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Assessment of the Research Interests and Perceptions of First-Year Medical Students at 4 Colleges of Osteopathic Medicine

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Context: There are limited data regarding the experiences of and attitudes toward research participation among osteopathic medical students despite rapidly increasing enrollment and expansion of the number of osteopathic medical schools.

Objective: To assess first-year osteopathic medical students' experience with research, their interest in it, their perceptions of its value, and barriers to participation.

Methods: An anonymous, online survey was sent to 868 medical students in the class of 2021 at 4 colleges of osteopathic medicine. The survey consisted of 14 multiple-choice items (7 of which offered the option of a written response) and 1 open-ended item that asked them to report their age. The survey remained open for 2 weeks, with 1 reminder email sent on the last day of the survey. Incomplete responses were excluded from the analysis.

Results: A total of 328 participants were included, for a response rate of 38%. A majority of respondents reported previous research experience (261 [79.6%]), consistent with a strong perception that research participation is important (315 [96.0%]). Fewer students (177 [54.0%]) were either currently participating in research or affirmed interest in performing research during medical school, with the highest level of interest in clinical research (259 [79.0%]) followed by basic science (166 [50.6%]). Regarding incentives that might encourage participation in research, students preferred monetary compensation (213 [64.9%]) or extra credit in courses (195 [59.5%]). A commonly reported barrier to performing research during medical school was the possibility of a negative impact on performance in coursework (289 [88.1%]).

Conclusion: First-year osteopathic medical students are interested in research, view research experience as valuable, and consider research experience as beneficial to future career development. This study's findings highlight opportunities for increasing student participation in research through incentives or removal of perceived barriers.

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Inquiry-based learning and teaching techniques promote critical thinking, reflection, and discovery to engage learners as active participants in the educational process. Participation in research projects facilitates this approach because students can integrate the knowledge gained from coursework with discoveries made during the research process. Many collateral benefits also accrue for those who participate in original research, including sharpened critical thinking and lifelong learning,¹⁻⁴ greater appreciation for evidence-based medicine,⁵ and improved clinical competence.⁶ Consistent with the collateral benefits of the research and publication, the American Osteopathic Association's Commission on Osteopathic College Accreditation requires that colleges of osteopathic medicine (COMs) provide instruction in the basic scientific principles of research and support student research participation.⁷ Despite these expectations, for all available years (2013-2018), nearly half of osteopathic graduates reported that their medical school did not devote adequate time to research.⁸⁻¹³ According to the 2018 National Residency Match Program data, only half of osteopathic medical students self-reported that a research experience led to a demonstrable product (eg, publication, abstract)¹⁴; this finding contrasts with 78% of allopathic medical students.¹⁵ The reasons for this discrepancy are no doubt multifactorial; however, there is a lack of available information regarding the attitudes and perceptions of osteopathic medical students toward research participation.

Previously, we disseminated an electronic survey to incoming first-year osteopathic medical students at 2 campuses of a single COM and found that the vast majority of students reported previous research experience and affirmed interest in participating in research during medical school.¹⁶ These findings suggested that first-year osteopathic medical students were highly motivated to perform research, but this broad generalization was limited because the population came from a single COM.

The present article is an extension of that study—using the same base survey instrument with slight

modifications for wider distribution—to 4 COMs (5 campuses). The purpose of this study was to more broadly examine the research experience, interests, and perceptions of students at 5 COM campuses representing different regions of the country.

Methods

We distributed a descriptive survey to first-year osteopathic medical students (class of 2021) at 4 osteopathic medical schools: Western University of Health Sciences College of Osteopathic Medicine of the Pacific (WesternU/COMP) in Pomona, California and WesternU/COMP-Northwest in Lebanon, Oregon; University of Pikeville Kentucky College of Osteopathic Medicine (UP-KYCOM); Marian University College of Osteopathic Medicine (MU-COM) in Indianapolis, Indiana; and West Virginia School of Osteopathic Medicine (WVSOM) in Lewisburg. This study was approved or deemed exempt by the institutional review boards at all 4 COMs.

