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RESEARCH NOTE

Knowledge of Exercise Prescription Guidelines Across One 4-Year Kinesiology Curriculum

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ABSTRACT

Purpose: Knowledge of evidence-based exercise prescription guidelines is considered a cornerstone of responsible professional practice. While many academics insist that a university degree in kinesiology or a related field should be required for all exercise professionals, the learning of exercise prescription guidelines that takes place during the course of a university degree program has not been investigated. **Method:** An 11-question knowledge quiz about the frequency, duration, and intensity of cardiovascular exercise recommended by the American College of Sports Medicine (Garber et al., 2011) was administered to 683 undergraduate students majoring in kinesiology and 89 certified exercise professionals. **Results:** Knowledge scores improved significantly, $F(4, 764) = 16.69$, $p < .001$, $\eta^2 = .08$, from the freshmen, who scored 24.30%, to the seniors, who scored 36.25%. Seniors did not differ significantly from the professionals, who scored 40.65%, despite the fact that 58.14% of professionals had graduate degrees and 44.95% had multiple certifications. However, 82.77% of seniors perceived that their knowledge of the guidelines (rated 5.48 out of 10) was lower than that required "to be able to function as an exercise professional safely and effectively" (rated 8.17). **Conclusion:** These data suggest that although significant learning of the guidelines occurs in a typical kinesiology curriculum, there is considerable room for improvement.

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American College of Sports Medicine; Common Core; curriculum; evidence-based practice

One of the questions most people probably expect a kinesiology graduate to be able to answer with confidence is, "How much exercise should people be doing to benefit their fitness and/or health?" However, despite considerable effort by scientific organizations and public health agencies to develop evidence-based exercise prescription guidelines and physical activity recommendations, these guidelines and recommendations are not considered central learning outcomes in kinesiology curricula.

Lack of knowledge of the most appropriate frequency, duration, and intensity of exercise for the promotion of fitness and health may be one of the reasons why graduates of kinesiology programs report feeling unprepared to function effectively as exercise professionals (De Lyon & Cushion, 2013; Melton, Katula, & Mustian, 2008). The purpose of evidence-based exercise prescription guidelines is to improve professional practice by specifying the doses that maximize fitness and health gains while minimizing risk (American College of Sports Medicine [ACSM], 2013; Garber et al., 2011). Although most undergraduate kinesiology curricula include courses either partly or entirely focused on exercise prescription (Elder, Pujol, & Barnes, 2003), the degree of learning that takes place as students progress through the programs has not been assessed.

Thus, the primary purpose of the present survey was to assess the knowledge of exercise prescription guidelines across one typical 4-year kinesiology curriculum. Specifically, the survey assessed knowledge of the frequency, duration, and intensity recommended in the 2011 guidelines entitled, "Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults: Guidance for Prescribing Exercise" (Garber et al., 2011), issued by the ACSM. The purpose of these guidelines is "to provide scientific evidence-based recommendations to health and fitness professionals in the development of individualized exercise prescriptions for apparently healthy adults of all ages" (Garber et al., 2011, p. 1335). Thus, these guidelines are essential to the mission of exercise professionals. Although there was no basis for anticipating what the level of knowledge might be, the hypothesis was that there would be a systematic increase in knowledge (a) across the 4 years of the curriculum and (b) as students were exposed to this information in more

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courses. To assess the development of knowledge of the guidelines across the curriculum, seniors were compared to freshmen (who had received minimal or no relevant instruction), sophomores, and juniors. Moreover, to evaluate their level of knowledge compared to that of working professionals, seniors were also compared to a group of certified exercise professionals (who had the advantage of work experience, certifications, and in most cases, postgraduate training). A secondary purpose of the study was to examine the evolution of (a) perceived knowledge of the guidelines, (b) the level of knowledge deemed necessary to function as professionals effectively and safely, and (c) the perceived "knowledge gap" (i.e., the difference between perceived and needed knowledge).

Methods

Participants

The sample consisted of 772 volunteers. Of them, 683 were undergraduate students majoring in "kinesiology and health" at a large Midwestern university in the spring of 2012 and 89 were certified exercise professionals attending a convention in March 2013.

