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Medical Students' Attitudes Toward The Medical College Admission Test

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MEDICAL STUDENTS' ATTITUDES TOWARD THE MEDICAL
COLLEGE ADMISSION TEST

by

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A THESIS

Presented to the Faculty of
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MEDICAL STUDENTS' ATTITUDES TOWARD THE MEDICAL
COLLEGE ADMISSION TEST

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University of Nebraska, 2010

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The following study analyzed the attitudes held by pre-clinical medical students about the Medical College Admission Test or MCAT. One hundred and eighty first-year and second-year medical students at a public Midwestern medical university participated in this study. Participants completed the "Medical Students Attitudes toward the Medical College Admission Test" survey during their morning lectures near the end of their spring semester. A composite scale score of the Likert items of the survey was computed and the proportion of students with attitudes ranging from strongly agree to strongly disagree was calculated. For six of the twelve Likert items the largest proportion of participants disagreed with the statements about the MCAT and its use in the admission process and its applicability to their current medical education. Other questions included how participants prepared for the MCAT and if they completed each of the subsections were addressed as well. Future research could determine if attitudes between students accepted into medical school and those not accepted are drastically different.

Dedication

To medical students of the past, present, and future; I wrote this to acknowledge your perspectives because they are important, even before your name ends in M.D.

And most importantly to my husband and favorite medical student, Solomon; this thesis is dedicated to you.

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Introduction

Medical doctors' practice various forms of medicine from general practice to neurosurgery. Yet, all medical doctors start their professional career as a medical student. To start their medical education, the student must be accepted into a public or private medical university. One part of the admission process is taking the Medical College Admission Test or MCAT which is taken during the student's junior or senior year of undergraduate college. The primary focus of this research study examines the attitudes medical students hold about the MCAT. Their attitudes are important to gain perspective on medical students' thoughts about a standardized admission test they were required to take.

Standardized tests are of particular interest to researchers and policy makers because tests and their scores are often vital components in decision making processes. Two of the most widely known standardized tests, for example, are the SAT and ACT. Both of these tests are taken by high school juniors and seniors every year before they start applying to colleges. These tests are used as part of the college admission process, though the weight on the test scores depends on the particular college or university (Sternberg, 2004; Syverson, 2007). Generally, specialized institutes or tech schools do not require an ACT or SAT score as part of the admission process; but universities and four-year colleges often require an ACT or SAT score to be admitted. For example, one large Midwestern research university's undergraduate admission office suggests applicants have scored a twenty on the ACT or 950 (sum of Verbal and Quantitative) on the SAT (2009). There are also various standardized tests used to gain admission to professional or higher education programs. These tests include but are not limited to the

LSAT (Law School Admission Test), GMAT (Graduate Management Admission Test), PCAT (Pharmacy College Admission Test), GRE (Graduate Record Examination), DAT (Dental Admission Test), and MCAT (Medical College Admission Test).

The Medical College Admission Test or MCAT was developed in 1928 to address difficulties with dropout rates in medical schools, although currently it is used as an admission criterion for United States and Canadian medical schools (McGaghie, 2002). Recently, the test was changed from an eight-hour, paper-and-pencil test to a four- and -a-half to five -hour computer-based test. The MCAT has consisted of these four subsections since 1991: verbal reasoning, physical sciences, biological sciences, and a writing sample (AAMC, 2010a). Each test starts with the verbal reasoning section, which has forty questions and has a sixty minute time limit. This section tries to measure an individual's ability to comprehend, assess, and relate information from reading passages (McGaghie, 2002). The next section covers the physical sciences. It is composed of fifty-two questions and has a seventy -minute time restriction. The content area of this section is general chemistry and physics problems (Blado, 2000). The third section on the MCAT is the biological sciences section. This section has a time limit of seventy minutes and includes fifty- two questions. These questions assess achievement in biology and organic chemistry (McGaghie, 2002). The final section is a writing sample. Students are given sixty minutes to complete this section. Test takers must complete two essays; each one addresses a specified topic. This section aims to address a student's ability to write compositions (Hojat et al., 2000).

As the name suggests, the MCAT is used as an admission test as part of the application process into medical universities. The purpose of the MCAT is to assess

ability and knowledge that medical doctors and medical instructors have acknowledged as key fundamentals for success in medical school and later in their medical careers (AAMC, 2010a). Like other standardized tests, the MCAT has been extensively researched. An important research topic deals with the predictive validity of the MCAT. Research on the predictive variability of the MCAT examines the extent to which the MCAT alone or in combination with other admission variables can predict medical students' pre-clinical (first and second year) performance, scores on all three boards, and clerkship performance (third and fourth year). Basco, Way, Gilbert, and Hudson (2002) suggest the MCAT and undergraduate grade-point averages are robust predictors of the exams taken during medical school. Wiley and Koenig (1996) propose MCAT scores individually have somewhat higher relationships with medical school grades in pre-clinical years than grade-point averages alone. Additionally, prediction was enhanced when MCAT scores and undergraduate grade point averages were used together. Julian (2005) also reports that medical school grades are best predicted when MCAT scores and undergraduate grade point averages are used jointly. A meta-analysis by Kreiter and Kreiter (2007) reviewed the literature on the validity of undergraduate grade point averages and MCAT scores in twenty- nine studies and concluded the use of MCAT score and undergraduate grade point averages as admission variables in medical school was useful. The MCAT scores have also been shown to have predictive validity with all three steps of the United States Medical Licensing Exams (USMLE), the most often noted in research is the USMLE Step 1 which is taken after the second year of medical school. Veloski et al. (2000) indicated the MCAT was a better predictor than undergraduate science grade-point average on all three licensing exams. The MCAT had

the largest relationship with USMLE Step 1 but the MCAT was also correlated with the USMLE Step 2 and USMLE Step 3. Similar to the medical school performance, the MCAT combined with undergraduate grade- point averages does a better job at predicting USMLE Step 1 scores (Wiley & Koenig, 1996; Julian, 2005). A meta-analysis done by Donnon, Paolucci, and Violato (2007) which included twenty-three studies examined the relationships among scores on the MCAT and/ or board results. The predictive validity coefficient between pre-clinical medical school performance and MCAT scores was $r = 0.39$, while the correlation equaled 0.34 for clerkship performance and MCAT scores. Additionally, the predictive validity coefficient between MCAT scores and the licensing exams are as follows: USMLE (United States Medical Licensing Examination) Step 1 $r = 0.60$, USMLE Step 2 $r = 0.38$ and USMLE Step 3 $r = 0.43$. All of the predictive validity coefficients increased in the meta- analysis after restriction of range adjustments. Furthermore, research has investigated the relationships of different sections of the MCAT. Basco et al. (2002) suggest the biological sciences section has the highest correlation with USMLE Step 1. The verbal section has been found to be a stronger predictor for clinical performance (Veloski et al., 2000; Haught & Wells, 2004). Often, the Writing Sample section is not included in the predictive validity studies because of it is scoring system. Yet, a study by Hojat et al. (2000) established it was more correlated to clinical performance in later years than the pre-clinical performance when fundamental science knowledge is learned. Finally, clinical grades in medical school are related to the MCAT scores specifically the Verbal Reasoning and Writing Sample scores. Huff (1999) suggests MCAT scores independently account for approximately a fifth of the variance in third year clerkship grades. Presently, according to the

Association of American Medical Colleges (AAMC) website a comprehensive review of the MCAT is currently underway (2009); they reported that this effort constitutes the fifth time for the MCAT to be assessed by that body.

While research supports the usefulness of the MCAT in the admission process; it is important to note that the MCAT is only one element of the admission process for medical schools. There are numerous other factors taken into account: total college grade-point average, science grade-point average, personal statement, community service hours, letters of recommendation, previous medical experiences, etc. Currently, each medical school sets its own criteria for each component of the admission process. An article by Albanese, Farrell, and Dottl, (2005) suggested that medical schools could use a threshold criterion to remove admittance of high risk students. This approach suggests using undergraduate GPA and MCAT subtests scores to predict USMLE Step 1.

Every year the Association of American Medical Colleges (AAMC) gives two separate surveys that address preparing for and taking the MCAT: the Pre- MCAT Questionnaire and the Matriculating Student Questionnaire. According to the AAMC's website the Pre-MCAT questionnaire is a web-survey emailed to undergraduate students after they sign up to take the MCAT (AAMC, 2010c). This survey asks students why they are taking the MCAT, future career plans, financial loan information, and other demographic questions. The Matriculating Student Questionnaire is given to medical students during their first-year orientation week (AAMC, 2010b), if their medical university chooses to participate. This survey addresses applying for medical school, career plans, paying for medical school, and demographic questions. Both surveys are for AAMC internal use though the results for the Matriculating Student Questionnaire are

accessible to participating medical schools. Though both of these surveys ask prospective and current medical students about their experiences with the MCAT neither asks their opinions of the test itself or its usefulness in the admission process. This study intends to fill a gap in this existing knowledge by asking students, who have almost completed their first and second year of medical school, their attitudes toward the MCAT. These students are more accustomed to their current medical school training and testing situations than the sample used for the Matriculating Student Questionnaire.