An email was sent to 868 students, who had entered medical school 3 weeks earlier, inviting them to voluntarily participate in the anonymous survey. The invitation provided basic information about the study as well as a statement indicating that submission of the survey by a student constituted informed consent. A hyperlink to the survey was provided at the end of the email invitation. The survey was administered by the online survey service Qualtrics, which allowed for anonymous data collection and concealment of the participants' identities.

The survey instrument ([eFigure](#)) consisted of 15 items: 14 multiple-choice items (7 offered a write-in response and were categorized by the authors by common language or sentiment) and 1 asked participants to specify their age. The survey remained open for 2 weeks, with 1 reminder email sent on the last day of the survey. Incomplete responses were excluded from the analysis. Data were summarized in aggregate form and by institution. Differences across COMs in previous research experience and current participation interest levels were analyzed using a 2-tailed χ^2 test;

Table 1.
Demographics of Survey Respondents

Characteristic	Overall	WesternU/ COMP	WesternU/ COMP-Northwest	UP-KYCOM	MU-COM	WVSOM
Respondents, No. (%)	328 (100%)	57 (17.4)	56 (17.1)	69 (21.0)	65 (19.8)	81 (24.7)
Response Rate, %	38%	25%	50%	49%	38%	38%
Age Range, y	20-49	21-41	22-36	21-39	21-30	20-49
Field of Bachelor's Degree, No. (%)						
Applied science	13 (4.0)	2 (3.5)	2 (3.6)	3 (4.3)	1 (1.5)	5 (6.2)
Basic science	246 (75.0)	42 (73.7)	43 (76.8)	53 (76.8)	53 (81.5)	55 (67.9)
Social science	29 (8.8)	4 (7)	5 (8.9)	7 (10.1)	6 (9.2)	7 (8.6)
Liberal Arts	11 (3.4)	4 (7)	1 (1.8)	1 (1.4)	1 (1.5)	4 (4.9)
Other	29 (8.8)	5 (8.8)	5 (8.9)	5 (7.2)	4 (6.2)	10 (12.3)
Highest Degree Earned, No. (%)						
Bachelor's	265 (80.8)	43 (75.4)	49 (87.5)	56 (81.2)	57 (87.7)	60 (74.1)
Master's	62 (18.9)	13 (22.8)	7 (12.5)	13 (18.8)	8 (12.3)	21 (25.9)
PhD	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Professional	1 (0.3)	1 (1.8)	0 (0)	0 (0)	0 (0)	0 (0)

^a Percentages refer to within each column grouping with the exception of "respondents" where referring to the percentage of the overall grouping.

$P < .05$ was considered statistically significant. An odds ratio was used to determine whether interest in participating in research during medical school was associated with previous research experience.

Results

A total of 328 students participated, for an overall response rate of 38% (328 of 868); the response rate for each COM ranged from 25% to 50% (Table 1). Each COM was also represented relatively equally in the final participation group: WesternU/COMP (57 [17%]), WesternU/COMP-Northwest (56 [17%]), UP-KYCOM (69 [21%]), MU-COM (65 [20%]), and WVSOM (81 [25%]) (Table 1). Respondent ages ranged from 20 to 49 years. For the majority of participants (265 [80.8%]; range, 74.1%-87.7%), a baccalaur-

ate degree was the highest degree earned, and basic science was the most prevalent field of study (246 [75.0%]; range, 67.9%-81.5%).

