



Exercise is Medicine®: Knowledge and Awareness among Exercise Science and Medical School Students

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ABSTRACT

International Journal of Exercise Science 12(3): 505-514, 2019. The purpose of this exploratory study was twofold: to determine whether exercise science and medical students are aware of the Exercise is Medicine® (EIM®) program and to construct a tool that would permit assessment of EIM® variables with students enrolled in both programs. The study consisted of a quantitative, cross-sectional design, using a self-report electronic questionnaire. An Exploratory Factor Analysis (EFA) using principal component analysis extraction method with Varimax factor rotation was employed to validate the survey instrument based on the expected constructs, which posited five (5) contending factors: Value, Familiarity, Preparedness, Curricular Perceptions, and Opinions. A pairwise comparison was then performed to compare elements of the EIM® scale identified from the factor analysis by student type (medical and exercise science student) using multiple independent sample *t*-tests. Based on the pairwise comparisons, there were statistically significant differences of all EIM® factors by student type with the exception of Opinions ($p = 0.109$). Based on the trends observed in the data, exercise science students had a more positive report for each EIM® factor compared to medical students. These findings suggest a discrepancy in the delivery, acceptance, and implementation of the EIM® initiative between exercise professionals and medical healthcare providers. Future investigation is warranted to validate this experimental instrument and study the differences in EIM® factors among current medical and exercise professionals.

KEY WORDS: Physical activity, healthcare, non-communicable diseases, American College of Sports Medicine, American Medical Association, medical students, exercise prescription, exercise counseling, exercise education

INTRODUCTION

Advances in modern medicine have led to the development of many pharmacological agents that control and treat non-communicable and lifestyle-induced diseases like hypertension, dyslipidemia, obesity, and type II diabetes (16, 17, 25). As a result, prescription medications are often the first line of treatment for these conditions with little consideration given to lifestyle change as a viable solution. However, amidst what epidemiologists have identified as an “inactivity epidemic,” the importance of widespread lifestyle alteration is becoming increasingly clear (1, 2, 5, 6). For example, routine exercise is not only as effective as

pharmacological treatments in reversing these conditions, but also offers a long-term solution to the problem and helps to reduce the growing financial burden of healthcare (8, 10, 20, 21). Therefore, the role that physicians have in prescribing exercise, providing lifestyle counseling, and connecting patients with qualified exercise professionals has received increased attention in recent years.

In 2007, the American College of Sports Medicine (ACSM) and the American Medical Association (AMA) established the Exercise is Medicine® (EIM®) campaign. Created just over a decade ago, this campaign marks a new direction in healthcare and attempts to bridge the gap between medicine and fitness through a focus on healthy living as the cornerstone of preventative and curative treatment for a variety of medical conditions (3, 24). According to the EIM® website, the goal of the initiative is to “[encourage] primary care physicians and other healthcare providers to include physical activity when designing treatment plans and to refer patients to evidence-based exercise programs and qualified exercise professionals, especially those with the EIM® credential” (15). Since its establishment, little research has been conducted to determine whether healthcare providers are aware of the program, receptive to its implementation in the clinical setting, and adequately trained to provide physical activity instruction to patients (4, 23, 24).

The purpose of this exploratory study was to evaluate awareness of the EIM® solution among exercise science and medical students in order to determine whether the EIM® campaign is effectively reaching future healthcare providers. This study also examined educational differences between exercise science and medical students and whether their academic and experiential preparation would allow them to prescribe exercise both confidently and effectively (7, 13, 23). It was hypothesized that the responses to the questionnaire instrument would indicate a discrepancy in the delivery, adoption, and implementation of the EIM® initiative between future medical and exercise professionals. An additional objective of the study was to develop an instrument that could be used as a tool to evaluate the adoption of EIM® among healthcare providers.

METHODS

Participants

Undergraduate exercise science students and graduate-level medical students were recruited via email from two different midwestern universities. Individuals were eligible to participate in the study if they were currently enrolled in an exercise science program or a medical school program at one of the two universities. The sample included 116* participants (39 exercise science and 77 medical student respondents). The overall mean age was 23.40 years (SD = 8.75, range = 17-47 years) and 33.62% of respondents were male while 66.38% were female. The mean age for exercise science students was 19.74 years (SD = 6.37, range = 17-24 years) and 23.08% were male and 76.92% female. The average age of the medical students was 25.25 years (SD = 8.97, range = 20-47 years) and 38.96% were male and 61.04% female. This study was reviewed and approved by the university’s institutional review board (IRB).

*Nine (9) students did not report a type and were excluded from the data analysis.

