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Research

Do MCAT, NBME, and UWorld practice exam scores help predict performance on USMLE Step 1?

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Abstract:

Background: The blueprint to matching into a top residency program has changed significantly over the past few decades, culminating in the current iteration that places strong emphasis on scores from the United States Medical Licensing Examination (USMLE) Step 1. Although current literature exists that demonstrates correlations between scores on the 1991 version of the Medical College Admission Test (MCAT), Comprehensive Basic Science Exam (CBSE), and USMLE Step 1, little focus has been placed on the predictive abilities of the 2015 MCAT, the Comprehensive Basic Science Self-Assessment (CBSSA) practice exams from the National Medical Board of Examiners (NBME), and self-assessments from the popular UWorld question bank.

Methods: The participants in this study are third year medical students who recently took the USMLE Step 1 exam and completed an online survey via Qualtrics. The survey asked students to accurately report their scores on the MCAT, scores from all CBSSA forms, scores from both self-assessments from UWorld, and USMLE Step 1 scores.

Results: Results from 87 third year medical students (49% of respondents) demonstrate an average Step 1 score of 238. Multiple linear regressions were performed on MCAT scores, CBSSA exam scores, UWorld self-assessment scores, and USMLE Step 1 scores in order to elucidate any potential relationships. These data demonstrated that Step 1 scores are strongly correlated to: UWorld self-assessment 2 *($r=0.86$, $p<0.0001$)*, CBSSA form 16 ($r=0.83$, $p<0.0001$), and UWorld self-assessment 1 ($r=0.82$, $p<0.001$). Alternatively, the lowest correlation to actual Step 1 scores was students' performance on the 1991 version of the MCAT ($r=0.17$, $p=0.01$). Correlation to Step 1 was higher with the 2015 MCAT ($r=0.52$, $p<0.001$).

Conclusions: Our study suggests that the best predictor of performance on USMLE Step 1 are UWorld self-assessments 1 & 2 and CBSSA form 16. Conversely, the poorest predictor of performance on USMLE step 1 is the score received on the 1991 version of the MCAT. The

2015 MCAT seems to be a better predictor of academic success in medical school than the 1991 version of the MCAT.

Introduction:

The formula for matching into one's top choice for residency training has gone through many changes over the past two decades, with current emphasis placed on performance on the United States Medical Licensing Examination (USMLE) Step 1. As such, average USMLE Step 1 scores continue to climb, increasing by nearly 10 points in the last 10 years[1]. The current average Step 1 score is 229[1]. Many of the most competitive specialties, such as dermatology, orthopedic surgery, and plastic surgery, have average USMLE Step 1 scores around the 85th percentile[2]. The emphasis on scores from Step 1 are compounded by medical schools switching to a pass/fail curriculum in the first two years[3].

Although the importance of Step 1 scores is well communicated, students have difficulty gauging how prepared they are based on practice exams. Existing literature mainly focuses on the predicative values of the 1991 version of the Medical College Admission Test (MCAT) and Comprehensive Basic Science Exam (CBSE) scores. Poor associations have generally been found between the 1991 version of the MCAT and Step 1 scores[4], prompting the Association of American Medical College (AAMC) to create the 2015 MCAT that has an added behavioral science section, among other changes[5]. To our knowledge, this is the first study that assesses correlation between scores on the USMLE Step 1 and 2015 MCAT. On the other hand, CBSE scores have been shown to have a strong association with Step 1 score[6,7].

Yet, little research has been done on the predicative capabilities of Comprehensive Basic Science Self-Assessment forms (CBSSA) and UWorld self-assessments, both regarded as the "gold standard" in preparation for Step 1. The first of our study's two objectives aims to address if whether the 2015 MCAT is a better predictor of academic success in medical school than the 1991 version of the MCAT. Additionally, our second objective focuses on determining which practice exam is best at predicting eventual Step 1 score.