The student sample included 374 women (54.76%), 308 men (45.10%), and 1 student who did not indicate his/her gender. Of them, 98 were freshmen (14.41% of sample; 52 women, 46 men; $M_{age} = 18.87 \pm 0.55$ years, range = 18–21 years), 144 were sophomores (21.18% of the sample; 76 women, 68 men; $M_{age} = 20.08 \pm 1.60$ years, range = 18–30 years), 200 were juniors (29.41% of the sample; 111 women, 89 men; $M_{age} = 21.37 \pm 2.57$ years, range = 18–47 years), 238 were seniors (35.00% of the sample; 133 women, 105 men; $M_{age} = 22.37 \pm 2.01$ years, range = 20–36 years), and 3 did not indicate their classification. The average age was 21.09 ± 2.33 years.

The sample of 683 students represented approximately 60% of the undergraduate enrollment in programs administered by the Department of Kinesiology in 2012. Less than 4% of students refused to participate. The students were enrolled in the following six options: (a) athletic training (13.80%), (b) community and public health (5.05%), (c) prehealth professions (33.98%), (d) exercise science (26.11%), (e) physical education teacher education (9.20%), and (f) a bachelor's/master's program in diet and exercise (1.93%). Some students (9.93%) had not declared an option. Only 11.00% of the students reported having worked as exercise professionals (e.g., personal trainers).

The sample of exercise professionals consisted of volunteers attending the ACSM Health and Fitness Summit and Exposition. Of 110 attendees who completed the survey (12.50% of those registered for the event), 89 valid surveys were retained after removing respondents who declared that they were still students and those who provided incomplete data. The sample included 54 women and 35 men, with an average age of 42.61 ± 13.38 years (range = 21–73 years) and 9.39 ± 8.41 years of experience (range = 0–35 years). Of them, 3 had a high school diploma (3.49%), 33 had a bachelor's degree (38.37%), 37 had a master's degree (43.02%), and 13 had a doctoral degree (15.12%). The professionals worked as personal trainers ($n = 27$, 35.06%), clinical exercise physiologists ($n = 11$, 14.29%), academics ($n = 10$, 12.99%), corporate wellness specialists ($n = 7$, 9.09%), exercise leaders ($n = 6$, 7.79%), health/wellness coaches ($n = 4$, 5.20%), and rehabilitation specialists ($n = 2$, 2.60%), and in other fitness and clinical specialties.

Most professionals had two ($n = 19$, 21.35%) or three or more certifications ($n = 21$, 23.60%). Among those who reported having one certification, the most common certifications were the ACSM certified personal trainer ($n = 14$, 15.73%), ACSM certified health and fitness specialist ($n = 14$, 15.73%), ACSM clinical exercise specialist ($n = 5$, 5.62%), and the National Strength and Conditioning Association certified strength and conditioning specialist ($n = 5$, 5.62%).

Survey

An 11-question multiple-choice quiz was used. The comprehensibility and validity of this quiz are supported by a nationwide study of certified exercise professionals, which showed significant knowledge improvement with increasing levels of educational attainment (Zenko & Ekkekakis, 2015). Respondents were instructed to answer "without exchanging information with the students sitting next to [them]" and were reassured of anonymity and confidentiality.

To keep the survey brief, the scope was limited to cardiovascular exercise and the general population of healthy adults. The 11 questions inquired about (a) the recommended frequency of moderate-intensity activity (i.e., 5–7 days per week); (b) the recommended duration of moderate-intensity activity per day (i.e., at least 30 min per day, accumulated throughout the day, with each bout lasting for at least 10 min); (c) the recommended frequency of vigorous-intensity activity (i.e., at least 3 days per week); (d) the recommended duration of vigorous-intensity activity per day (i.e., at least 20 min per day, accumulated throughout the day, with each bout lasting for at least 10 min); (e) the definition of one metabolic equivalent unit (MET) as a metric of intensity (i.e., 3.5 ml of oxygen uptake per kg per min); (f) the definition of the range of moderate intensity in terms of METs (i.e., 3.0–5.9); (g) the definition of the range of

vigorous intensity in terms of METs (i.e., 6.0–8.7); (h) the definition of the range of moderate intensity in terms of percentages of maximal heart rate (i.e., 64%–76%); (i) the definition of the range of vigorous intensity in terms of percentages of maximal heart rate (i.e., 77%–95%); (j) the definition of range of moderate intensity in terms of the rating of perceived exertion (RPE; Borg, 1998), with a copy of the 6-to-20 RPE scale provided for reference (i.e., 12–13); and (k) the definition of the range of vigorous intensity in terms of the RPE (i.e., 14–17). Each question was accompanied by five response options, selected to be unambiguously mutually exclusive. For example, the five options accompanying the question about the frequency of vigorous-intensity activity ranged from "at least 1 day per week" to "at least 5 days per week."

