Comparison of COMLEX-USA Scores, Medical School Performance, and Preadmission Variables Between Women and Men

Donna Dixon, PhD

From the Department of Medical Education at the New York Institute of Technology College of Osteopathic Medicine in Old Westbury.

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Address correspondence to Donna Dixon, PhD, PO Box 8000, Old Westbury, NY 11568-8000.

E-mail: ddixon@nyit.edu

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Context: Previous studies by the author showed differences in preadmission variables and Comprehensive Osteopathic Medical Licensing Examination-USA (COMLEX-USA) scores between women and men at the New York Institute of Technology College of Osteopathic Medicine (NYIT-COM). It is pertinent to reexamine the preadmission variables, medical school performance, and COMLEX-USA scores of women and men to determine whether these differences still exist.

Objective: To examine the relationship between student sex and performance on COMLEX-USA Level 1 and Level 2-Cognitive Evaluation (CE), performance during medical school, and preadmission academic variables at NYIT-COM.

Methods: Scores on COMLEX-USA Level 1 and COMLEX-USA Level 2-CE, grades in all courses taken during the first 2 years of medical school, the National Board of Osteopathic Medical Examiners' clinical science subject examination scores, Medical College Admission Test (MCAT) scores, and undergraduate grade point averages (GPAs) were compared between women and men in the classes graduating between 2009 and 2012.

Results: Data from 748 students were analyzed. Men had statistically significantly higher scores than women on COMLEX-USA Level 1 in 2009 (540 vs 500; $P<.001$) and 2010 (537 vs 496; $P<.001$). No statistically significant difference in COMLEX-USA Level 2-CE scores was found between women and men. The performance of women and men was comparable during the first 2 years of medical school and on clinical science subject examinations in years 3 and 4. Men had statistically significantly higher MCAT scores than women, but no statistically significant differences were found between women's and men's undergraduate GPAs.

Conclusion: Men were found to have higher scores than women on COMLEX-USA Level 1 and the MCAT. However, the reasons behind these data have yet to be elucidated. Although a stronger background in basic science could explain the discrepancy in scores between women and men, women were found to have equally high science GPAs and performed comparably to men in osteopathic medical school. The results were in agreement with previous studies at NYIT-COM.

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In the mid-1990s, studies by allopathic medical schools reported sex differences in student performance on medical licensing examinations, with men outperforming women on the National Board of Medical Examiners (NBME) Examination Part I, a precursor to the current United States Medical Licensing Examination (USMLE).[1,2] These studies found no differences in scores on the NBME Examination Part II between women and men. Men were reported to perform better than women on the USMLE Step 1,[3] and women were found to have higher scores than men on the USMLE Step 2 Clinical Knowledge.[4,5]

The osteopathic literature during a similar time frame has shown comparable findings.[7-9] Men were reported to score higher on the National Board of Osteopathic Medical Examiners (NBOME) examination Part I (a precursor to the Comprehensive Osteopathic Medical Licensing Examination-USA [COMLEX-USA])[7] and on the COMLEX-USA Level 1.[8,9] These studies found that women and men performed equally well on the NBOME Part II and the COMLEX-USA Level 2-Cognitive Evaluation (CE).[7-9] The purpose of the current study was to compare the medical school performance and preadmission variables between women and men at the New York Institute of Technology College of Osteopathic Medicine (NYIT-COM).

Methods

The study group was composed of students who had graduated from NYIT-COM between 2009 and 2012. Students were included if they had been enrolled in the traditional, systems-based pathway and had passed the COMLEX-USA Level 1 and Level 2-CE on the first attempt. The university's institutional review board deemed the current study exempt. Student records were coded to protect anonymity.

The COMLEX-USA Level 1 emphasizes the scientific concepts and principles of basic science that are relevant to solving medical problems, and the COMLEX-USA Level 2-CE emphasizes the medical concepts and principles necessary to make appropriate medical diagnoses through patient history and physical examination. The Level 1 and Level 2-CE scores used were those reported by NBOME to NYIT-COM.

Medical school performance was measured using course grades during the first 2 years and NBOME clinical science subject scores during years 3 and 4. The course grades, obtained from institutional databases, comprised the subject of introduction to osteopathic medicine, as well as the following system courses: musculoskeletal, integumentary, neuroscience, hematology and immunology, cardiovascular and pulmonary, endocrinology, gastrointestinal, reproduction, and genitourinary. The clinical subject examinations, obtained from the NBOME, were given after the clinical clerkships of principles of osteopathic manipulative medicine, family medicine, medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery.

Medical College Admission Test (MCAT) scores and the total and science undergraduate grade point averages (GPAs) were obtained from the American Association of Colleges of Osteopathic Medicine Application Service.

Comparisons of the data between sexes were measured using the 2-tailed *t* test for independent samples. Statistical significance was defined as $P \leq .05$. An analysis of covariance was also performed. All statistical analyses were calculated using SPSS statistical software (version 22.0, SPSS Inc).

