are seen across the country. There is also a need for continued exploration into if EI changes throughout the undergraduate medical education process, if EI varies by subspecialty choice, and how emotional intelligence impacts patient satisfaction in practicing physicians.

In conclusion, higher USMLE Step 1 scores are associated with lower emotional intelligence, namely hardiness, in medical students. Because most residency selection processes fail to incorporate non-cognitive assessments when ranking applicants, residency programs that select for high board scores may be inadvertently selecting a group of future physicians with diminished soft skills which could have implications in areas such as patient satisfaction, malpractice suits, and burnout. Future studies should be performed to examine the relationship between emotional intelligence and success in residency and clinical practice.

Acknowledgment

Conflict of Interest

The author declares no conflict of interest.

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