Methods:

Institutional approval:

Approval for this study was given by the Institutional Review Board at Saint Louis University School of Medicine (SLUSOM).

Setting:

In most medical schools in the United States, the first two years of medical school are "pre-clinical years" where students first attend basic science courses followed by organ-based courses. At the end of the second year, students are typically given a designated "dedicated period" to study for the USMLE Step 1 examination. This period lasts anywhere from 3-8 weeks. Most of the participants completed the examination between March 2017 and May 2017.

Participants and Study Design:

The participants in this study are third year medical students who recently took the USMLE Step 1 exam and completed an online, confidential survey via Qualtrics. All third year medical students were emailed the Qualtrics survey, asking for basic demographics, scores on the MCAT, scores on CBSSA forms 13, 15, 16, 17, 18, & 19, scores on self-assessments 1 & 2 from UWorld, and USMLE Step 1 scores. Linear Regressions and associated p-values were individually calculated for Step 1 scores vs 1991 version of MCAT, 2015 MCAT, CBSSA exams, and UWorld self-assessments. The average age for participants was 24.5 years with an even distribution of males and females (50% each).

Results:

A total of 99 students filled out the Qualtrics survey; however, 12 surveys had to be excluded since they were incomplete and thus 87 students (a 49% response rate) successfully filled out the Qualtrics survey. The average Step 1 score for these students is a 238 (67^{th} percentile). The average age of participants at the time of the survey was 24.5. Approximately 52% of the respondents are female, whereas 48% of the respondents are male.

MCAT:

45 students (52%) had taken the 2015 MCAT, whereas 42 students (48%) had taken the 1991 version of the MCAT. For easier comparison of MCAT scores between the two examinations, self-reported MCAT scores were converted to percentiles based off AAMC guidelines[8,9]. For students who took the old version of the MCAT, the average Step 1 score is 243 and average percentile on the MCAT is 89^{th} percentile. For students who took the new version of the MCAT, the average Step 1 score is 233 and average percentile on the MCAT is 81^{st} percentile.

In calculating linear regression plots for Step 1 vs MCAT scores, the Pearson correlation coefficient was found to be 0.17 for the 1991 version of the MCAT ($p=.01$), compared to 0.52 for the 2015 MCAT ($p<0.0001$) as shown in figures 1 and 2.

NBME CBSSA:

During the dedicated period to study for USMLE Step 1, 20 students (23%) took CBSSA form 13, 25 students (29%) took CBSSA form 15, 30 students (35%) took CBSSA form 16, 46 students (53%) took CBSSA form 17, 57 students (66%) took CBSSA form 18, and 48 students (55%) took CBSSA form 19.

Pearson correlation coefficients calculated were highest on CBSSA form 16 ($r=0.83$, $p<0.0001$) and lowest on CBSSA form 13 ($r=0.58$, $p<0.01$). The Pearson correlation coefficients for the remainder of the forms include 0.67 on CBSSA form 15 ($p<0.0001$), 0.71 on CBSSA form 17 ($p<0.0001$), 0.77 on CBSSA form 18 ($p<0.0001$), and 0.71 on CBSSA form 19 ($p<0.0001$) as shown in figures 3-8.

UWorld self-assessment 1 and 2:

During the designated study period, 66 students (76%) completed UWorld self-assessments 1 and 2. Pearson correlation coefficients calculated were higher on UWorld self-assessment 2 ($r=0.86$, $p<0.0001$) compared to UWorld self-assessment 1 ($r=0.82$, $p<0.0001$).

Discussion:

If academic success in medical school is centered around scores received on the rigorous Step 1 exam, the MCAT seems to be a poor prognostic indicator. Although correlations were much higher with the newer version of the MCAT (*r=0.52 vs r=0.17*), it still remains relatively poor at predicting performance in the first two years of medical school. Our research serves as a reminder for medical school admissions that acceptance in medical school should remain a holistic approach, incorporating MCAT scores along with extracurricular activities, personal statements, letters of recommendation, and intangible qualities that make students great doctors.