Students were also asked to indicate their gender, age, classification, option, grade point average (GPA), and whether they had worked as exercise professionals. A survey of instructors and course syllabi revealed that exercise prescription guidelines are covered in five courses: two introductory (200-level) courses (Physical Fitness and Conditioning; Advanced Strength Training and Conditioning), two core (300-level) courses (Physiology of Exercise; Exercise Psychology); and one advanced (400-level) course (Principles of Fitness Assessment and Exercise Prescription). Students were asked to indicate which of these courses they had attended. Exercise professionals were asked to indicate their gender, age, years of work experience, primary job role, highest level of education, and certifications.

Following the knowledge quiz, all respondents were asked questions designed to assess their confidence in their knowledge of the guidelines, their perceived level of knowledge, and the "needed" (i.e., ideal or desirable) level of knowledge. Thus, first, respondents were asked to indicate whether they felt they knew the answers or had to guess ("I knew all the answers"; "I knew most of the answers"; "I knew about half of the answers"; "I knew fewer than half of the answers"; "I was guessing for most of the answers"). Second, one question asked respondents to "indicate how well you think you know the current guidelines on a scale from 0 to 10 (with 10 being perfect knowledge)." Another asked them to "indicate how well one should know the current guidelines to be able to function as an exercise professional safely and effectively," also on a scale from 0 to 10 (with 10 being perfect knowledge). The difference between the responses to these two questions was considered an indication of a perceived "knowledge gap."

Procedure

All participants responded using paper-and-pencil versions of the survey that were distributed in person by one of the investigators. The student data were collected while the students were in their classes (after obtaining approval from the institutional review board and the support of instructors). Each course with enrollment limited to kinesiology majors was visited once. Students who had already taken the survey while in another class were asked to check an appropriately labeled box at the top of the front page.

The data from exercise professionals were collected on site at the Health and Fitness Summit and Exposition organized by ACSM in Las Vegas, NV, on March 12 to 15, 2013. After obtaining institutional review board approval, the authors contacted the vice president for evidence-based practice and scientific affairs of the ACSM to request support for the project. Subsequently, with the permission of the national director of certification and registry programs and support from the assistant director of certification, one of the investigators attended the Health and Fitness Summit and Exposition. The survey was administered in the Exposition Hall, from a desk located adjacent to the booth of the certification programs. A small poster described the survey as a "5-min questionnaire about your job" and as "completely anonymous," and participants were offered a "chance to win a copy of the *ACSM's Guidelines for Exercise Testing and Prescription*, ninth edition, a $40.00 value." Five copies of the book were on display and were subsequently mailed to participants who won a raffle.

Results

Students answered 3.58 ± 1.75 of the 11 questions correctly (i.e., 32.54% ± 15.92%). The median and the mode were 3 correct answers. Professionals answered 4.47 ± 2.00 of the 11 questions correctly (40.65% ± 18.19%). The median and the mode were 4 correct answers. An initial 5 (classification: freshmen, sophomores, juniors, seniors, professionals) × 2 (gender: women, men) analysis of variance showed that neither the main effect of gender nor its interaction with classification was significant ($p = .483$, $p = .834$, respectively). Thus, the analysis was repeated as one-way and showed a significant main effect of classification, $F(4, 764) = 16.69$, $p < .001$, $\eta^2 = .08$ (see Figure 1, Panel a). The knowledge scores improved from freshmen (24.30% ± 13.17%, 95% CI [21.66%, 26.94%]) to sophomores (29.86% ± 14.61%, 95% CI [27.45%, 32.27%]) to juniors (33.91% ± 16.14%, 95% CI [31.66%, 36.16%]) to seniors (36.25% ± 16.10%, 95% CI [34.19%, 38.30%]) to professionals (40.65% ± 18.19%, 95% CI [36.82%, 44.48%]). Post-hoc comparisons using Tukey's honestly significant difference for