The second variable in this study is preparation method for the MCAT. It is vital for educators and researchers to know how current students prepared for the test, so prospective medical students know how successful applicants have prepared and the amount of time they spent preparing. Prospective students have many options available to them as preparatory materials. Students may prepare by themselves, with classmates, or with a professionally trained individual or tutor such as at a test preparation program or a school. There are numerous preparation books for the MCAT at major bookstores and testing centers offer private tutoring or prep courses. Books generally are the least inexpensive preparation method, prices ranging from twenty to one hundred dollars. The Kaplan test prep website has private prep course and private tutoring courses which can cost at least eighteen hundred dollars and may exceed five thousand dollars (2010). These commercial test prep programs advertise that they can increase student's MCAT scores. The research on MCAT preparation courses has not seen the same positive results as advertised by the companies themselves. McGaghie, Downing, and Kubilius (2004) used a qualitative approach to locate peer-reviewed studies on the impact of commercial exam preparation classes on performance. This study concluded there is little support of

using these classes especially because no cost-benefit analysis has been done. Still, it is important to note that these preparation courses have been useful to some students and in the end the student must pick whatever preparatory method best suits their needs.

The third variable this study examined is the speededness of the MCAT. Speededness is an important issue being addressed by other standardized tests as well, like the LSAT (Henderson, 2004). Speededness means that the time limits provided for each test has an impact on test scores (Neustel, 1998). These time limits mean that not everyone can complete each subtest. Furthermore, it is possible students who notice they have little time left just fill in the last questions they have without reading them. This a major concern for students with reading or other learning disabilities. Students with disabilities may request accommodations from the Association of American Medical Colleges (AAMC) to establish that their disability (Hearing or visual impairment, dyslexia, ADHD, etc.) restricts their capacity to take the test (AAMC, 2010d). If students are given their requested accommodations their tests scores are flagged when they are sent to the medical universities (AAMC, 2010e). Current medical students have used the MCAT to successfully gain entrance into medical school so it is important to know the proportion of students who completed or did not complete each subsection in allotted time frame.

Speededness is an important issue to consider when researching the MCAT. The speededness of the MCAT has been addressed as a legal issue. A California court case (Turner v. Association of American Medical Colleges, 2006) where four students sued the AAMC for not being granted accommodations (their own room and extra time) for their reading/ learning disability while taking the MCAT. The plaintiffs assumed under

the state of California Law Unruh Civil Rights Acts they were permitted to further accommodations. The defendants, AAMC, were unwilling to provide the time and placement alterations because they stated under the federal law, Americans with Disabilities Act, reading/ learning impairments are not considered disabilities. For their defense, they proposed that medical student and also medical doctors needed to be able to process information quickly. Additionally they proposed if accommodations are offered, comparing MCAT scores may not be as useful to admission committees because the test is not in its standardized form. The four students, plaintiffs, won the trial initially but lost in an appeal. More research needs to be done on speededness to understand how it affects MCAT scores. This study intends to address a part of the speededness issue: if a majority of current medical students finished each of the MCAT subsections.

Purpose of the Study

The purpose of this study is to examine the attitudes held by first and second year medical students at a public Midwestern medical university about the Medical College Admission Test or MCAT. The following research questions were addressed:

1. What attitudes do medical students have about the MCAT?

Specifically, what attitudes do medical students have about using the MCAT as part of the admission process into medical school and how applicable are the MCAT subsections to their current medical school curriculum?

2. a). How did current medical students say they prepared for the MCAT?
b). Does choice of preparation method vary by gender?

3. Does speededness play a role in medical students' MCAT scores; specifically did the majority of medical students complete or not complete each subsection of the MCAT?

The following hypotheses were examined by this research study.

1. Medical students would have an overall positive attitude toward the MCAT. Specifically, they will agree with its use in the admission process and believe that the MCAT subsections are applicable to their current medical education.
2. A majority of medical students would have prepared for the MCAT using the cheaper materials like exam prep books and practice test and questionnaires rather than with expensive resources like prep courses and private tutoring. There will be no difference in preparation methods between male and female medical students.
3. The researcher hypothesized that a majority of medical students would have completed each of the four subsections of the MCAT.

Method

Participants

The participants for this survey study were one hundred and eighty (90.45% response rate) first-year and second-year medical students from a public Midwestern medical university. The sample included one hundred males, seventy-nine females and two not specified, ranging in age from twenty-two to thirty- nine. The mean age was 24.47 with a standard deviation of 2.18. Ninety- six participants were second-year medical student and eighty-four participants were first-year medical students (See Table 1). All prospective

Table 1

Sample Demographics

	<u>First-Year</u>	<u>Second-Year</u>
Gender (n = 178)		
Male	44(24.72%)	56(31.46%)
Female	39(21.91 %)	39(21.91%)
Year in Medical School (N= 180)	84(46.67%)	96(53.33%)
Field of Medicine Interested in (n=172)		
Surgery	20(11.63%)	22(12.79%)
Pediatrics	7(4.07%)	8(4.65%)
Internal Medicine	13(7.56%)	19(11.05%)
Psychiatry	0(0.0%)	1(0.58%)
Family Practice	17(9.88%)	14(8.14%)
Obstetrics/ Gynecology	3(1.74%)	6(3.49%)
Emergency Medicine	10 (5.81%)	12(6.98%)
Undecided	6 (3.49%)	5(2.91%)
Other	4(2.33%)	5(2.91%)
Form of MCAT Taken (N=178)		
Paper & Pencil Version	4 (2.25%)	27(15.17%)
Computer- based Version	75 (42.13%)	60(33.71%)
Both Versions	4(2.25%)	8(4.49%)
Number of Times taken MCAT (N=178)		
One Time	47 (26.40%)	67(37.64%)
Two Times	28 (15.73%)	24(13.48%)
Three Times	7 (3.93%)	3(1.69%)
Four or More Times	1(0.56%)	1(0.56%)

medical students were required to take the Medical College Admission Test (MCAT) to apply for entrance into medical school. The MCAT was changed from an eight-hour, paper-and-pencil test to a four- to five- hour computer-based test in January 2007 (AAMC, 2010a). Therefore, all third- year and fourth-year medical students would have taken the old paper-and-pencil version. Additionally, third-year and fourth-year medical students are on different clerkship rotations at various hospitals around the city so they

were not easily accessible to the researcher. First- year and second-year medical students have their lectures together in a cohort, so all students in their first-year and second-year of medical school can be accessed in one setting together, the first-year lecture hall and the second-year lecture hall. The survey was administered in these lecture halls used specifically for each medical school class. Also, because medical students have a very time- consuming schedule (Dyrbye, Thomas, Huschka, Lawson, Novtny, Sloan, et al. 2006; Dyrbye, Thomas, Massie, Power, Eacker, Harper, 2008; Dyrbye, Thomas, & Shanafelt, 2005) it was seen as unlikely that they would answer a mail or web survey. This implementation method was used to gain the highest response rate for this survey. The participants were chosen for this study using a convenience sample to gain the maximum number of responses to the survey and because they were accessible to the researcher. This survey implementation reduced coverage error because there were only medical students in each lecture hall. These lectures were open only to medical students so no physician assistant, pharmacy, or nursing students were present. Also, the sample included an adequate number of participants according to a G* Power a priori analysis (multiple regression). For the linear multiple regression: fixed model, R^2 deviation from zero with effect size set at .15 and power of .95 with three predictors, a minimal sample size of one hundred and nineteen was suggested. This sample size was obtainable because there are approximately one hundred and twenty students in each class.

Measure

This study used the survey, “Medical Students Attitudes toward the Medical College Admission Test” (see Appendix A) which was developed by the researcher to understand how current medical students prepared for the MCAT, if they find its use in

the admission process adequate, and if the subsections are applicable to their medical education. Additionally, this survey also intended to examine the speededness of the MCAT by evaluating the proportion of students who completed each subsection of the MCAT. The variables this survey assessed are medical students' attitudes, preparation for MCAT, and speededness. Medical students' attitudes were assessed using 12 Likert scale items. Students were asked to what extent they agree or disagree with particular statements about the MCAT on a scale from one to five ranging from strongly disagree to strongly agree. A reliability analysis was run on the scores and a coefficient alpha of .70 was found. The composite score of medical students' attitudes was used as a primary dependent variable in this study. This variable was chosen to be measured because current research extensively describes the usefulness of the MCAT as a predictor of future board scores (Basco, Way, Gilbert, & Hudson, 2002; Haught & Wells, 2004) but it leaves out the students' perceptions of the test. Another variable this survey intended to measure is preparation for this test. Important aspects of this variable include how the student prepared and the length of their preparation time. Knowing how current medical students prepared for the MCAT would be useful for current undergraduate students who are planning to take the MCAT. Such results might provide them a plan of how to study and the MCAT composite score they should try to achieve. The third variable this survey intended to measure is speededness. Lack of speededness is generally defined by the amount of items completed- "eighty percent of the examinees will finish one hundred percent of the items on a test and one hundred percent of examinees will finish eighty percent of the items (Neustel, 1998)." While the MCAT is meant to measure readiness for medical school, if students do not complete most of the items it is difficult to measure

their ability adequately. This variable was analyzed to understand the frequency of medical students who reported completing each subsection.