The majority of participants (261 [79.6%]; range, 68.1%-94.7%; Table 2) reported participation in research before entering a COM. Significant differences were found in previous research experience between COMs ($\chi^2=11.87$; $df=3$; $P=.008$). Most of those with experience (160 [61.3%]; range, 48.1%-68.7%) had published or presented their research findings. When asked whether they were interested in participating in research during medical school, 177 (54%; range, 36.2%-66.7%) either expressed interest or were currently doing research (Table 3). One hundred fifteen (37.5%) also indicated that they might be interested in participating in research. Significant differences were found in interest in participating in research ($\chi=15.48$;

Table 2.
Previous Research Experience Among Survey Respondents ^a

Previous Research Experience	Overall	WesternU/COMP	WesternU/COMP-Northwest	UP-KYCOM	MU-COM	WVSOM
Yes	261 (79.6)	54 (94.7)	45 (80.4)	47 (68.1)	48 (73.8)	67 (82.7)
Published or presented	160 (61.3)	26 (48.1)	24 (53.3)	31 (66.0)	33 (68.8)	46 (68.7)
Not published or presented	101 (38.7)	28 (51.9)	21 (46.7)	16 (34.0)	15 (31.3)	21 (31.3)
No	67 (20.4)	3 (5.3)	11 (19.6)	22 (31.9)	17 (26.2)	14 (17.3)

^a Percentages refer to within each column grouping. Data are given as No. (%).

$df=3$; $P=.001$) between COMs. The odds of interest in research during medical school were 2 times greater for participants with previous research experience than for those with no previous research experience (OR, 2.00; 95% CI, 1.16-3.46). Fifteen participants (4.6%) reported no interest in research (Table 3).

The majority of participants (259 [78.9%]; range, 64.9%-86.4%) affirmed interest in clinical research (Table 3). Level of interest in other research topic areas were: basic science (166 [50.6%]; range, 47.4%-53.8%), anatomical research (108 [32.9%]; range, 22.8%-39.3%), osteopathic manipulative medicine (105 [32.0%]; range, 19.6%-39.1%), social science (101 [30.8%]; range, 26.2%-33.3%), translational research (48 [14.6%]; range, 11.6%-19.3%), applied science (30 [9.1%]; range, 7.2%-10.8%), and other (10 [3.0%]; range, 1.4%-5.4%). Of the “other” answers, 3 participants indicated an interest in exercise physiology and nutrition, and 1 participant each wrote in concussion, social determinants of health, immunology, education, prehospital care, and gene therapy as their areas of research interest.

An overwhelming majority of participants (315 [96.0%]; range, 94.6%-97.1%) indicated that they perceived some level of importance to participating in research during their osteopathic medical school tenure; 124 participants indicated that they felt a research experience was “very” or “extremely” important (range, 27.7%-55.4%). Thirteen participants

(4.0%) indicated that research participation during medical school was “not important.” Regarding the question of perceived benefits of participating in research during medical school (Table 4), for which participants could identify more than 1 answer, a majority of participants (274 [83.5%]; range, 75.4%-87.7%) believed that research participation would enhance their competitiveness in residency applications. Other perceived benefits included an opportunity to interact with current faculty (222 [67.7%]; range, 61.4%-75.4%), to develop skills for conducting research as a physician (219 [66.8%]; range, 55.4%-73.7%), and to deepen understanding of curricular concepts (212 [64.6%]; range, 59.6%-76.8%). In open-ended answers, some participants (18 [5.5%]) reported other benefits, including “to aid in the advancement of medicine,” “furthering the DO field by supporting techniques with evidence based research,” “contributing to society, patient care, and improving patient outcomes,” and “developing and sharpening one’s ability to critically analyze multivariable problems.” Four participants (1.2%) indicated that research participation was not beneficial.

An overwhelming majority of participants (289 [88.1%]; range, 78.6%-94.7%) thought that research would have a negative effect on their coursework performance. Relatively fewer participants indicated that a preference for other extracurricular activities (115 [35.1%]; range, 28.4%-43.9%) might be a reason to

Table 3.
Interest in Participating in Research During Osteopathic Medical School Among Survey Respondents