For CBSSA practice exams, our research shows that the best predictor of success on USMLE Step 1 is form 16 (*r=0.83, p<0.0001*). This is followed by form 18 (*r=0.77, p<0.0001*), form 17 (*r=0.71, p<0.0001*), and form 19 (*r=0.71, p<0.0001*). A pervasive ideal that circulates among a majority of medical students is that newer the CBSSA practice exam is, the more accurate the score; however, this study finds evidence that does not support this logic. It is the opinion of the authors that although the newer forms of the CBSSA perhaps more closely model the current version of the USMLE Step 1 in content, the newer forms may not be best at predicting performance on Step 1.

As a whole, UWorld self-assessments from the popular UWorld question bank had the best correlation with scores on Step 1. Particularly, UWorld self-assessment 2 seemed to be the single best predictor of performance on Step 1 in our study (*r=0.86, p<0.0001*). Because these practice examinations have the strongest association with Step 1, we advise medical students to save at least one self-assessment a week before their scheduled exam to get a fair assessment of how prepared they are.

There are, however, limitations to our study. First, there is an inherit bias in surveys wherein students feel less compelled to fill out the survey if they did poorly on Step 1. Although our survey was confidential, the competitive nature of medical school forces some students to be more guarded on sharing such sensitive material. As a result, our participants tended to be higher scorers. Second, because of the ubiquitous thought that newer forms of the CBSSA have a more accurate depiction of the Step 1 exam, more students reported taking CBSSA forms recently released. This resulted in inherit bias against older forms of CBSSA and can partially explain the lower Pearson correlation coefficients for CBSSA forms 13 (*r=0.58, p<0.01*) and 15 (*r=0.67, p<0.0001*). Another confounding variable in our study is that students tend to take the CBSSA exams and UWorld assessments in different order. Thus, some students might have taken a particular form of CBSSA early in their studying, whereas other students took the same form of CBSSA at the end of their studying. This is less likely to effect data on UWorld self-assessment 2, a test typically taken towards the end of the dedicated study period. Finally, it is difficult to generalize findings from our survey due to the 49% response rate. Although this is a reasonable response rate given the nature of how busy medical school is, for future studies, we encourage researchers to further incentivize students to fill out surveys. Although all students who completed the survey were randomly selected for gift cards, the monetary value of a gift card likely outweighed taking time to fill out a survey on such personal information.

Conclusion:

This study demonstrates that the newer version of the MCAT is superior than the older version of the MCAT at predicting scores on USMLE Step 1. However, neither has a strong association with scores on Step 1. Of the practice exams available to medical students, the best practice tests for assessing scores on Step 1 include UWorld self-assessments 1 & 2 and CBSEE form 16. Future studies are needed to verify these conclusions.

Practice Points:

1. UWorld self-assessments 1 and 2 positively correlate with actual performance on Step 1.

2. CBSEE form 16 seems to be an equal predictor of success on Step 1 as UWorld self-assessments 1 and 2.

3. The 2015 MCAT seems to be a better predictor of medical school performance than previous iterations.

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Figures/Tables:

Figure 1: Linear regression (r^2=0.0284) for Step 1 score vs 1991 version of MCAT