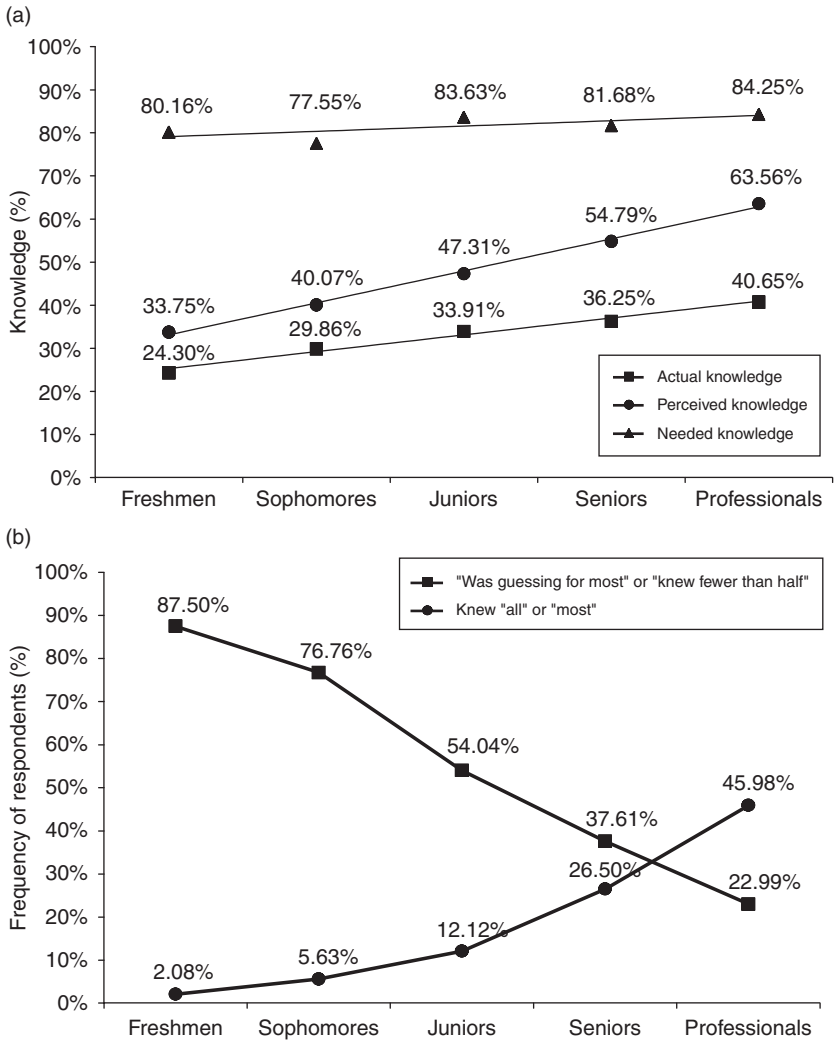

Figure 1. Knowledge and confidence about knowledge of exercise prescription guidelines during a 4-year kinesiology curriculum and among certified exercise professionals. Panel a shows the actual, perceived, and needed knowledge. While actual and perceived knowledge increased significantly across these categories (with slopes of 3.91% and 7.43%, respectively), needed knowledge did not increase (slope of 1.23%). Panel b shows that while the percentage of respondents who admitted "guessing for most" of the questions or knowing "fewer than half" of the answers progressively decreased, the percentage of those claiming to have known "all" or "most" of the answers increased.

pairwise comparisons showed that juniors scored higher than freshmen (+9.60%, $p < .001$, $d = 0.63$). Seniors scored significantly higher than freshmen (+11.94%, $p < .001$, $d = 0.78$) and sophomores (+6.39%, $p < .01$, $d = 0.41$). Professionals scored higher than freshmen (+16.34, $p < .001$, $d = 1.04$), sophomores (+10.79, $p < .001$, $d = 0.67$), and juniors (+6.74, $p < .01$, $d = 0.40$), but not seniors (+4.40%, $p = .163$, $d = 0.26$).