Results

Table 1 presents the COMLEX-USA Level 1 and COMLEX-USA Level 2-CE scores for the 748 women and men who met inclusion criteria in the 4 classes that graduated between 2009 and 2012. The scores are expressed as the differences in the mean scores between women and men. The mean COMLEX-USA Level 1 scores of men were higher than the mean scores of women in all 4 years, and these differences were statis-

Table 1.
Four-Year Comparison of Mean COMLEX-USA Level 1 and Level 2-CE Scores Between Women and Men

Examination	Score		*P* Value
	Women[a]	Men	
COMLEX-USA Level 1			
2009	499.81	540.14	<.001
2010	495.88	537.10	<.001
2011	507.01	530.75	.03
2012	512.35	547.94	<.01
COMLEX-USA Level 2-CE			
2009	522.30	535.90	.29
2010	519.32	537.30	.16
2011	506.60	528.32	.09
2012	526.70	545.67	.18

[a] The study population comprised 98 women (52%) in 2009, 119 (56%) in 2010, 117 (44%) in 2011, and 115 (44%) in 2012.

Abbreviations: CE, Cognitive Evaluation; COMLEX-USA, Comprehensive Osteopathic Medical Licensing Examination-USA.

tically significant in 2009 (540 vs 500; *P*<.001), 2010 (537 vs 496; *P*<.001), 2011 (531 vs 507), and 2012 (548 vs 512). No statistically significant difference in COMLEX-USA Level 2-CE scores was found between women and men, and no statistically significant differences were found between women's and men's undergraduate GPAs.

The performance of women and men was comparable during the first 2 years of medical school and on clinical science subject examinations in years 3 and 4. No statistically significant difference between women and men was found in the mean course grades during the first 2 years (82.69 vs 82.00; *P*<.633) or in the mean scores on the 7 NBOME clinical science subject examinations given in the third and fourth years (549.67 vs 522.42; *P*<.48).

Table 2 shows the mean MCAT scores, undergraduate science GPAs, and total undergraduate GPAs for each class. The mean MCAT scores of men were significantly higher than those of women in 2009 (23.76 vs 25.89; *P*<.001), 2010 (25.24 vs 25.93; *P*<.001), 2011 (25.28 vs 27.12; *P*<.001), and 2012 (27.41 vs 26.54; *P*=.001). The total mean undergraduate GPAs of women were higher than those of men in all classes, but these differences were not statistically significant. No differences were found between women and men in undergraduate science GPAs. Controlling for MCAT score and total undergraduate GPA did not eliminate the sex difference seen in the COMLEX-USA Level 1 scores.

Discussion

The findings that men outperformed women on COMLEX-USA Level 1 and that no difference existed between women's and men's scores on COMLEX-USA Level 2-CE agree with the findings of studies of the classes of 2002 to 2006 at NYIT-COM.[8] In addition, the other findings in the present study were comparable to those in the earlier study[8] of the classes of 2002 to 2006. However, the current findings show that women's undergraduate science GPAs were not lower than men's. One might expect that as more women enter the medical profession, the women accepted to medical schools would have equal or higher mean MCAT scores than the men. Both the COMLEX-USA Level 1 and the MCAT assess basic science knowledge, which might point to a weaker foundation in basic science among women. Because women had lower COMLEX-USA Level 1 scores, they might have been expected to have lower grades than men during the first 2 years of medical school, but this relationship was not found in the current study. Women's performance during the first 2 years of medical school, on clinical subject examinations, and on COMLEX-USA Level 2-CE was equal to that of men. The reasons for the differences are unknown.

The present study has some limitations. Because it was conducted at a single osteopathic medical school, these findings may not apply to other medical schools. The present study did not consider performance on COMLEX-USA Level 2-Performance Evaluation, which

focuses on clinical skills, or Level 3, which is typically taken after graduation and may be a better reflection of performance in practice. It also did not consider reasons for the differences between male and female performance, which could be used to address discrepancies earlier in a medical student's career.

Future research should explore other possible predictors of medical school performance. These predictors might be specific undergraduate science courses, ethnicity, or admission policies. Future research might also explore possible performance differences between women and men in internships, residencies, and the choice of specialties.

Conclusion

The current study demonstrated that men who graduated from NYIT-COM between 2009 and 2012 had higher scores than women on the COMLEX-USA Level 1 and MCAT. No statistically significant difference was found between women and men in performance in preclinical course work, NBOME clinical science subject examinations, or COMLEX-USA Level 2-CE. If these findings are confirmed at other osteopathic medical schools, further research will be needed to understand why women and men perform differently on the MCAT and COMLEX-USA Level 1.

Table 2.
Four-Year Comparison of Mean Preadmission Variables Between Women and Men

Preadmission Variable	Women[a]	Men	*P* Value
MCAT Score			
2009	23.76	25.89	<.001
2010	25.24	25.93	<.001
2011	25.28	27.12	<.001
2012	26.54	27.41	.001
Total Undergraduate GPA			
2009	3.51	3.47	.219
2010	3.45	3.39	.816
2011	3.47	3.46	.731
2012	3.54	3.52	.506
Science Undergraduate GPA			
2009	3.40	3.38	.756
2010	3.31	3.31	.572
2011	3.34	3.41	.937
2012	3.42	3.44	.486

[a] The study population comprised 98 women (52%) in 2009, 119 (56%) in 2010, 117 (44%) in 2011, and 115 (44%) in 2012.

Abbreviations: MCAT, Medical College Admissions Test; GPA, grade point average.

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