The items for this survey were developed by checking current research literature's important concepts associated with the Medical College Admission Test or MCAT especially aspects of the test that could impact medical students' attitudes. These items were specifically developed to understand student's attitudes. Questions four through eight are intended to measure preparation for MCAT. While questions nine through sixteen and question eighteen are intended to measure medical students' attitudes toward the MCAT. The speededness of the MCAT is measured by item seventeen. Finally, demographics of the participants are assessed by questions one through three and nineteen through twenty- three (see Appendix B). Two items on the survey had problems with nonresponse. Question number three asked students for their composite MCAT score, 10 out of 180 (5.56%) participants did not indicate their score. Seven participants left the question blank, one participant wrote they did not remember, and the final participant just wrote no. Question number seven asked participants how many hours they prepped for the MCAT, 36 out of 180 (20.0%) participants did not give a usable answer for analysis use.

Procedures

Pilot study procedures. A pilot study was conducted to help assess the face validity of the survey as part of a classroom assignment in the researcher's survey design class. Five third year medical students, who were easily accessible to the researcher and would not be part of the final sample, reported their thoughts and opinions about the

survey, “Medical Students Attitudes toward the Medical College Admission Test”. These students were asked to complete the survey and to provide a comment next to each question stating if it easy to understand, unclear, or not understandable. Participants in the pilot study were also asked to comment on the backside of survey on the actual content. Specifically, they were asked to write anything they thought was left out by the survey items. All five pilot participants stated all of questions were easy to understand but they asked that the questions about the MCAT subtest scores be deleted. All five medical students told the researcher that they could not remember their scores for each subsection (Biological Sciences, Physical sciences, Verbal reasoning, and Writing Sample). So, the final survey only contained one question asking for the composite MCAT score.

Survey procedures. The first step in the implementation process was completing forms with the both the Internal Review Board at the researcher’s institution (see Appendix C) and the medical university (see Appendix D). Approval was gained at both institutions before the survey was handed out to first-year and second-year medical students (see Appendix E and Appendix F). This survey was administered in person to ensure the highest possible response rate. Students were first notified about the survey when they received an email at their student email account about what the survey entailed and when it would be handed out (see Appendix G). This email was received the day before the survey was administered. The researcher sent the prepared email notification to a staff member at the medical university. The staff member sent this email to all first-year and second-year medical students. This procedure kept the participants email contact information confidential from the researcher. The survey was provided to the students during their last week of classes of their first- year or second-year of medical school. On

the day the survey was administered, the researcher entered each classroom before their first fifty minute lecture started and introduced the survey, just in case some of the students had not see the email from the previous day. (see Appendix H). After describing the study, the survey and informed consent letters (see Appendix I) were handed out. Students were told the surveys would be picked up by the researcher after their morning lectures were over. Students were asked to bring the completed surveys to the front of the room and place them in a manila envelope. Those who did not want to participate could throw the surveys away or leave them in the lecture hall without returning them. Miniature candy bars were left at the front of the classroom so students could take them after they handed in their surveys.

Results

The primary focus of this research study was to determine the attitudes medical students hold about the Medical College Admission Test or MCAT. Attitudes were determined for each student by using a composite or scale score calculated by adding together the Likert responses for questions nine through sixteen and all four sub questions of question eighteen. The higher the composite score the more positive attitudes students held of the MCAT. The composite score (n=174) had an average of $M= 38.91$, $SD= 6.08$, and ranged from 19.00 to 53.00. (see Table 2). For Likert questions, 9 (40.7%), 10 (50.0%), 11 (46.7%), 14 (43.6%), 15 (42.5%), and 16 (66.5%) the highest proportion of participants reported disagreeing or strongly disagreeing with each statement. For Likert questions, 12 (60.7%), 13 (60.9%), 18V (76.2%), 18P (75.7%), 18B (86.4%), and 18W (83.6%) the highest proportion of participants reported agreeing or strongly agreeing with each statement.

Table 2
Frequencies of Attitudinal Likert Item

	SA	A	N	D	SD
Q9: I think the MCAT is a useful predictor for success in medical school. (n=179)	10 5.6%	49 27.4%	47 26.3%	49 27.4%	24 13.3%
Q10: The Physical Sciences section tests relevant concepts related to my current medical curriculum. (n=178)	4 2.2%	47 26.4%	38 21.3%	68 38.2%	21 11.8%
Q11: I believe undergraduate GPA is more indicative of success in medical school than MCAT score. (n=178)	13 7.3%	40 22.5%	42 23.6%	64 36.0%	19 10.7%
Q12: The Biological Sciences section of the MCAT is closely related to information I am learning in medical school. (n=178)	19 10.7%	89 50.0%	41 23.0%	25 14.0%	4 2.2%
Q13: I feel the MCAT should not be a determining factor of getting accepted into medical school. (n= 179)	29 16.2%	80 44.7%	35 19.6%	23 12.8%	12 6.7%
Q14: The Verbal Reasoning section tested concepts applicable to my current medical curriculum. (n= 179)	6 3.4%	45 25.1%	50 27.9%	49 27.4%	29 16.2%
Q15: I believe applicants with the higher MCAT scores should be accepted into medical schools before applicants with lower MCAT scores. (n= 179)	8 3.4%	45 25.1%	50 27.9%	51 28.5%	25 14.0%
Q16: The Writing Sample tested important abilities relevant to my success in medical school. (n= 179)	1 .6%	28 15.6%	31 17.3%	71 39.7%	48 26.8%
Q18: Do you think there was an adequate amount of time provided to complete every question in each section of the MCAT?					
Verbal Reasoning (n= 177)	36 20.3%	99 55.9%	13 7.3%	26 14.7%	3 1.7%
Physical Sciences (n= 177)	41 23.2%	93 52.5%	14 7.9%	26 14.7%	3 1.7%
Biological Sciences (n =177)	49 27.7%	104 58.7%	15 8.5%	9 5.1%	0 0.0%
Writing Sample (n= 177)	42 23.7%	106 59.9%	18 10.2%	9 5.1%	2 1.1%

A frequency count was conducted to see which preparation method was the most popular among the sample. The most popular method was a combination of prep course, exam prep books, and practice tests/ practice questions (25.28%). A Pearson Chi Square (χ^2) test was completed to calculate whether there was a significant difference in preparation methods and gender (see Table 3). Using an alpha level of .05, the results

Table 3

Chi Square for Preparation Method and Gender

Preparation Method (n= 178)	Gender	
	Female	Male
Prep Course Alone	17 (9.5%)	19 (10.6%)
Exam Prep Books Alone	10 (5.6%)	23 (12.9%)
Practice tests/ Practice questions Alone	2 (1.1%)	8 (4.5%)
Prep Course and Exam Prep Books	2 (1.1%)	6 (3.4%)
Prep Course, Exam Prep Books, & Practice tests/ Practice questions	24 (13.5%)	21 (11.8%)
Prep Course & Practice tests/ Practice questions	5 (2.8%)	6 (3.4%)
Exam Prep Books & Practice tests/ Practice questions	15 (8.4%)	10 (5.6%)
Exam Prep Books & Audio Tapes	0 (0.0%)	1 (0.6%)
Exams Prep Books & Exam Cracker Broke Service	1 (0.6%)	0 (0.0%)
Exam Prep Books, Practice tests/ Practice questions, & Kaplan Flash Cards	1 (0.6%)	0 (0.0%)
Prep Course, Exam Prep Books, Practice tests/ Practice questions, & School	0 (0.0%)	1 (0.6%)
No prep materials	1 (0.6%)	5 (2.8%)

were significant, $\chi^2 (11, 178) = 188.27, p < .05$. The overall Chi Square suggests there is a significant association between gender and preparation method. For example, 23

(12.9%) males reported using exam preparation books alone while only 10(5.6%) females reported using this method. Fives males (2.8%) and one female (0.6%) reported using no preparation materials. Additionally, males were more likely to report using only one preparation while females were more likely to report using multiple preparation methods. Fifty males (28.1%) reported using only one preparation method while twenty- nine (16.3%) females using a prep course alone, exam preparation books alone, or practice tests/ practice questions alone. Forty- five males (25.3%) and forty- eight females (27.0%) reported using multiple preparation methods. It is important to note that the Chi Square assumption for the expected cell count of five was not met, so it is possible the statistic is distorted.

A frequency count was conducted to see if this sample of medical students completed or did not complete each section of the MCAT (see Table 4). For the Verbal Reasoning section (n= 179), 160 students completed this section, 14 did not complete it, and 5 could not remember. For the Physical sciences (n= 179), section 160 students completed this section, 12 did not complete it, and 7 could not remember. For the Biological Sciences section (n= 179), 172 students completed this section, one did not complete it, and six could not remember. Finally, for the Writing Sample (n= 179), 168 students completed this section, 5 did not complete it, and six could not remember.