Protocol

Participants received an email with an embedded link to the electronic questionnaire (consisting of 30 items) which was created using the Qualtrics© survey platform (Provo, UT, USA, 2018). Prior to beginning the questionnaire, it was stated that the students' decision to continue to the next page (i.e. the first block of questions) served as the informed consent. Participants were asked to complete a block of questions related to their familiarity with the EIM® initiative. This series of questions also included questions related to their perception of physical activity as a viable therapeutic treatment, as well as their level of formal education and experience with exercise prescription. These items were scored using a five-point Likert scale. The second section included questions related to participant demographics, including age, gender identity and educational level/background. The average time for completion of the questionnaire was six minutes.

Statistical Analysis

Instrument Creation: An *a priori* sample size minimum was based on a subject to variable ratio of 5:1 and an optimal sample size based on a subject to variable ratio of 10:1 (11, 19). The original instrument had 21 items, thus a minimum sample size $n = 105$ and optimal sample size was $n = 210$ was determined to be necessary. Factor Analysis (FA) using principal component analysis extraction with Varimax factor rotation was employed to parse items within the survey instrument based on the expected constructs. A range of 4-7 identified factors were expected based on the calculated range of $v/3$ to $v/5$, with $v = 21$, where $v =$ number of variables (12). Prior to FA, initial item-reduction was performed based on inter-item correlations $r \geq 0.90$. Assumptions of the FA procedure that could be statistically tested included sampling adequacy via Kaiser-Meyer-Olkin (KMO) statistic with values above 0.70 indicative of sampling adequacy and pattern of correlations yielding reliable factors. Additionally, sphericity was assessed via the Bartlett's test of Sphericity with statistical significance indicating that the correlation matrix was not an identity matrix. Varimax rotation was used to create orthogonal factors. Model fit criteria was based on the χ^2 measure of goodness of fit with non-significance indicative of model fit. Subsequently, factors with Eigen values greater than 1 were allowed and expressed as variance explained after rotation. The item loadings within each factor were based on the highest loading absolute value. Loading values < 0.50 were excluded from the final instrument. Finally, parallel analysis confirmed the results of the factor analysis. For each factor, reliability was assessed using inter-item internal consistency via Cronbach's α . Subscales were quantified as [*Subscale total* = $\sum_1^N X$] where $N =$ number of scale items and $X =$ individual Likert scale response. EFA and reliability analysis was performed using SPSS version 22 (IBM, Chicago, IL, 2013).

Comparison of Student Type by EIM® Factors: Using multiple independent sample *t*-tests, a pairwise comparison evaluated elements of the EIM® scale by student type (medical student and exercise science student), as identified by the factor analysis. The assumption of homogeneity of variance was tested using Levene's Test of Equal Variance, with degrees of freedom (*df*) adjusted for significant tests. Finally, the pairwise comparisons of EIM® factors by student type were reported as mean difference (exercise science – medical student) and 95% confidence

intervals (CI) with significance set at $\alpha \leq 0.05$. Statistical analyses were performed using SPSS version 22 (IBM, Chicago, IL, 2013).

RESULTS

Factor Analysis

Factor Analysis yielded six contending factors; however, Factors 5 and 6 were combined due to similarity of content. Therefore, the final analysis considered the following five factors: (1) Value of EIM® in future career, (2) Familiarity with the EIM® initiative, (3) Preparedness and confidence in prescribing exercise, (4) Perception of exercise topics in current curricula, and (5) Opinions about the role of EIM® as a medical tool. Factor loadings are illustrated in the rotated component matrix in Table 1. The Kaiser-Meyer-Olkin (KMO) statistic indicated that the patterns of correlations were not problematic (KMO = 0.72); thus, factor analysis was appropriate based on the number of observations and the *a priori* sample size target. Furthermore, Bartlett's test of Sphericity reached significance [$\chi^2(210) = 898.39, p < 0.001$], which indicated probable relationships within the correlation matrix; thus, factor analysis was appropriate. The model fit criteria did not reach statistical significance, $\chi^2(99) = 99.807, p = 0.458$, thus the factors in the model were able to adequately explain covariance. The FA procedure identified six factors that explained a total of 63.54% of the variance. After rotation, each factor was able to account for 14.67%, 11.61%, 11.29%, 11.02%, 7.70% and 7.25% of the variance for factors 1, 2, 3, 4, 5, and 6, respectively. A parallel analysis confirmed the presence of the six factors, but as stated above, Factors 5 and 6 were merged based on the similarity of content. Descriptive statistics for each scale are illustrated in Table 2 below. Following factor analysis, reliability via internal consistency was calculated, with each factor exceeding Cronbach's Alpha threshold of acceptability ($\alpha = 0.60$), with the exception of Opinions ($\alpha = 0.42$). Interestingly, when the items related to the role of exercise and medical professionals in physical activity prescription were removed (Q3 and Q5), the internal consistency improved to $\alpha = 0.80$. Possible explanations for this occurrence are described in the Discussion section.