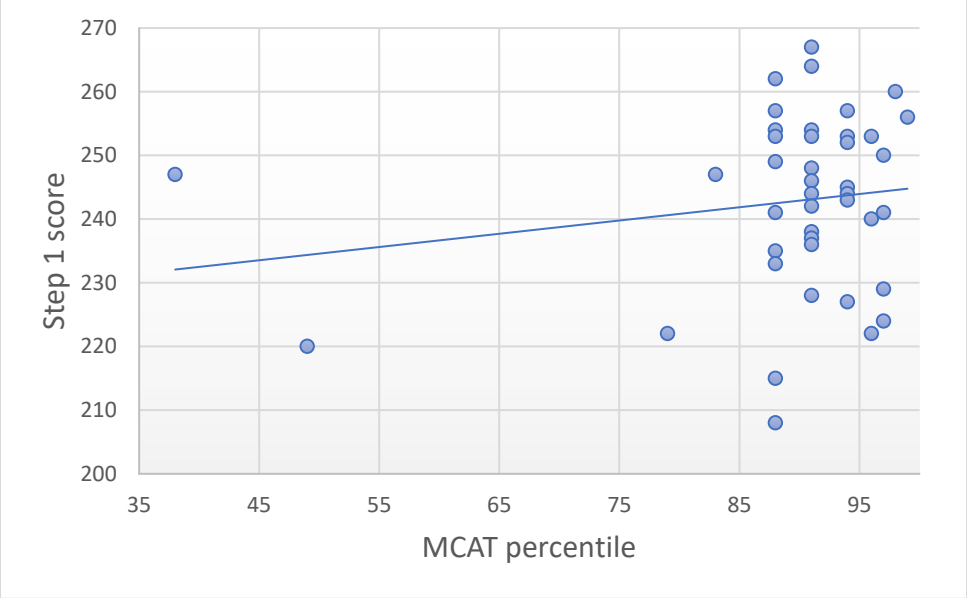

Figure 2: Linear regression (r^2=0.268) for Step 1 score vs 2015 MCAT

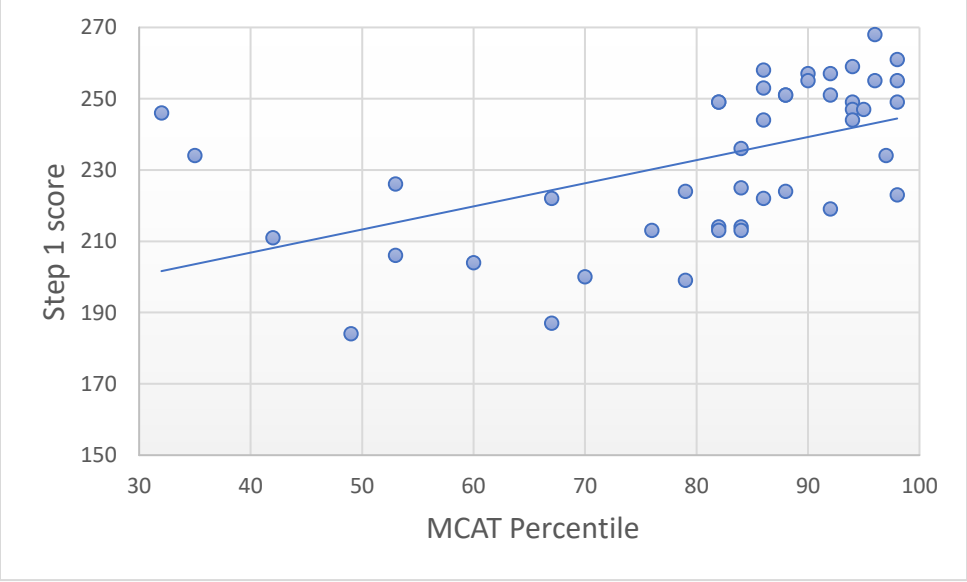

Figure 3: Linear regression (r^2=0.3373) for Step 1 score vs CBSSA 13

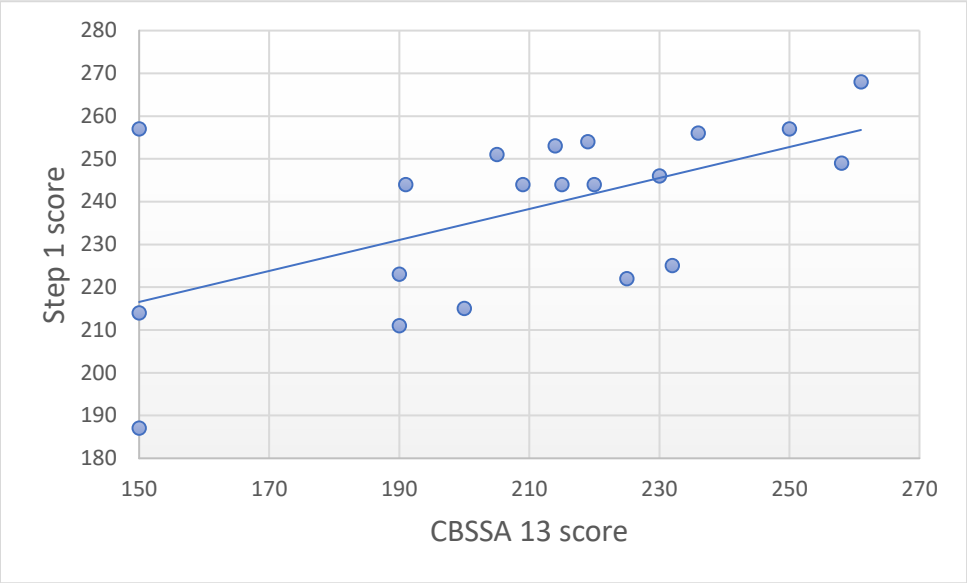

Figure 4: Linear regression (r^2=0.6708) for Step 1 score vs CBSSA 15