A secondary analysis was conducted after the researcher noticed more participants stated they had taken the paper-and-pencil version or both versions of the MCAT than anticipated. The first analysis of variance (ANOVA) was used to determine whether the type of MCAT completed affected self-reported composite MCAT scores at an alpha level of .05. The Levene Statistic (2, 167) = .86, $p > .05$ was not significant, so variance

Table 4

Frequencies of Speededness Test Items

Question 17: For each section of the MCAT there is a time restriction. (n= 179)	<u>Number of Participants</u>
Verbal Reasoning	
Completed	160 (89.39%)
Not Completed	14 (7.82%)
Do Not Remember	5 (2.79%)
Physical Sciences	
Completed	160 (89.39%)
Not Completed	12 (6.70%)
Do Not Remember	7 (3.91%)
Biological Sciences	
Completed	172 (96.09%)
Not Completed	1 (0.56%)
Do Not Remember	6 (3.35%)
Writing Sample	
Completed	168 (93.85%)
Not Completed	5 (2.79%)
Do Not Remember	6 (3.35%)

is equal among groups. The results were not significant, $F(2, 167) = 1.04$, $MS_{\text{error}} = 11.28$, $p > .05$, $\eta^2 = 0.01$. The second analysis of variance used MCAT Form as the independent variable and the composite score, AT2MCAT, as the dependent variable. The Levene Statistic (2, 171) = .67, $p > .05$ was not significant; the homogeneity of variance assumption is tenable. The results were significant, $F(2, 171) = 4.10$, $MS_{\text{error}} = 35.73$, $p < .05$, $\eta^2 = 0.05$. A post-hoc test was performed to determine which groups differed from each other. A Tukey HSD Test determined that there was a significant difference in

attitudes between students who took both versions of the MCAT and those who took just the paper-and-pencil version or just the computer-based test. The students who took both versions had significantly lower attitudes toward the MCAT.

An additional follow-up one- way analysis of variance examined the difference between first- year and second- year medicals students' attitudes toward the MCAT. The Levene Statistic (1, 171) = .86, $p > .05$ was not significant; the homogeneity of variance assumption is tenable. The results were not significant, $F(1, 171) = 0.15$, $MS_{\text{error}} = 37.39$, $p > .05$. $\eta^2 = 0.00$. First-year and second year medical students did not hold attitudes toward the MCAT that were significantly different.

Discussion

The first hypothesis stated medical students would have an overall positive attitude toward the MCAT. Specifically, it was expected that they would agree with its use in the admission process and believe that the MCAT subsections are applicable to their current medical education. This hypothesis was rejected because the mean for the attitude composite score was not obviously positive or negative. On only six of the twelve Likert items participants agreed or strongly agreed on with each statement. Participants disagreed (40.7%) that the MCAT was a useful predictor of medical success, while 60.9% of participants agreed with question 13 that the MCAT should not be a determining factor to get accepted to medical school. Over sixty percent of participants agreed that the Biological Sciences section was applicable to what they are learning in medical school. Though the majority of medical students did not believe the other three sections were applicable to their current medical education. Participants largely agreed (over 75% on all sub questions on question 18) that the time limits for each section were

adequate though The second hypothesis stated that a majority of medical students would have prepared for the MCAT using the cheaper materials like test preparation books and practice tests and questionnaires rather than with expensive resources like preparation courses and private tutoring. This hypothesis was rejected because 101 out of 178 (56.7%) participants reported using a preparation course alone and/ or in combination with other materials to prepare for their MCAT. The category with the highest proportion reported by medical students was preparation course, exam prep books, and practice tests/ practice questions which accounted for 25.28% (45 out 178). The researcher had assumed a larger proportion of student would have used the cheaper methods like books and practice questions. Finally, the third hypothesis stated a majority of medical student would have completed each of the four subsections of the MCAT. This hypothesis was not rejected because the lowest number who reported completing a subsection was 160 out of 178 (89.89%) and the highest number of students reporting completion of a subsection was 172 out of 178 (96.63%). It is important to note that this information could be unreliable because the sample took the MCAT between one half years to three years before they completed this survey. Nonetheless, students were given the option to select does not remember and majority of them did not select this option.

This study holds important information for the MCAT developers as well as prospective medical students. It gives information about preparation materials and the amount of time spent preparing which is of particular use for individuals thinking about applying for medical school and taking the MCAT. The information about speededness is important as well because for at least this medical school around ninety percent or more of students reported completing each subsection which is larger than the eight percent of

items completed that Neustel (1998) suggested. It is not know what proportion of the participants had or requested test accommodations due to disability though. It is important to note that only information on completion rate was established for the speededness variable. Additionally, there was no way to tell if the students actually completed each subsection.

For the first hypothesis which concerned medical students' attitudes toward the test, it was assumed that each medical student would hold positive attitudes about the MCAT given that their MCAT scores helped them enroll at medical school. It was unsuspected that the average ($M= 38.91$) for the composite score, AT2MCAT, would be only very slightly positive and that with the standard deviation ($SD =6.08$) taken into account mostly neutral. For the second hypothesis, about what preparatory materials were used, all of the options were very general and it did not discriminate as well as the researcher hoped. It is possible that one participant who checked practice questions/practice tests paid for an online question bank while another participant making the same response bought a book of practice tests. Additionally, there was no way to determine if a participant who checked preparation course attended a course at Kaplan or if they attended a free review at their college or university. The third hypothesis, about speededness, was also not rejected. Perhaps it is not surprising that participants who can complete timed tests scored well on the MCAT and seem to have other desirable characteristics not examined by this study, like high undergraduate grade- point averages. Additionally, these current students need to have the ability to finish timed tests because all of their pre- clinical tests during first- year and second-year are timed, as well as all

three steps of the United States Medical Licensing Exams (the computer-based tests and clinical tests).

There were many notable limitations to this research study. The researcher would have started the IRB applications much sooner to insure that all aspects of the study could be included that were important. Specifically, the researcher would have had more time to get the university and the medical school to agree on a method to access each student's actual MCAT scores from the admission office, such a change would have made this variable more reliable than the self-reported scores that were used in the analysis. Having the students' actual scores would have helped account for the following: non-response to survey question #3, inaccurate responses to survey question #3 because students may have forgotten their MCAT score in the years it has been since they took the test, and inaccurate responses to survey question #3 because of self-reported bias. Another aspect that would have helped was if the researcher could have finished the IRB approvals with another medical university in the state. This procedure would have more than likely doubled the sample size and it would have been beneficial to see if there was a difference in attitudes between this private medical university students and the sample of public medical university students used in this study. The survey was distributed during the last week of lectures for the students; this was because IRB approval was only just given that week. If the IRB approvals would have been received earlier the researcher could have looked at the lecture schedules and scheduled a day when more students would have come to lecture. Additionally, if there would have been more medical schools that were accessible to the researcher a larger pilot sample could have been acquired, giving the researcher a better idea on how students would answer the questions so that the

survey could have been modified before the actual sample completed the survey. Specifically, question number seven could have been changed to say, "Please estimate how many hours you studied for the MCAT (please give a numerical answer)." Such a change would have decreased the amount of unusable answers given including: a lot, tons, more than I can count, and even an infinity symbol. Another limitation of this survey was that it asked too many questions on different variables from attitudes toward using MCAT in admission, attitudes toward the applicability of the different subsections of the MCAT, preparatory materials, number of hours prepped, and speededness. A more focused survey about only one or two of these topics probably would have been more useful.

Future research dealing with MCAT could include surveying the differences in attitudes toward the MCAT for individuals accepted into medical school and those not accepted into medical school. It would be useful to see if the accepted applicants would hold significantly more positive attitudes toward the test than those who were not accepted. This could also show if those students not accepted blamed their MCAT score for not being accepted into medical school. Future research should continue to examine the speededness of the MCAT. It would be useful to know if accepted medical school applicants had a higher proportion of completeness than those who were not accepted. Additional research could also provide a more completed checklist of items to use to prepare for the MCAT for example, a separate item for preparation books from separate companies like Kaplan or Princeton review. It would be useful to see what students with the highest composite MCAT scores used to prepare for the MCAT. Furthermore, it would be interesting to research the average hours current medical students prepared

from different medical universities. A demographic question about race could be added to examine if different races use different preparation methods. It would be interesting to see if the more expensive preparatory methods are accessible to everyone. Finally, it is important to not underestimate the usefulness of test takers opinions not only for the MCAT but other standardized tests as well. Future research should continue to determine not only the predictive validity of the MCAT but also test takers attitudes and perspectives.

