

## Analysis of American Medical Students' Knowledge of Physical Activity Recommendations

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### Abstract

**Introduction:** The benefits of physical activity (PA) are widely recognized; American medical schools have begun to emphasize PA, but the effectiveness of these changes is unclear.

**Methods:** We performed a cross-sectional analysis of medical students enrolled in US osteopathic and allopathic medical schools between August 2019 and May 2020. All participants completed an electronic survey about PA instruction across the 4 years of medical school. Objective information including hours and format of PA instruction was collected. Subjectively, participants reported their relative comfort discussing various aspects of PA education with patients.

**Results:** A total of 480 medical students completed the survey, representing 82 of the 192 US medical schools (69 allopathic, 13 osteopathic). Students are more comfortable discussing overall exercise benefits than exercise testing, exercise prescription, and exercise physiology ( $P<.0001$ ). They also report more exposure to general PA guidelines related to overall PA duration than strength training ( $P<.0001$ ). Students at allopathic and osteopathic schools reported similar outcomes regarding PA education, while students with class sizes under 200 reported increased familiarity with National Physical Activity Guidelines regarding PA duration ( $P<.0001$ ) and strength training ( $P=.01$ ).

**Conclusion:** Despite recent efforts to improve PA education in medical school, students feel unprepared to apply their knowledge in a clinical setting and remain unaware of national PA guidelines. Future studies should determine how to practically integrate PA education longitudinally into curricula to change PA education from an afterthought to an essential component of medical school education.

## Introduction

The overall health benefits of physical activity (PA) are wide ranging, cost effective, and universally recognized.<sup>1-22</sup> Incoming medical students understand the importance of PA, as more than 97% of them report moderate or vigorous personal exercise programs.<sup>23</sup> However, traditional medical education focuses on pharmacologic management of chronic diseases, failing to emphasize prevention.<sup>9,20,23,24</sup> Consequently, the majority of future physicians are uncomfortable discussing the details of PA with their patients.<sup>25-28</sup>

Although many American medical schools have expanded their PA education,<sup>21,29-32</sup> few studies have examined the results of these curriculum modifications.<sup>4,21,33-36</sup> Understanding the knowledge and comfort

level of future physicians is essential for targeted, effective curricular changes. We sought to analyze medical students' perspectives of the quantity and quality of PA education received during medical school and to assess comfort with discussing aspects of PA with patients, specifically the National Physical Activity Guidelines.<sup>37</sup>

## Methods

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We conducted a cross-sectional analysis of medical students of all class years enrolled in osteopathic and allopathic medical schools in the United States with Institutional Review Board (IRB) approval. From August 2019 to May 2020, a 19-question electronic survey created via Research Electronic Data Capture (REDCap, Vanderbilt University, Nashville, TN) was distributed via email to medical student members of the American Medical Society of Sports Medicine (AMSSM, [Appendix A](#)). The survey was anonymous, and no incentive was provided for completion. The initial response rate was low (14 completed surveys from 330 email addresses), and the authors began distributing the survey to more targeted audiences. The survey was emailed to the primary contact of the AMSSM Charter Medical Schools to circulate to students at their individual medical school. The authors also distributed the survey link to medical students at their respective institutions and via social media (Facebook and GroupMe). We collected objective information, including hours and format of PA instruction, and subjective opinions of comfort with PA education.

We calculated descriptive statistics for categorical and continuous variables. Tests of significance utilized included  $\chi^2$ , Fisher's exact, Student *t* tests, and Mann-Whitney U tests, where appropriate. *P* values less than .05 were considered statistically significant. We performed all analyses with SAS (SAS Institute, Cary, NC).

## Results

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A total of 480 medical students completed the survey, representing 82 US medical schools (69 allopathic, 13 osteopathic, [Appendix B](#)). The largest cohort of respondents were third-year students (33.5%). Further demographics can be found in Table 1. Instructional delivery of PA content varied by class year, but 71% of respondents reported at least one instance of exercise-related didactic instruction (Table 2).

Medical students receive more exercise-related instruction in their preclinical years (mean=7.84 hrs) than their clinical years (mean=3.96 hrs,  $P<.0001$ ), with the majority taking place in their first year (mean±standard deviation: 4.31±7.02 hours, Table 2). Respondents reported a total of 11.82 total hours dedicated to PA over the 4 years of medical school.

Most students (89.6%) report that they would be comfortable discussing the overall health benefits of exercise with a patient. However, students are less familiar with details of exercise testing, prescription, and physiology, and they are less confident in their ability to discuss these topics with patients ( $P<.0001$ , Table 3). Only 27.1% of fourth-year medical students believe they would be able to prescribe an appropriate fitness plan for a patient. Medical students reported more exposure to PA guidelines related to overall PA duration (63.1%) than strength training (43.4%,  $P<.0001$ , Table 4).

There was no significant difference between allopathic and osteopathic schools regarding familiarity with guidelines on exercise duration ( $P=.23$ ) and strength training ( $P=.70$ ). Respondents attending institutions with class sizes under 200 reported increased familiarity with National Physical Activity Guidelines regarding PA duration ( $P<.0001$ ) and strength training ( $P=.01$ ) relative to those at larger institutions.