Table 1. Rotated component matrix

ITEM	FACTOR 1: VALUE	FACTOR 2: FAMILIARITY	FACTOR 3: PREPAREDNESS	FACTOR 4: PERCEPTIONS	FACTOR 5: OPINIONS
Q21 As a future health professional, would you be interested in becoming involved with EIM®?	0.79				
Q16 Do you believe it adds value to your profession to receive education in physical activity prescription?	0.79				
Q19 Would you be interested in learning more about the EIM® initiative?	0.74				
Q15 How likely are you to enroll in courses related to physical activity and disease prevention / treatment?	0.67				
Q23 How strongly do you believe that becoming involved with EIM® would increase your credibility as a health professional?	0.66				
Q20 Are you aware that the American College of Sports Medicine offers an EIM training for both physicians and exercise professionals?		0.86			
Q18 How familiar are you with the EIM® initiative from the American College of Sports Medicine?		0.78			
Q22 Are you aware that the American College of Sports Medicine offers physicians a referral network between exercise professionals and physicians?		0.76			
Q11 Based on your education, how prepared do you feel to prescribe physical activity to patients?			0.86		
Q12 How confident are you that you can effectively prescribe physical activity to future patients?			0.77		
Q10 How much formal training or education have you received in prescribing physical activity?			0.64		
Q14* How many college courses related to the role of exercise in disease prevention have you taken so far?			0.54		
Q17 What is your perception of the physical activity-related content being offered in medical schools?				0.85	
Q13 What is your opinion about the level of physical activity-related education/ training present in your current curriculum?				0.83	
Q2 Do you believe it is a physician's role to prescribe physical activity to patients?					0.74
Q7 Do you believe physical activity is a valid component of the treatment plan?					0.59
Q6 Do you believe physical activity is a necessary component of preventative medicine?					0.70
Q5 How often do you believe physicians should discuss physical activity with patients?					0.69
Q3 Do you believe it is an exercise professional's role to prescribe physical activity to patients?					0.51

*Item Q14 was reverse-coded to achieve consistent phrasing and scaling with other items

Table 2. Scale descriptive statistics

Scale	Scoring Range	Minimum	Maximum	Mean	SD	Items	α^*
Value	5-25	5	21	9.87	3.45	5	0.78
Familiarity	3-15	3	9	8.13	1.54	3	0.62
Preparedness	4-20	4	19	12.64	3.65	4	0.74
Perceptions	2-10	2	10	5.71	2.40	2	0.81
Opinions	5-25	5	13	7.46	1.78	5	0.42

* α represents the indicated scale internal consistency via Cronbach's Alpha

Comparison of Student Type by EIM® Factors

Undergraduate exercise science students and graduate-level medical students were recruited via email from two different midwestern universities. The total sample included $N = 116^*$ participants and consisted of 39 exercise science and 77 medical students. Based on violations of homogeneity of variance, df were adjusted for the t -tests of Value, Familiarity, Preparedness, and Curricular Perceptions factors. Descriptive statistics revealed differences between student type for each EIM® factor (Table 3). Pairwise comparisons by student type revealed statistically significant differences for all EIM® factors, with the exception of Opinions, $p = 0.109$ (Table 4).

*Students that did not report a type were excluded, $n = 9$.

Table 3. Descriptive statistics of EIM® factors by student type

Factor	Exercise			Medical		
	Mean	\pm	SD	Mean	\pm	SD
Value	7.23	\pm	2.11	10.96	\pm	3.39
Familiarity	7.03	\pm	2.02	8.70	\pm	0.76
Preparedness	11.13	\pm	4.05	13.17	\pm	3.25
Perceptions	3.69	\pm	1.38	6.69	\pm	2.20
Opinions	7.77	\pm	1.68	7.22	\pm	1.75

Exercise Student $n= 39$, Medical Student $n= 77$

Table 4. Pairwise testing of EIM® factors by student type

Factor	d	t	df	p -value	95% CI		Levene's Test	
					Lower	Upper	F	p -value
Value*	-3.73	7.28	109.05	0.000	-4.75	-2.71	4.89	0.029
Familiarity*	-1.68	5.00	43.57	0.000	-2.35	-1.00	84.45	0.000
Preparedness*	-2.04	2.73	63.56	0.008	-3.53	-0.55	3.67	0.058
Perceptions*	-3.00	8.96	108.79	0.000	-3.66	-2.33	19.00	0.000
Opinions	0.55	1.62	114.00	0.109	-0.12	1.22	0.00	0.975

*Indicates that the df were adjusted

Mean differences (d) and Confidence Intervals (CI) are reported as Exercise Science - Medical Student

DISCUSSION

The purpose of this exploratory study was to evaluate awareness of the EIM[®] solution among exercise science and medical students, examine educational differences between the two groups, and develop a tool for the evaluation of EIM[®] implementation among healthcare providers. Therefore, by surveying students in these areas, this study sought to determine whether the EIM[®] campaign is effectively reaching future healthcare providers and whether their academic and experiential preparation would allow them to prescribe exercise both confidently and effectively. It was hypothesized that the responses to the questionnaire instrument would indicate a discrepancy in the delivery, adoption, and implementation of the EIM[®] initiative between future medical and exercise professionals.