Interested in Participating in Research	Overall	WesternU/COMP	WesternU/COMP-Northwest	UP-KYCOM	MU-COM	WVSOM
Yes	165 (50.3)	28 (49.1)	30 (53.6)	22 (31.9)	31 (47.7)	54 (66.7)
Maybe	115 (35.1)	20 (35.1)	16 (28.6)	31 (44.9)	26 (40)	22 (27.2)
Currently participating	12 (3.7)	3 (5.3)	5 (8.9)	3 (4.3)	1 (1.5)	0 (0)
No	15 (4.6)	2 (3.5)	0 (0)	7 (10.1)	2 (3.1)	4 (4.9)
No response	21 (6.4)	4 (7)	5 (8.9)	6 (8.7)	5 (7.7)	1 (1.2)
Type of Research Interest						
Clinical research	259 (79.0)	37 (64.9)	43 (76.8)	53 (76.8)	56 (86.2)	70 (86.4)
Basic science	166 (50.6)	27 (47.4)	29 (51.8)	35 (50.7)	35 (53.8)	40 (49.4)
Anatomical research	108 (32.9)	13 (22.8)	22 (39.3)	21 (30.4)	23 (35.4)	29 (35.8)
Osteopathic manipulative medicine	105 (30.0)	16 (28.1)	11 (19.6)	27 (39.1)	21 (32.3)	30 (37.0)
Social science	101 (30.8)	19 (33.3)	16 (28.6)	23 (33.3)	17 (26.2)	26 (32.1)
Translational research	48 (14.6)	11 (19.3)	7 (12.5)	8 (11.6)	8 (12.3)	14 (17.3)
Applied science	30 (9.1)	6 (10.5)	5 (8.9)	5 (7.2)	7 (10.8)	7 (8.6)
Other	10 (3.0)	3 (5.3)	3 (5.4)	1 (1.4)	1 (1.5)	2 (2.5)
Not interested in research	21 (6.4)	4 (7.0)	5 (8.9)	6 (8.7)	5 (7.7)	1 (1.2)

^a For the type of research, participants were allowed to choose ≥ 1 factors. Percentages refer to within each column grouping. Data are given as No. (%).

not participate in research. Lack of opportunity for a specific kind of research was a less prevalent concern (38 [11.6%]; range, 7.0%-17.9%). Some students (17 [5.2%]) reported additional concerns, most of which pertained to other types of obligations (eg, spending time with family and military service).

More than half of the participants indicated that monetary compensation would motivate them to engage in research (213 [64.9%]; range, 53.6%-72.5%), as would extra credit in coursework (195 [59.5%]; range, 51.9%-68.1%) (Table 5). Some participants (101 [30.8%]; range, 23.1%-37.0%) reported that an opportunity for a specific type of research might encourage their participation.

Discussion

This study is an extension of previous study by WesternU/COMP-Northwest,¹⁶ in which experience with and attitudes toward research were examined among first-year osteopathic medical students at WesternU/COMP and WesternU/COMP-Northwest. Those data revealed that the vast majority of students reported prior research experience and were interested in participating in research during medical school. Additionally, osteopathic medical students at 1 COM reported that there were perceived barriers and benefits to participating in research during medical school.¹⁶ However, the generalizability of those findings to other COMs was unclear because of the limitation of

Table 4.
Survey Respondents' Perceptions of the Importance and Benefits of Participating in Research During Osteopathic Medical School^a

Factors	Overall	WesternU/ COMP	WesternU/ COMP-Northwest	UP-KYCOM	MU-COM	WVSOM
Importance of Participating in Research Experience						
Extremely important	46 (14.0)	6 (10.5)	10 (17.9)	10 (14.5)	5 (7.7)	15 (18.5)
Very important	78 (23.8)	16 (28.1)	21 (37.5)	12 (17.4)	13 (20.0)	16 (19.8)
Moderately important	150 (45.7)	24 (42.1)	19 (33.9)	37 (53.7)	36 (55.4)	34 (42.0)
Slightly important	41 (12.5)	8 (14.0)	3 (5.4)	8 (11.6)	9 (13.8)	13 (16.0)
Not important	13 (4.0)	3 (5.3)	3 (5.4)	2 (2.9)	2 (3.1)	3 (3.7)
Benefits of Participating in Research						
Enhancing competitiveness for residency slots	274 (83.5)	43 (75.4)	49 (87.5)	59 (85.5)	57 (87.7)	66 (81.5)
Engaging with faculty members	222 (67.7)	35 (61.4)	40 (71.4)	47 (68.1)	49 (75.4)	51 (63.0)
Developing skills for doing research as a physician	219 (66.8)	42 (73.7)	39 (69.6)	43 (62.3)	36 (55.4)	59 (72.8)
Deepening understanding of curricular concepts	212 (64.6)	34 (59.6)	43 (76.8)	45 (65.2)	40 (61.5)	50 (61.7)
Other	18 (5.5)	4 (7.0)	8 (14.3)	4 (5.8)	2 (3.1)	1 (1.2)
No benefit	4 (1.2)	2 (3.5)	1 (17.9)	0 (0.0)	1 (1.5)	0 (0.0)