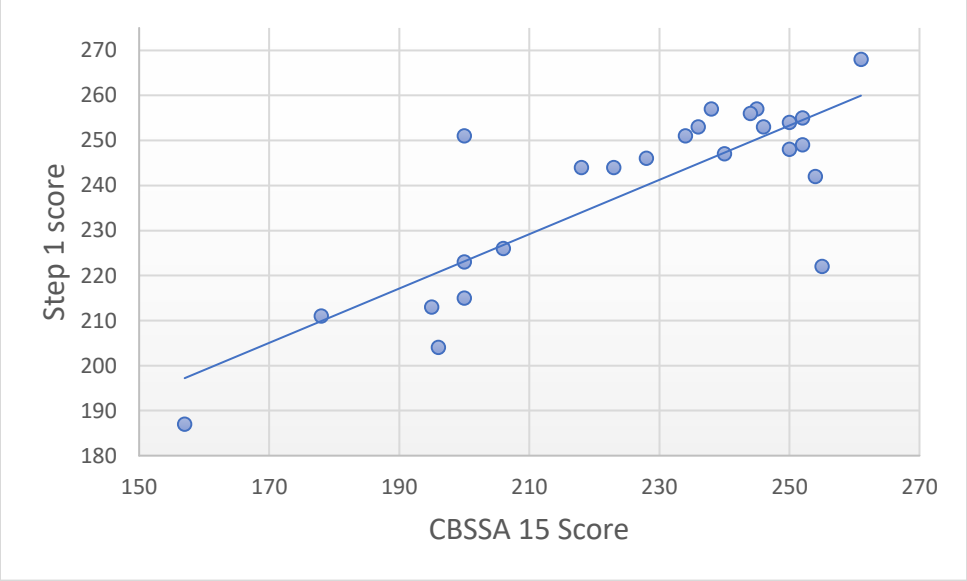

Figure 5: Linear regression (r^2=0.6982) for Step 1 score vs CBSSA 16

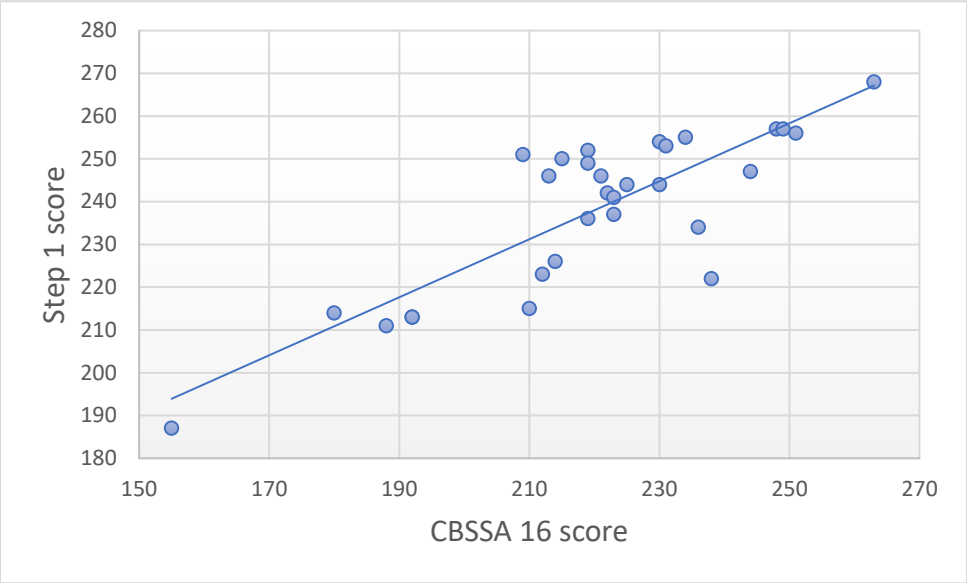

Figure 6: Linear regression (r^2=0.5037) for Step 1 score vs CBSSA 17

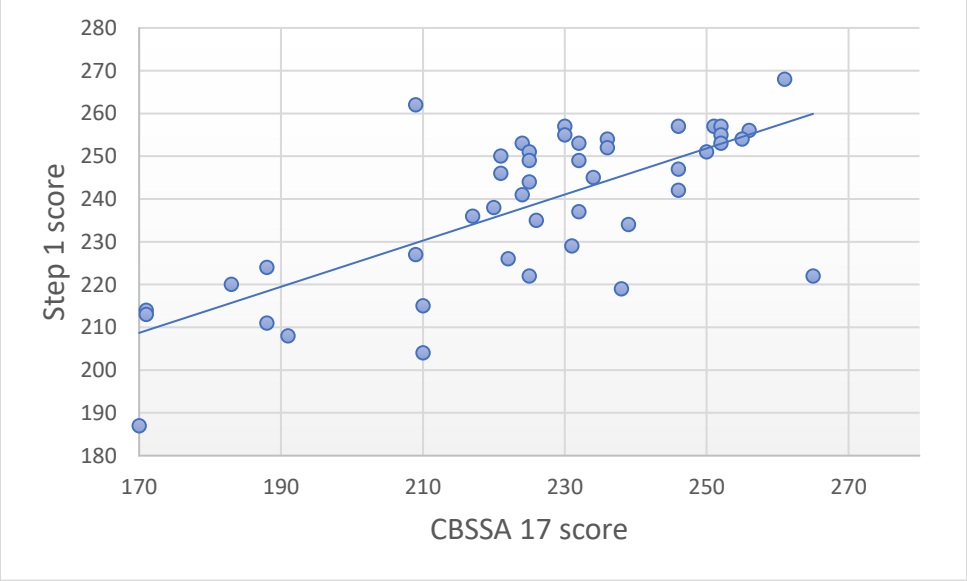

Figure 7: Linear regression (r^2=0.5995) for Step 1 score vs CBSSA 18