Factor analysis of the questionnaire items revealed five major factors: (1) the value of EIM[®] in students' future careers, (2) their familiarity with the EIM[®] initiative, (3) their preparedness and confidence in prescribing exercise, (4) their perception of exercise topics offered in current curricula, and (5) their opinions about the role of Exercise is Medicine[®] as a medical tool. The main finding of this study was the discovery of a significant difference in the perceived value of the EIM[®] program between the two groups of participants. Exercise science students reported more positively towards the Value factor, whereas medical students responded more negatively. Notable differences were also observed for the Preparedness and Familiarity factors, with exercise science students reporting a higher level of confidence prescribing exercise than medical students. Exercise science students were also more aware of and familiar with the EIM[®] initiative than their medical student counterparts. Possible explanations for these results include differences in the curriculum and course requirements for exercise science and medical students. In addition, the amount, duration, and type of exposure and engagement with exercise-related topics and exercise prescription likely differs between the two groups.

The results of this study indicate that underlying challenges may exist for the Exercise is Medicine[®] initiative in reaching its target audiences and medical doctors in particular. As previously stated, the overarching goal of the EIM[®] program is to encourage a collaborative effort between physicians and exercise professionals towards incorporating physical activity in the treatment plan (15). However, this cannot be accomplished without widespread adoption of the EIM[®] principles among healthcare providers on both sides of the proposed collaboration. The inclusion of exercise prescription training using the EIM[®] protocol in medical school curriculums would increase exposure to and proficiency in these areas and help ensure the success of the EIM[®] initiative.

This investigation is not without limitations. First, the amount and type of participants that completed the questionnaire could be improved. The study included 116 student respondents from two universities. A larger sample size of participants from more institutions would help make these findings more generalizable. Also, this exploratory study specifically evaluated students and therefore does not provide an accurate picture of the situation among current exercise and medical professionals in their respective fields. Future studies should test this instrument among different groups of health professionals currently working in the field.

Second, the cross-sectional design of this study did not capture whether opinions and perspectives related to EIM[®] change throughout the course of a person's academic and professional career. Therefore, administering this questionnaire at various points during a person's professional development would provide insight into changes over time. Another possible limitation of this study was the self-report method of data collection, which can introduce an unwanted level of subjectivity in reporting one's ability to prescribe exercise. The incorporation of a standardized measure for proficiency in exercise prescription would improve this limitation. Finally, from a statistical standpoint, this investigation was exploratory in nature and aimed to generate a preliminary model and metric to evaluate EIM[®]. Therefore, in order to make generalizations about this instrument, further investigation is warranted to evaluate its external validity. Validity could be assessed using confirmatory factor analysis and mixed methods, which would allow for qualitative explanation of the quantitative responses obtained from multiple health professional populations.

Following factor analysis, the Opinions factor did not meet Cronbach's Alpha threshold of acceptable internal consistency of $\alpha = 0.60$. However, when items Q3 and Q5, which assessed the perceived role of exercise and medical professionals in physical activity prescription, were removed, internal consistency improved to $\alpha = 0.80$. Further analysis of these items revealed dissonance between the two groups. Exercise students recognized an equal role for exercise professionals and physicians in prescribing physical activity (OR 1.03) while medical students were almost twice as likely to *not* acknowledge the role of exercise professionals in prescribing physical activity (OR 1.80). This finding indicates that future investigation on the Opinions factor is warranted and shows that the questionnaire items included under this factor are relevant when discussing the effectiveness of Exercise is Medicine[®]. For example, evaluating opinions about which types of healthcare providers should have the largest role in prescribing exercise would provide valuable insights about the obstacles that prevent EIM[®] adoption and implementation. Similarly, determining whether healthcare providers consider physical activity to be a legitimate therapeutic approach would offer additional information about the likelihood of their utilizing the EIM[®] strategy. Inclusion of the Opinions factor items would ultimately serve to strengthen the proposed instrument's evaluative quality.

Future research should continue to determine the breadth and effect of the Exercise is Medicine[®] initiative among students in health professions programs. However, this instrument should also be adapted and repeated in future studies that evaluate the influence of the EIM[®] initiative among other groups. For example, it would be beneficial to test this instrument with current medical and exercise professionals in order to create a more relevant picture of the Exercise is Medicine[®] program. Although this study only evaluated future medical doctors, future studies should also evaluate whether there are significant differences between medical doctors and osteopathic doctors and their involvement with EIM[®].

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