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Appendix A

Medical Students' attitudes toward the Medical College Admission Test (MCAT)

1. What form of the MCAT did you take?
 Paper & pencil test Computer based test

2. How many times did you take the MCAT?
 One time
 Two times
 Three times
 Four times or more

3. What was your highest composite or total MCAT score? (Please recall that the composite score is the sum of the Physical Sciences, Biological Sciences, and Verbal Reasoning sections with a range of 3 (lowest possible score) to 45 (highest possible score). _____)

4. Did you use specific materials to prepare for the MCAT?
 Yes
 No

5. Which materials did you use to prep for the MCAT? Please check all that apply.
 Prep course
 Private tutoring
 Exam prep books
 Practice tests/ practice questions
 None
 Other _____

6. Do you think your preparation materials were effective?
 Yes
 No
 No opinion

7. How many hours did you study before taking the MCAT? _____

8. Was this an adequate amount of time to prepare for the MCAT?

- Yes
 No
 Not sure

Please indicate your attitude toward the following statements.

9. The MCAT is a useful predictor for success in medical school.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

10. The Physical Sciences section tested relevant concepts related to current medical curriculum.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

11. Undergraduate GPA is more indicative of performance in medical school than MCAT score.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

12. The Biological Sciences section of the MCAT is closely related to information learned in medical school.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

13. The MCAT should not be a determining factor of getting accepted into medical school.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

14. The Verbal Reasoning section tested concepts applicable to current medical curriculum.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

15. Individuals with the highest MCAT scores should be accepted into medical schools before individuals with lower MCAT scores.

- Strongly Agree Agree Neutral Disagree Strongly Disagree

16. The Writing Sample section tested important abilities relevant to succeed in early medical training.

Strongly Agree Agree Neutral Disagree Strongly Disagree

17. For each section of the MCAT there is a time restriction. Please check if you completed or did not complete each section.

Verbal Reasoning Completed Not Completed Don't Remember

Physical Sciences Completed Not Completed Don't Remember

Biological Sciences Completed Not Completed Don't Remember

Writing Sample Completed Not Completed Don't Remember

18. Do you think there was an adequate amount of time provided to complete each section of the MCAT? Please check if agree or disagree with time provided to complete each section.

Verbal Reasoning

Strongly Agree Agree Neutral Disagree Strongly Disagree

Physical Sciences

Strongly Agree Agree Neutral Disagree Strongly Disagree

Biological Sciences

Strongly Agree Agree Neutral Disagree Strongly Disagree

Writing Sample

Strongly Agree Agree Neutral Disagree Strongly Disagree

Demographics

19. Age: _____

20. Gender: _____

21. What year are you in medical school?

- 1st year
- 2nd year

22. What type of medical university do you currently attend?

- Publicly funded medical college
- Privately funded medical college

23. What field of medicine would you like to specialize in? Please pick one.


- Surgery
- Pediatrics
- Internal Medicine
- Psychiatry
- Family Practice
- Obstetrics/ Gynecology
- Other _____

Appendix B

Item Abstract

Research Questions	Survey Items
How did current medical students say they prepared for the MCAT?	4, 5, 6, 7, 8
What attitudes do medical students have about the MCAT? Specifically, what attitudes do medical students have about using the MCAT as part of the admission process into medical school and how applicable are the MCAT subsections to their current medical school curriculum?	9, 10, 11, 12, 13, 14, 15, 16, 18
Does speededness play a role in medical students' MCAT scores?	17, 18

Appendix C

	University of Nebraska-Lincoln Institutional Review Board (IRB) 312 N. 14 th St., 209 Alex West Lincoln, NE 68588-0408 (402) 472-6965 Fax (402) 472-6048 irb@unl.edu	FOR OFFICE USE ONLY IRB# _____ Date Approved: _____ Date Received: _____ Code #: _____
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IRB NEW PROTOCOL SUBMISSION

Project Title:	Medical students' attitudes toward the Medical College Admission Test
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Investigator Information:

Principal Investigator:	Cassie Connealy	Secondary Investigator or Project Supervisor*:	Dr. Kurt Geisinger
Department:	Educational Psychology	Department:	Educational Psychology
Department Phone:	402-472-2223	Department Phone:	402-472-2223
Contact Phone:	402- 514-7993	Contact Phone:	(402) 472-3280
Contact Address:	10753 Brentwood Dr. #3B	Contact Address:	21 Teachers College Hall
City/State/Zip:	La Vista NE 68128	City/State/Zip:	Lincoln NE 68588-0345
E-Mail Address:	cjconnealy@yahoo.com	E-Mail Address:	kgeisinger2@unl.edu

* Student theses or dissertations must be submitted with a faculty member listed as Secondary Investigator or Project Supervisor.

Principal Investigator is:

	Faculty		Staff		Post Doctoral Student
X	Graduate Student		Undergraduate Student		Other

Type of Project:

X	Research		Demonstration		Class Project
	Independent Study		Other		

Does the research involve an outside institution/agency other than UNL*?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
--	-----	-------------------------------------	----	--------------------------

* Note: Research can only begin at each institution after the IRB receives the institutional approval letter

If yes, please list the institutions/agencies.	University of Nebraska Medical Center & Creighton University School of Medicine
Where will participation take place (e.g., UNL, at home, in a community building, etc)	At each campus

Project Information:

Present/Proposed Source of Funding:	n/a		
Project Start Date:	March 2010	Project End Date:	August 2010

*Please attach a copy of the funding application.

Type of Review Requested: Please check either exempt, expedited, or full board. Please refer to the investigator manual, accessible on our website: <http://www.unl.edu/research/ReComp1/compliance.shtml>, to determine which type of review is appropriate. **Final review determination will be made by the IRB.**

Please check your response to each question.

	Yes	X	No	
		X	No	1. Does the research involve prisoners?
	Yes		No	2. Does the research involve using survey or interview procedures with children (under 19 years of age) that is not conducted in an educational setting utilizing normal educational practices?
	Yes	X	No	3. Does the research involve the observation of children in settings where the investigator will participate in the activities being observed?
	Yes	X	No	4. Will videotaping or audio tape recording be used?
	Yes	X	No	5. Will the participants be asked to perform physical tasks?
	Yes	X	No	6. Does the research attempt to influence or change participants' behavior, perception, or cognition?
	Yes	X	No	7. Will data collection include collecting sensitive data (illegal activities, sensitive topics such as sexual orientation or behavior, undesirable work behavior, or other data that may be painful or embarrassing to reveal)?
	Yes	X	No	8. For research using existing or archived data, documents, records or specimens, will any data, documents, records, or specimens be collected from subjects after the submission of this application?
	Yes	X	No	8a. Can subjects be identified, either directly or indirectly, from the data, documents, records, or specimens?

Exempt **Expedited** **Full Board**

Description of Subjects:

Total number of participants (include 'controls'):	500
--	-----

Will participants of both sexes/genders be recruited? Yes No

If "No" was selected, please include justification/rationale.

--

Will participation be limited to certain racial or ethnic groups? Yes No

*Faculty, Staff, Graduate Student, Undergraduate Student, Unaffiliated, Other

Required Signatures:

Principal Investigator:		Date:	
Secondary Investigator/Project Advisor:		Date:	

PROJECT DESCRIPTION

FOR OFFICE USE ONLY

PROTOCOL:

DATE APPROVED:

1. Describe the significance of the project..

What is the significance/purpose of the study? (Please provide a brief 1-2 paragraph explanation in lay terms.)

The purpose of this study is to relate the use of preparatory materials to attitudes toward the Medical College Admission Test (MCAT) for medical students at two Midwestern medical universities. The following research questions will be addressed:

1. How did current medical students prepare for the MCAT?
2. What attitudes do medical students have about using the MCAT for admission into medical school?
3. What role does speededness play in medical student's MCAT scores?

2. Describe the methods and procedures.

Describe the data collection procedures and what participants will have to do.

The principal investigator will arrive at the first and second year medical students' first morning lecture to hand out consent forms and the surveys. The students who wish to fill out the survey will place the completed survey in separate manila folder left by the principal investigator in the front row of the lecture hall. Those who do not want to participate may throw the surveys away or leave them in the lecture hall. The principal investigator will pick them up after the morning lectures are over at approximately noon.

How long will this take participants to complete? 5 to 10 minutes

Will follow-ups or reminders be sent? If so, explain. Yes

First and second year medical students will receive an email notification at their student email account telling them what day the survey will be handed out and a brief description of what the survey entails

3. Describe recruiting procedures.

How will the names and contact information for participants be obtained?

No names will be obtained; participants are simply identified because they attend medical school. I will not be asking for any contact information.

How will participants be approached about participating in the study?

Participants will be asked to fill out the survey in their lecture halls. All students will be given a survey; they can turn the survey in blank if they do not want to complete it.

****Please submit copies of recruitment flyers, ads, phone scripts, emails, etc.**

4. Describe Benefits and Risks.

Explain the benefits to participants or to others.

It gives medical students a chance to make their opinion on a required admission test heard. This is important because even though the psychometrics of the MCAT have been thoroughly researched, the opinions of individuals required to take this test have not been taken into account

after they started their medical training.

Explain the risks to participants. What will be done to minimize the risks? If there are no known risks, this should be stated.