^a For the perceived benefits, participants were allowed to choose ≥ 1 factors. Percentages refer to within each column grouping. Data are given as No. (%).

surveying students at only 1 COM. Using the same survey instrument, with slight modifications for broader distribution, the current study allowed aggregate analysis of cohort-matched osteopathic medical students at 4 COMs and revealed institution-specific differences between students. Similar to Carter et al,¹⁶ the vast majority of students at each COM reported previous research experience (79.6% overall in our study vs 81% in the Carter et al study) and potential participation in research during medical school (89.0% vs 75%). That said, χ^2 analyses revealed institution-specific differences in research interests and experience, with

COMP/WesternU and COMP-Northwest students reporting the highest amount of previous research experience, WVSOM students reporting the highest interest in participating in research, and UP-KYCOM students reporting the lowest amount of research experience and interest in research. Across campuses, the majority of students reported interest in clinical research, which is consistent with Carter et al,¹⁶ Pheley et al,¹⁹ and Licciardone et al²⁰ regarding clinical research electives. Moreover, approximately half of the students in the current study and in Carter et al¹⁶ reported interest in basic science research, while

Table 5.
Survey Respondents' Perceptions of the Reasons to Not Participate in and Possible Enablers to Encourage Participating in Research During Osteopathic Medical School^a

Factors Affecting Research Interest	Overall	WesternU/COMP	WesternU/COMP-Northwest	UP-KYCOM	MU-COM	WVSOM
Reasons to Not Participate						
Concern about academic performance	289 (88.1)	54 (94.7)	44 (78.6)	63 (91.3)	60 (92.3)	68 (84.0)
Prefer other extracurricular activities	115 (35.1)	25 (43.9)	22 (39.3)	24 (34.8)	21 (32.3)	23 (28.4)
Lack of opportunity for a specific kind of research	38 (11.6)	4 (7.0)	10 (17.9)	6 (8.7)	6 (9.2)	12 (14.8)
Not applicable	12 (3.7)	4 (7.0)	3 (5.4)	4 (5.8)	2 (3.1)	4 (4.9)
Other	17 (5.2)	0 (0.0)	4 (7.1)	2 (2.9)	2 (3.1)	4 (4.9)
Possible Enablers						
Monetary compensation	213 (64.9)	39 (68.4)	30 (53.6)	50 (72.5)	43 (66.2)	51 (63.0)
Extra credit	195 (59.5)	33 (57.9)	31 (55.4)	47 (68.1)	42 (64.6)	42 (51.9)
Specific type of research	101 (30.8)	18 (31.6)	17 (30.4)	21 (30.4)	15 (23.1)	30 (37.0)
Nothing	29 (8.8)	7 (12.3)	8 (14.3)	3 (4.3)	5 (7.7)	6 (7.4)
Other	25 (7.6)	5 (8.8)	9 (16.1)	2 (2.9)	2 (3.1)	7 (8.6)

^a Participants were allowed to choose ≥ 1 factors. Percentages refer to within each column grouping. Data are given as No. (%).

approximately one-third of students in both studies reported interest in osteopathic manipulative medicine research. Notably, interest in research participation during osteopathic medical school was significantly greater for students with previous research experience when compared with students with no research experience. These findings may have important implications for COMs that are considering expanding their research programs and increasing research opportunities for students, potentially through recruitment and admission practices, faculty hiring in particular research areas, and intramural research funding and infrastructure.