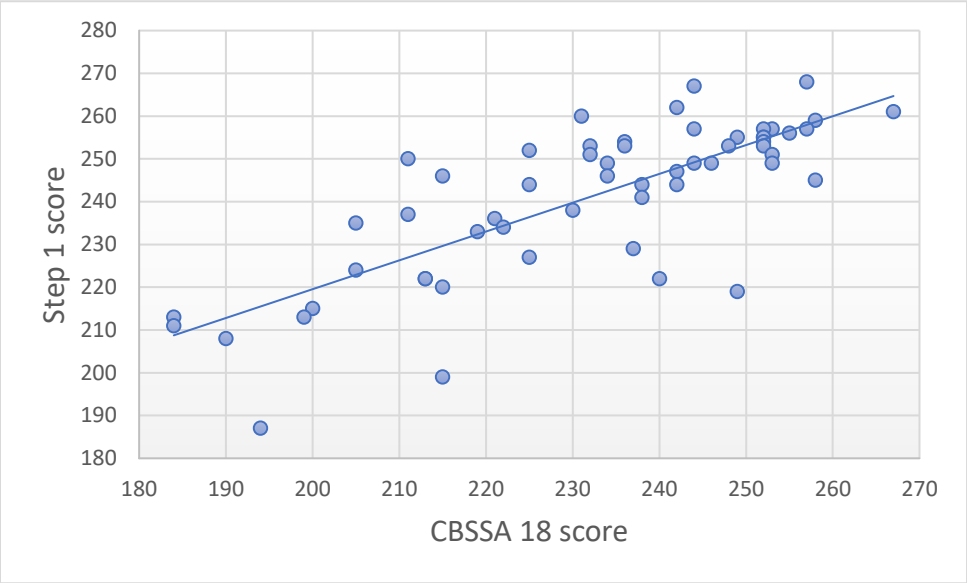

Figure 8: Linear regression (r^2=0.4983) for Step 1 score vs CBSSA 19

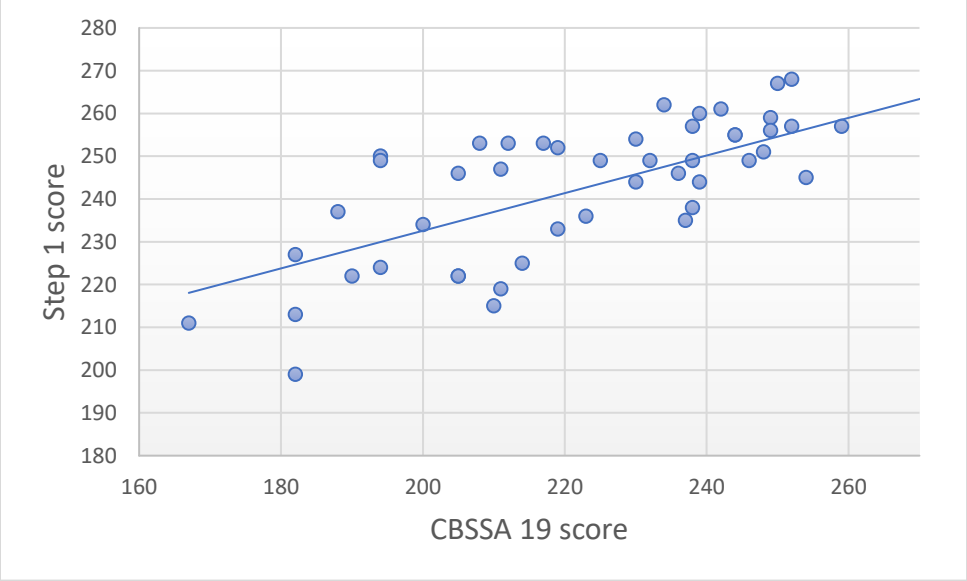

Figure 9: Linear regression (r^2=0.6787) for Step 1 score vs UWorld 1

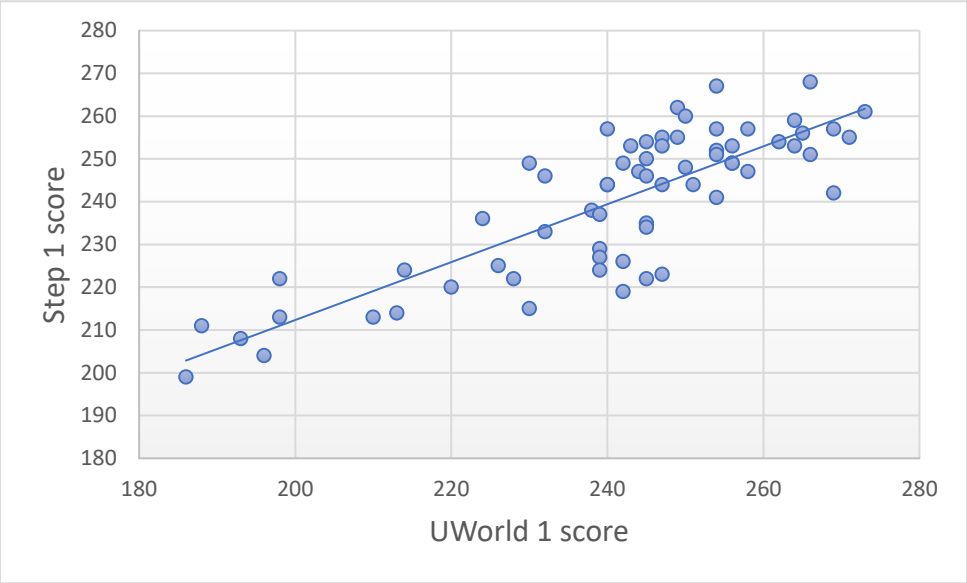

Figure 10: Linear regression (r^2=0.7398) for Step 1 score vs UWorld 2

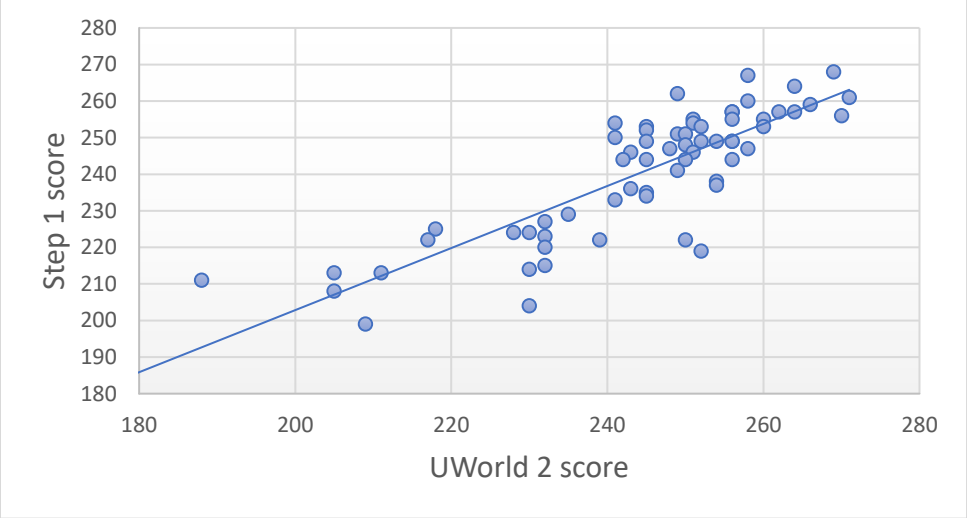

Table 1: Summary of Pearson correlation coefficients

Examination	n	Pearson correlation coefficient	p value
1991 MCAT	45	0.17	<0.0001
2015 MCAT	42	0.52	<0.0001
CBSSA 13	20	0.58	<0.01
CBSSA 15	25	0.67	<0.0001
CBSSA 16	30	0.83	<0.0001
CBSSA 17	46	0.71	<0.0001
CBSSA 18	57	0.77	<0.0001
CBSSA 19	48	0.71	<0.0001
UWorld 1	65	0.83	<0.0001
UWorld 2	65	0.86	<0.0001

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We would like to thank all the medical students who took time to respond to the survey. We would also like to thank Rachel VonLuehrte for her hard work in helping to collect data for this paper.

Declaration of Interest:

The authors report no declarations of interest.