No known risks.

5. Describe Compensation. Will compensation be provided to participants? Yes

If 'Yes', please describe amount and type of compensation, including money, gift certificates, extra credit, etc.

Each student will be able to take a miniature candy bar when they put their survey in the manila envelope.

6. Informed Consent

How will informed consent/assent be obtained?

By completing the survey and handing it in the manila envelope the medical students consent to be part of the study.

****Please attach copies of informed consent forms, emails, and/or letters. Please refer to the last page for a checklist of the information that needs to be included in the informed consent document.**

7. Describe how confidentiality will be maintained.

How will confidentiality of records be maintained? Only principle investigator will have access to them at her home because she will lock these surveys in her personal filing cabinet

Will individuals be identified? No

How long will records be kept? Until all survey data can be collected from UNMC & Creighton

Where will records be stored? Locked filing cabinet

Who has access to the records/data? Just principal investigator

How will data be reported? In APA formatted tables and written in the results section of an academic paper.

For web based studies, how will the data be handled? Will the data be sent to a secure server?

Will the data be encrypted while in transit? Will you be collecting IP addresses? N/a

If transcriptions are required, how will transcriptions be handled? Who is doing the transcriptions? Please attach a copy of the confidentiality agreement that transcriptionists will sign. N/A

** For studies utilizing Protected Health Information (PHI; e.g., information obtained from a hospital, clinic, or treatment facility), how will this PHI data be obtained and safeguarded? Please provide a copy of the release of authorization that will be used to obtain permission from the participant for the agency/institution to release protected health information for project*

purposes or a letter from the agency/institution documenting agreement to provide protected health information for project purposes. N/a

**For studies involving genetic data/sampling/analysis, illegal drug use, or criminal activity that places the participant at risk for legal action, how will confidentiality be maintained? Will a Certificate of Confidentiality be obtained to protect the compelled disclosure of this information?
N/a*

8. Copies of questionnaires, survey, or testing instruments.

Please list all questionnaires, surveys, and/or assessment instruments/measures used in the project..

Please submit copies of all instruments/measures. Medical students attitudes toward the Medical College Admission Test

Appendix D

EXEMPT EDUCATIONAL, BEHAVIORAL, AND SOCIAL SCIENCE RESEARCH

SECTION I

1. STATUS:

- New Submission
- Five Year Resubmission (Current IRB # _____)
- X Request for Change – Revised application (Current IRB # 174-10-EX)

2. TITLE OF PROTOCOL: MEDICAL STUDENTS' ATTITUDES TOWARD THE MEDICAL COLLEGE ADMISSION TEST

3. RESPONSIBLE PERSONNEL

In order to verify CITI training, list each individual's full name (i.e., first, middle and last) and degree. The name should match the legal name utilized by the UNMC, TNMC, UNO, or CHMC. Do not use nicknames.

A. Principal Investigator (PI):

Name:	Cassie Jo Connealy	Position:	Graduate Student
Department:	UNL- Educational Psychology	Campus Zip:	68588
Address:	10753 Brentwood Dr. #3B La Vista NE 68128		
Email Address:	cjconnealy@yahoo.com		
Phone:	402- 514- 7993	Pager:	N/a

B. Secondary Investigator (SI):

Names	Position	Department

C. Participating Personnel:

Names	Position	Department

C. Lead Coordinator:

Name	Phone	Pager	Email

D. Coordinator(s):

Names	Phone	Email

4. DATA/ADMINISTRATIVE PERSONNEL:

Names	Phone	Email

5. FUNDING SOURCE: Check all that apply and supply names

- Grant – Provide source: _____
- Commercial – Provide source: _____
- State
- Other – Provide source: Personal funding _____

6. **FUNDING AGENCY DEADLINE FOR IRB APPROVAL:** N/a_____

7. **PERFORMANCE SITES-** On University of Nebraska Medical Center campus at the Michael F. Sorrell Center

8. **PRINCIPAL INVESTIGATOR'S ASSURANCE**

The Principal Investigator understands and accepts the following obligations to protect the rights and welfare of research subjects in this study:

I recognize that as the Principal Investigator it is my responsibility to ensure that this study is conducted in full accordance with the approved protocol and all applicable IRB requirements.

I recognize that it is my responsibility to ensure that valid informed consent/assent (if required) has been obtained from all research subjects or their authorized representatives.

All listed study personnel have completed the IRB required CITI Training.

I will not initiate any change in protocol which may change the exempt status of this study without IRB approval.

I will maintain all required research records on file; and I recognize that the IRB is authorized to inspect these records.

I will inform the ORA immediately of any research related problems which impact the subjects.

I understand that IRB approval is valid for a maximum period of five years.

Printed Name of Principal Investigator
Date_____

Signature of Principal Investigator

9. **Certification of Faculty Advisor**

My signature certifies that I have reviewed this IRB application and approve it for submission to the IRB.

Signature of Faculty Advisor
Date_____

Printed Name of Faculty Advisor

EXEMPT EDUCATIONAL, BEHAVIORAL, AND SOCIAL SCIENCE RESEARCH**SECTION II**

Instructions: In order to review your proposal, the ORA must have the following information. Each subpart must be titled using **boldface subheadings** as described below and addressed independently in the listed sequence without reliance on information covered under other subparts. Attachment of applicable sections of the grant application is not acceptable as a substitute for completion of each subpart.

Each page of the IRB application must be numbered. When responding to the questions in each section, please retain the questions in the finished application for easy reference. The *italicized, educational* information (Notes) may be removed. These instructions may be deleted from the final version submitted to the IRB.

PURPOSE OF THE STUDY AND BACKGROUND (1-2)**1. Purpose of the Study**

What are the specific scientific objectives (aims) of the research?

The purpose of this study is to relate the use of preparatory materials to attitudes toward the Medical College Admission Test or MCAT for first and second year medical students at two Midwestern medical universities. The following research questions will be addressed:

1. How did current medical students prepare for the MCAT?
2. What attitudes do medical students have about using the MCAT for admission into medical school?
3. What role does speededness play in medical student's MCAT scores?

2. Background and Rationale

Describe the background of the study. Include a critical evaluation of existing knowledge, and specifically identify the information gaps that the project is intended to fill.

Testing is extensively used in our society. There is a test for many facets of life from spelling tests in early elementary school to professional licensure tests for career certification. Standardized tests are of particular interest to researchers and policy makers because these tests and their scores are often vital components in decision making processes. The Medical College Admission Test or MCAT was developed in 1928 to address difficulties with dropout rates in medical schools; though currently, it is used as an admission criterion for U.S. and Canadian medical schools (McGaghie, 2002). Recently, the test was changed from a paper-and-pencil test to a computer-based test. The MCAT has consisted of following four subsections since 1991: verbal reasoning, physical sciences, biological sciences, and writing sample. The entire test takes four and a half to five hours to complete (Association of American Medical

Colleges, 2010a). Each test starts with the verbal reasoning section, which has forty questions and has a sixty minute time limit. This section tries to measure an individual's ability to comprehend, assess, and relate information from reading passages (McGaghie, 2002). The next section covers the physical sciences. It has fifty-two questions and has a seventy minute time restriction. The content area of this section is general chemistry and physics problems (Blado, 2000). The third section on the MCAT is the biological sciences section. This section has a time limit of seventy minutes and includes fifty- two questions. These questions assess achievement in biology and organic chemistry (McGaghie, 2002). The final section is the writing sample. Students are given sixty minutes to complete this section. They must complete two essays; each one addresses a specified topic. This section aims to address a student's composition abilities (Hojat et al., 2000).

There has been an extensive amount of research to investigate the predictive validity of the MCAT by the Association of American Medical Colleges and university researchers. Research on the predictive variability of the MCAT examines the extent to which the MCAT alone or in combination with other admission variables can predict medical students' pre-clinical (first and second year) performance, scores on all three boards, and clerkship performance (third and fourth year). Basco, Way, Gilbert, and Hudson (2002) suggest that MCAT and undergraduate grade point averages are robust predictors of the exams taken during medical school. Wiley and Koenig (1996) propose MCAT scores individually have somewhat higher relationships with medical school grades in pre- clinical years than undergraduate grade point averages alone. Additionally, prediction was enhanced when MCAT scores and undergraduate grade point averages were used together. Julian (2005) is of the same opinion that medical school grades are the best predicted when MCAT scores and undergraduate grade point averages are used jointly. A meta- analysis by Kreiter and Kreiter (2007) reviewed the literature on the validity of undergraduate grade point averages and MCAT scores in twenty- nine studies and concluded the use of MCAT score and undergraduate grade point averages as admission variables in medical school was useful. The MCAT scores have also been suggested to have predictive validity with all three steps of the United States Medical Licensing Exams (USMLE); the most noted in research is the USMLE Step 1 which is taken after the second year of medical school. Veloski et al. (2000) indicates the MCAT was a better predictor than undergraduate science grade point average on all three licensing exams. The MCAT had the largest relationship with USMLE Step 1 but the MCAT was also correlated with the USMLE Step 2 and USMLE Step 3. Similar to the medical school performance, the MCAT scores combined with undergraduate grade point averages does a better job at predicting USMLE Step 1 scores (Wiley & Koenig, 1996; Julian, 2005). A meta- analysis done by Donnon, Paolucci, and Violato (2007) which included twenty- three studies examined the relationships among scores on the MCAT and medical school performance or board results. The predictive validity coefficient between pre- clinical medical school performance $r = 0.39$, while $r = 0.34$ for clerkship performance and MCAT scores. Additionally, the predictive validity coefficient between MCAT scores and the licensing exams are as follows: USMLE Step 1 $r = 0.60$, USMLE Step 2 $r = 0.38$ and USMLE Step 3 $r = 0.43$. All of the predictive validity coefficients increased in the meta- analysis after restriction of range adjustments were made. Furthermore, research has investigated the relationships of different sections of the MCAT. Basco et al. (2002) suggests the biological sciences section has the highest correlation with the first step of the United States