## Conclusions

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Medical students in this sample received more PA instruction in their preclinical years than their clinical years. Although 63.1% of respondents were aware of national recommendations on aerobic exercise, only 43.3% were familiar with strength training guidelines. Additionally, our findings illustrate that despite student comfort with discussing the general benefits of PA, their ability to provide specific exercise instruction is relatively limited.

Dacey et al published the lone systematic review examining PA instruction in medical school education, reporting widespread didactic instruction and minimal clinical application.<sup>38</sup> Our findings mirror Dacey's; students received extensive didactic instruction in PA, but only 24.6% of them reported clinical application of that knowledge.

This study inherently has limitations. Given the lack of incentivization, students interested in PA may have been more likely to respond, contributing to response bias. These students are also more likely to seek out PA educational opportunities and may disproportionately recall teaching related to PA. Therefore, results may not be representative of the average medical student. The means of survey dissemination resulted in higher responses from certain medical schools, thereby reducing generalizability. The study could have been strengthened by weighting responses, but we were unable to do so given the large number of schools with few respondents. Recall bias was intrinsically present because respondents were asked to report education that occurred years prior. Additionally, as most students completed this survey in February and March, they likely underestimated the number of hours of PA education in their current year of school. While our assessment of medical student comfort was binary, future investigation should utilize a Likert scale to more adequately describe comfort in discussing PA with patients.

In summary, we observed that medical students receive minimal education on PA, resulting in low comfort in discussing PA with patients. Future studies should objectively examine the ability of medical school graduates to assess exercise needs and appropriately counsel patients on PA programs. That data, when combined with curriculum analysis, would compare the effectiveness of instructional methods employed by schools across the country. Regardless of the next step in research, it is imperative that PA education evolves from an afterthought to an essential component of medical education.

## Tables and Figures

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**Table 1: Individual and Institutional Demographics of Survey Respondents**

Characteristic	n (%)
<b>Current Class Year</b>	
First (MS-1)	112 (23.33)
Second (MS-2)	100 (20.83)
Third (MS-3)	161 (33.54)
Fourth (MS-4)	107 (22.29)
<b>Educational Format<sup>†</sup></b>	
Allopathic	427 (89.52)
Osteopathic	50 (10.48)
<b>Accelerated (18-Month) Preclinical Curriculum</b>	
Yes	186 (38.75)
No	294 (61.25)
<b>Average Class Size<sup>†</sup></b>	
Less than 50	1 (0.21)
50-100	50 (10.42)
100-150	223 (46.46)
150-200	159 (33.13)
200-250	26 (5.42)
250-300	4 (0.83)
More than 300	17 (3.54)
<b>Geographic Location<sup>°</sup></b>	
Northeast	90 (20.04)
Northwest	21 (4.68)
Southeast	251 (55.90)
Southwest	16 (3.56)
Midwest	71 (15.81)

<sup>†</sup>="I don't know" option included in survey but not represented in table;

<sup>°</sup>=Regional distinctions/boundaries left to the discretion of survey respondents, "Other" option included in survey but not represented in table.

**Table 2: Characteristics of PA Instruction by Respondent Class Year**

	First Year (N=480)	Second Year (N=368)	Third Year (N=268)	Fourth Year (N=107)
Total Hours (Average±SD)	4.31±7.02	3.54±8.04	2.96±9.28	1.01±3.27
<b>Mode of Instruction (%)</b>				
Didactics	71.7	42.5	14.0	4.8
Small group	35.8	25.0	8.10	2.1
Clinical experiences	18.3	12.1	24.6	8.8
OSCE/clinical examination	20.4	18.3	11.5	2.9
Case-based instruction	27.1	20	9.80	2.7
Motivational techniques	35.8	20	13.1	2.7

Abbreviations: PA, physical activity; SD, standard deviation; OSCE, objective structured clinical examination.  
 %=Percentage of students who report receiving this specific mode of instruction during the given academic year.

**Table 3: Respondent Comfort Discussing Each Characteristic of PA With Patients**

Characteristic	n (%)
Benefits of physical activity	430 (89.58)
Exercise testing	206 (42.92)
Exercise prescription	157 (32.71)
Exercise nutrition	156 (32.50)
Exercise physiology	185 (38.54)
Max HR/Aerobic HR training zones	127 (26.46)
Exercise and behavior change	243 (50.63)
None of the above	35 (7.29)

Abbreviations: PA, physical activity; HR, heart rate.  
 Exercise testing was defined to include treadmill testing or cardiopulmonary exercise testing with VO<sub>2</sub> max. Exercise prescription was defined as a specific plan of fitness related activities that are designed for a specified purpose. Exercise and behavior change was defined as motivational interviewing techniques, such as the Prochaska Model of Change.

**Table 4: Respondent Knowledge of 2018 National PA Guidelines<sup>38</sup>**

Characteristic	n (%)
<b>150 Minutes/Week of Moderate to Vigorous Aerobic Activity</b>	
Yes	303 (63.13)
No	177 (36.88)
<b>Strength Training Twice/Week</b>	
Yes	208 (43.33)
No	272 (56.67)

Abbreviation: PA, physical activity.

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