Ample evidence shows that research participation provides many collateral benefits to medical professionals, including sharpened critical thinking and lifelong learning skills,¹⁻⁴ greater appreciation for

evidence-based medicine⁵; and improvement in clinical competency scores.⁶ It is important to keep in mind that the primary benefit ascribed to research participation by students in the current study and in Carter et al¹⁶ was the potential for enhanced competitiveness in residency applications (83.5% vs 91.0%, respectively). This finding is striking considering that, for all available years (2013-2018), nearly half of recent osteopathic graduates reported that their medical school did not devote adequate time to research.⁸⁻¹³ Previous studies of allopathic medical students reported that they value research participation as contributing to their career development and that it increased their confidence about placement into their desired residency.²¹⁻²³ Previous reports²⁴⁻²⁶ found that research experience increased the likelihood of allopathic medical students matching into their desired residency

program for many specialties. Corresponding data are limited regarding osteopathic medical students.²⁶ Furthermore, the 2018 NRMP Program Director survey indicated that, in certain specialties (eg, radiation oncology, plastic surgery, neurosurgery, interventional radiology), more than 75% of program directors surveyed felt that “demonstrated involvement and interest in research” was a key factor in the selection of applicants for an interview.²⁷ Therefore, it is important to identify the motivations and real or perceived barriers to participating in research during osteopathic medical school.

In the present study and in Carter et al,¹⁶ the overwhelmingly predominant barrier or concern was the potential for research to negatively affect performance in coursework (88.1% vs 87.2%, respectively), which we suspect is due to the time commitment required for conducting meaningful research. Similar barriers to those reported in the current study have been reported by US and international allopathic medical students, including time, funding, research mentor availability, research techniques training, and receiving appropriate acknowledgment for their research contributions.^{22,28,29} In the changing landscape of the residency match process, osteopathic medical schools should be encouraged to provide more research opportunities for their medical students because evidence suggests that research experience during medical school correlates with matching into residency programs and is considered a key factor by residency program directors.^{25,26} Directly addressing research barriers may lead to increased opportunities for research experience during medical training. For instance, by implementing specific tools and resources (added mentorship, protected time, biostatistical assistance), resident physicians increased their publication and national presentation rates.³⁰ Therefore, institutions that emphasize medical student research should consider instituting similar types of incentives (eg, monetary compensation, dedicated time in the curriculum, or a pass-fail grading system) to encourage research participation.

The current study has several important limitations that may affect its generalization to osteopathic medical students nationwide. First, the response rate (38%) was relatively low. Second, our survey instrument, while anonymous, relied on the accuracy of self-reported information. Third, the experience and perceptions of first-year osteopathic medical students at the COMs may have been influenced by regional or institution-specific factors that were beyond the scope of the study. Similarly, institution-specific admission criteria may have underpinned differences between the COMs. Taking these limitations into consideration, overall consistency was observed between the campuses and our prior study,¹⁶ which had a response rate of 77%. Thus, we cautiously generalize our findings and interpret them in the context of undergraduate osteopathic medical education overall.

Conclusion

Our findings indicate that first-year osteopathic medical students are interested in research, view research experience as valuable, and perceive research experience as beneficial to future career development. These findings should compel COMs to provide sufficient research opportunities and resources to students. We hope that all COMs will address the interests, attitudes, and perceptions toward research of their students, promoting a greater awareness and practice of research within the osteopathic medical community.

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Author Contributions

All authors provided substantial contribution to conception and design, acquisition of data, or analysis and interpretation of data; Mss Nguyen, Kaneshiro, and Nallamala, Mr Kirby, and Drs Zahl, Hum, Lowery, and Kisby drafted the article or revised it critically for important intellectual content; all authors gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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