Medical Licensing Examination or USMLE Step 1 while the verbal section is a stronger predictor for clinical performance (Veloski et al., 2000; Haught & Wells, 2004). Often, the Writing Sample section is not included in the predictive validity studies because of its scoring system. Yet, a study by Hojat et al. (2000) established it was more correlated to clinical performance in later years than the pre-clinical performance when fundamental science knowledge is learned. Finally, clinical grades in medical school are related to the MCAT scores specifically the Verbal Reasoning and Writing Sample scores. Huff et al. (1999) suggests MCAT scores independently account for approximately a fifth of the variance in third year clerkship grades.

Another important psychometric property of the MCAT to examine is the underlying variable of test speededness. This means that the time limits put on each test are an underlying component in MCAT scores (Neustel, 1998). These time limits mean that not everyone can complete each subtest. Speededness is an important issue being addressed by all standardized tests, like the LSAT (Henderson, 2004). Lack of speededness is generally defined by the amount of items completed- "eighty percent of the examinees will finish one hundred percent of the items on a test and one hundred percent of examinees will finish eighty percent of the items (Neustel, 1998)." It is very possible that the speededness of the MCAT will affect medical students' attitudes toward the test especially if they did not finish at least one section.

Preparing for the MCAT entails many different methods and resources that vary from person to person. There are numerous prep books for the MCAT at all major bookstore and testing centers offer private tutoring or prep courses. Books generally are the least inexpensive prepping method, prices range from twenty to fifty dollars. While the prep course and private tutoring all run at least eighteen hundred dollars and can exceed five thousand dollars. These commercial test prep programs advertise that they can increase student's MCAT scores. The research on MCAT preparation courses has not seen the same positive results as advertised by the companies themselves (McGaghie, Downing, & Kubilius, 2004). This finding on the use on expensive preparatory materials makes understanding the students' attitudes about prepping for the MCAT even more important. This study wants to understand how students have prepped and if this method was effective according to medical students.

Every year the Association of American Medical Colleges (AAMC) gives two separate surveys, the Pre-MCAT questionnaire and the Matriculating Student questionnaire, that address preparing for and taking the MCAT. According to the AAMC's website the Pre-MCAT questionnaire is web-survey emailed to undergraduate students after they sign up to take the MCAT (AAMC, 2010c). If medical colleges chose to participate the Matriculating Student Questionnaire is given to medical students during their first-year orientation week (AAMC, 2010b). This study intends to fill a gap in this existing knowledge by asking first and second year medical students who are accustomed to their current medical school training and testing situations. It is very plausible that these medical students will hold attitudes differing from those just entering medical school.

CHARACTERISTICS OF THE SUBJECT POPULATION (3-7)

3. Number of Subjects

- A.** What is the number of subjects that must complete the study in order to achieve the scientific objectives of the research?
400 (200 from UNMC & 200 from Creighton)

- B.** What is the statistical or other justification for the number of subjects needed to complete the study?

The proposed sample size will include an adequate number of participants according to a G* Power a priori analysis for ANOVA and multiple regression. For ANOVA fixed effects, special, main effects and interactions with an effect size of .25, power of .95 and six groups, a sample of four hundred is suggested. For the linear multiple regression: fixed model, R^2 deviation from zero with effect size set at .15 and power of .95 with three predictors, a sample size of one hundred and nineteen is recommended.

- C.** What is the maximum number of subjects that will be consented at all sites under the oversight of the UNMC IRB and what is the justification for this number?

250 would be the maximum if all first and second year UNMC medical students filled out the survey

4. Gender of the Subjects

Are there any enrollment restrictions based on gender?

No

Yes. Provide justification.

5. Age Range of the Subjects

- A.** What is the age range of the adult subjects? 21- 30

- B.** What is the rationale for selecting this age range? The majority of medical students are in this age range.

- C.** Will children (18 years of age or younger) be included in this research?

No. What is the justification for excluding children from this research?

Children have not completed their undergraduate degree so they have not taken the MCAT or been accepted into medical school so they cannot answer the survey questions

Yes. Respond to the following:

1. What is the justification for including children and adolescents?
2. What is the age range of child and adolescent subjects?
3. What is the rationale for the age range chosen?

6. Racial and Ethnic Origin

Are there any subject enrollment restrictions based upon race or ethnic origin?

No

Yes. Explain the nature of the restrictions and provide justification.

7. Inclusion Criteria

What are the specific inclusion criteria?

Students who have taken the MCAT and are attending UNMC as a first or second year medical student

METHODS AND PROCEDURES (8-10)

8. Performance Sites

Where will the study be conducted? Submit a letter from an authorized official at all external performance sites other than UNO, UNMC, and the Nebraska Medical Center granting permission to conduct the research at that site.

At UNMC in the Michael F. Sorrell Center

9. Description of Procedures

A. Does the research involve interaction with or observation of subjects?

No

X Yes. Describe sequentially all procedures and evaluations to be applied to subjects.

First and second year UNMC medical students will receive an email at their student email account telling them what day the survey will be handed out and a brief description of what the survey entails. The survey is a 23 item questionnaire developed by the principal investigator. Items ask about preparation for the MCAT, attitudes toward the use of MCAT in the admission process, attitudes toward the content of the MCAT, and the speededness of the MCAT.

The principal investigator will arrive at the first and second year medical students' first morning lecture to ask students to complete the survey. All students will be given the survey and consent form. The principal investigator will briefly describe the survey and give students instructions to turn the surveys in. All students will be told they may take a miniature candy bar at the front of the classroom. The students who wish to fill out the survey will place the completed survey in a manila envelope left by the principal investigator in the front row of the lecture hall. Those who do not want to participate may throw the surveys away or leave them in the lecture hall. The principal investigator will pick them up after the morning lectures are over.

B. Does the research involve review of identifiable private information, including information from public or other registries or databases?

X No

Yes. Respond to the following:

1. What information will be accessed from the records?
2. Will there be subject identifiers associated with research data at any time following retrieval from the registry or database?

X No

Yes. Respond to the following:

- a) Describe the subject identifiers to be retained.
 - b) How long will the subject identifiers be retained? (e.g., until all subject's data has been collected, until final data analysis, etc).
 - c) What is the justification for retention of subject identifiers?
3. Will existing data be used (that is, data existing in a registry or database at the time of this application)? No
 4. Will prospective data be used (that is, data which will be collected in the future)? Yes
 5. Will data be retained with or without identifiers for use in future research projects (that is, will a database be constructed for future analysis or recruitment)? There will be no identifiers associated with this project at any time.

10. Confidentiality

Where will the research data be stored during the study and how will it be secured?

The hard copies of the survey will be kept at the principal investigators place of residence in a locked filing cabinet. The Excel file will contain only coded numerical data. The Excel copy of the survey responses will be kept on the principal investigators laptop and home desktop computer. Both computers are located on a network with a built in firewall, as well as a firewall on each computer. The network has a WEP 64-bit encryption. The laptop computer will have the file on a fully encrypted drive that is password protected using the encryption program BitLocker. The desktop computer will have the data file encrypted also using BitLocker with password protection for computer login. The data will never be placed onto a CD, external hard drive, flash drive or any other external media.

RISK/BENEFIT ASSESSMENT (11-13)

11. Potential Risks

Are there any potential psychological, social, economic, or legal risks associated with this study?

No

Yes. Describe.

12. Potential Benefits to the Subject

Are there any potential benefits the subject may obtain by participating in the research?

No

Yes. Describe.

There are no known direct benefits. It gives medical students a chance to make their opinions on a required admission test heard. This is important because even though the psychometrics of the MCAT have been thoroughly researched, the opinions of individuals required to take this test have not been taken into account after they started their medical training.

13. Potential Benefits to Society

What is the anticipated value to society (e.g., advancement of knowledge) that may result from this research?

This study hopes to advance knowledge of attitudes toward the Medical College Admission Test by asking current medical student's their perspective on the test. This study's targeted sample is different from previous surveys by the Association of American Medical Colleges about the MCAT. This survey will be given to medical students who have almost completed their first or second year of medical school.

SUBJECT IDENTIFICATION, RECRUITMENT AND CONSENT/ASSENT (14-15)**14. Method of Subject Identification and Recruitment**

A. How will prospective subjects be identified (e.g., previous research participants, class rosters, databases)? Participants are identified by their enrollment in first and second year UNMC medical classes.

B. Does the principal, secondary investigator, participating personnel have ethical access to the names of potential subjects?

Yes

No. How will these names be obtained?

No names will be obtained by the principal investigator.

C. How will prospective subjects be contacted for recruitment into the study?
Students will be sent an email notification about the survey and when it will be handed out in their lecture hall. The principal investigator will send the email notification she prepared to a UNMC staff. The staff member will send this email all first and second year medical students. This will keep the participants email information confidential. Additionally, after the principal investigator briefly explains the survey and gives instruction the students will be left with the survey during morning lectures and the principal investigator will pick them up after the student leave their lecture hall. The students will be free to decide if they will or will not participate.

15. Informed Consent

Will informed consent be obtained from prospective subjects?

No

Yes. Briefly describe the process of consent and submit one of the following in consideration of the nature of the research

Written consent form

Notification (e.g., cover letter on a survey; email notice)

Written narrative of information to be orally conveyed to the subject

EXEMPTION CATEGORY (16)**16. Exemption Category**

Specify the exemption category [1-6] under which this protocol should be classified. The categories are outlined in the submission instructions located on pages 1-3 of this application. A study may qualify for more than one category, and all categories should be stated.

Exemption category # 2

LITERATURE REVIEW (17)**17. References**

Provide a full listing of the key references cited in the background (Section II.2). The references should clearly support the stated purpose of the study.

- Association of American Medical Colleges (2010a). 2010 MCAT essentials. Retrieved February 20, 2010, from <http://www.aamc.org/students/mcat/mcatessentials.pdf>
- Association of American Medical Colleges (2010b). Matriculating student questionnaire (MSQ). Retrieved January 11, 2010, from <http://www.aamc.org/data/msg/start.htm>.
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- Henderson, W. D. (2004). The LSAT, law school exams and meritocracy: The surprising and untheorized role of test- taking speed. *Texas Law Review*, *82*, 975- 1051.
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- McGaghie, W.C., Downing, S. M., & Kubilius, R. (2004). What is the impact of commercial test preparation courses on medical examination performance? *Teaching and Learning in Medicine, 16*(2), 202- 211.
- Neustel, S. (1998). An investigation into the possible speededness of Medical College Admission Test. Association of American Medical Colleges, 1- 73.
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- Wiley, A. & Koenig, J.A. (1996). The validity of the medical college admission test for predicting performance in the first two years of medical school. *Academic Medicine, 71*(10), 83-85.

Appendix E



April 26, 2010

Cassie Connealy
Department of Educational Psychology
10753 Brentwood Dr #3B La Vista, NE 68128

Kurt Geisinger
Department of Educational Psychology
21G TEAC, UNL, 68588-0345

IRB Number: 20100410794 EX
Project ID: 10794
Project Title: Medical Students' Attitudes toward the Medical College Admission Test

Dear Cassie:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46) and has been classified as Exempt Category 2.

You are authorized to implement this study as of the Date of Final Approval: 04/26/2010. This approval is Valid Until: 08/31/2010.

1. Please use the informed consent documents that were submitted to distribute to participants at the respective institutions. If you need to make changes to the informed consent form, please submit the revised form to the IRB for review and approval prior to using it.
2. Please email final approval letters from UNMC and Creighton to irb@unl.edu. We will need to include these approvals for our records.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or

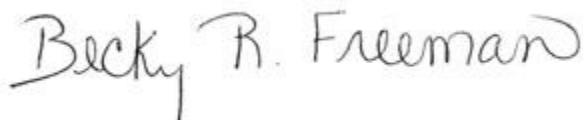
others, and was possibly related to the research procedures;

- * Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
- * Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
- * Any breach in confidentiality or compromise in data privacy related to the subject or others; or
- * Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This project should be conducted in full accordance with all applicable sections of the IRB Guidelines and you should notify the IRB immediately of any proposed changes that may affect the exempt status of your research project. You should report any unanticipated problems involving risks to the participants or others to the Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,



Becky R. Freeman, CIP
for the IRB



Appendix F



NEBRASKA'S HEALTH SCIENCE CENTER

Office of Regulatory Affairs (ORA)
Institutional Review Board (IRB)

April 27, 2010

Cassie Connealy
Educational Psychology
UNL - Via Courier

IRB#: 174-10-EX

TITLE OF PROTOCOL: Medical Students' Attitudes Toward the Medical College Admission Test

Dear Ms. Connealy

The Office of Regulatory Affairs (ORA) has reviewed your application for Exempt Educational, Behavioral, and Social Science Research on the above-titled research project. According to the information provided, this project is exempt under 45 CFR 46:101b, category 2. You are therefore authorized to begin the research.

It is understood this project will be conducted in full accordance with all applicable HRPP Policies. It is also understood that the ORA will be immediately notified of any proposed changes that may affect the exempt status of your research project.

Please be advised that this research has a maximum **approval period of 5 years** from the original date of approval and release. If this study continues beyond the five year approval period, the project must be resubmitted in order to maintain an active approval status.

Sincerely,

A handwritten signature in black ink, appearing to read "Ernest D. Prentice".

Ernest D. Prentice, Ph.D.
Executive Chair, IRB

EDP/gdk

Appendix G

IRB # 174-10-EX

Dear medical student:

I will be conducting a survey on medical students' attitudes toward the Medical College Admission Test (MCAT) at your campus on April 28th, 2010. I have chosen to give questionnaires to medical students because this standardized test is part of the admission criteria for all accredited American medical schools. Your input on how you prepared for the MCAT and your opinion on its applicability for your medical education are important for this research study.

For this survey, I ask you to please look up your composite MCAT score, if you do not remember it currently. These scores will be used for comparing attitudes of other medical students with similar test scores. These scores will only be used for this study. I will not ask for your name or other identifying information so your scores will be kept confidential.

Your assistance in filling out this survey will give you the opportunity to express your attitudes toward a test that you were required to take to be accepted into medical school. I would like to thank you in advance for taking the time to complete this survey.

Sincerely,

Cassie J. Connealy
Graduate Student
Educational Psychology
University of Nebraska at Lincoln

Appendix H

Hi. My name is Cassie Connealy and I am UNL graduate student. I am getting my Masters degree in Educational Psychology specializing in Qualitative, Quantitative, and Psychometric Methods. The survey being passed around now is for my Master's thesis project. I developed this survey on Medical Students' Attitudes toward the MCAT. Attached to the front of the survey is an informed consent letter which details my research project and gives you contact information if you have any further questions about being part of this research study. This survey is completing confidential and I have no way of knowing whose survey is whose. It should take around five minutes to complete and you have until the end of your lectures today to finish which is when I will pick them up. Please place the completed surveys in the manila envelope at the front of the lecture hall and make sure you take some candy as well. I'd like to thank you in advance for completing this survey and helping me with my thesis project.

Appendix I



INFORMED CONSENT FORM

UNMC IRB# 174-10-EX
UNL IRB# 10794

Medical Students' Attitudes toward the Medical College Admission Test (MCAT)

This is a research project that will ask your opinion about the usefulness and applicability of the MCAT to your medical education. You must be 19 years of age or older to participate. You are asked to participate in this study because you are a first or second year medical student who has taken the MCAT.

Participation in this study will require approximately 10 minutes of your time. You will be given a short survey consisting of 23 questions. After finishing the survey you will place it in an envelope at the front of your lecture hall.

There are no known risks or discomforts associated with this research.

There are also no known direct benefits to participation in this research study. It does give you a chance to make your opinions on a required admission test heard. This is important because even though the psychometrics on the MCAT have been thoroughly researched, the opinions of individuals required to take this test have not been taken into account after they have started medical school.

Any information obtained during this study which could identify you will be kept strictly confidential. The data will be stored in a locked filing cabinet at the investigator's residence and will only be seen by the investigator during the study and for 4 months after the study is complete. The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data.

There will be no monetary compensation for participating in this research but feel free to take a miniature candy bar when you turn in the survey.

You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. You may call the investigator at any time. If you have questions concerning your rights as a research subject that have not been answered by the investigator or to report any concerns about the study, you may contact the University of Nebraska Medical Center Institutional Review Board at (402) 559-6463 and/or the University of Nebraska- Lincoln Institutional Review Board at (402) 472- 6965.

You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, University of Nebraska- Lincoln or your institution. Your decision will not result in any loss or benefits to which you are otherwise entitled.

You are voluntarily making a decision whether or not to participate in this research study. By completing the survey, you agree to take part in this research. You should keep this letter for your records.

Name and Phone number of investigators

Cassie Jo Connealy, B.A., Principal Investigator *Home: (402) 514-7993*

Kurt Geisinger, Ph.D., Project Supervisor *Office: (402) 472- 3280*