Effects of coursework

As students advanced through the curriculum, they took additional courses relevant to exercise prescription, with freshmen averaging only 0.17 ± 0.38 relevant courses and seniors averaging 2.71 ± 1.33 courses. The effect of coursework on the knowledge score was significant, $F(4, 668) = 18.36$, $p < .001$, $\eta^2 = .10$, but plateaued after two relevant courses. Students who had not taken any relevant courses ($n = 203$) scored 26.24% ± 13.24% (95% CI [24.41%, 28.07%]), those who had taken one course ($n = 181$) scored 30.84% ± 15.38% (95% CI [28.58%, 33.09%]), those who had taken two courses ($n = 116$) scored 37.93% ± 17.79% (95% CI [34.66%, 41.20%]), those who had taken three courses ($n = 102$) scored 37.61% ± 15.25% (95% CI [34.62%, 40.61%]), and those who had taken four courses ($n = 71$) scored 38.41% ± 15.53% (95% CI [34.74%, 42.09%]). Thus, the score of students who had not taken any course was significantly lower than the scores of those who had taken one course (+4.6%, $p = .037$, $d = 0.32$), two courses

(+11.69, $p < .001$, $d = 0.78$), three courses (+11.37%, $p < .001$, $d = 0.82$), or four courses (+12.17%, $p < .001$, $d = 0.88$). Those who had taken only one course scored significantly lower than those who had taken two courses (+7.43%, $p = .001$, $d = 0.43$), three courses (+6.77%, $p = .005$, $d = 0.44$), or four courses (+7.57%, $p = .005$, $d = 0.49$). However, the scores of students who had taken two relevant courses did not differ from the scores of those who had taken three or more courses (all $d \leq 0.05$).

Highest and lowest scores on individual questions

None of the students or professionals picked the correct answers to all 11 or even 10 of the 11 questions. On the other hand, 22 students (3.22%) and 2 professionals (2.25%) did not pick any answers correctly. The only questions for which more than 50% of students picked the correct answer were (a) the duration of moderate-intensity activity (59.24%), (b) the frequency of vigorous-intensity activity (55.46%), and (c) the definition of moderate-intensity activity in terms of METs (55.04%). On the other hand, fewer than 15% of students knew the answers to the following three questions, all dealing with how the ranges of "moderate" and "vigorous" intensity are defined: (a) the definition of the range of moderate-intensity activity in terms of maximal heart rate (14.71%), (b) the definition of the range of vigorous-intensity activity in terms of RPE (14.29%), and (c) the definition of the range of vigorous-intensity activity in terms of maximal heart rate (13.87%). The four items with the worst performances were the same for the seniors and the professionals; they were questions pertaining to the definition of "moderate" and "vigorous" activity in terms of percentages of maximal heart rate and RPE.

Confidence and perceived knowledge gap

The percentage of respondents admitting that they were "guessing for most of the answers" or that they "knew fewer than half of the answers" decreased from 87.50% among freshmen to 37.61% among seniors to 22.99% among professionals. Conversely, the percentage of those claiming to know "all the answers" or "most of the answers" grew from 2.08% among freshmen to 26.50% among seniors to 45.98% among professionals (see Figure 1, Panel b).

Responses to the question, "Please indicate how well one should know the current guidelines to be able to function as an exercise professional safely and effectively" (i.e., the needed level of knowledge) did not vary significantly across classifications, $F(4, 750) = 2.36$, $p = .051$, $\eta^2 = .01$ (e.g., 8.02 ± 1.92 among freshmen, 8.17 ± 2.04 among seniors, 8.43 ± 1.72 among professionals). The overall average was 8.14 ± 2.06 out of 10 (95% CI [7.99, 8.29]). On the other hand, responses to the question, "Please indicate how well you think you know the current guidelines" (i.e., perceived knowledge) showed a steady, significant increase, $F(4, 752) = 33.13$, $p < .001$, $\eta^2 = .15$, from 3.38 ± 2.28 out of 10 (95% CI [2.91, 3.83]) among freshmen, to 4.01 ± 2.13 (95% CI [3.65, 4.36]) among sophomores, to 4.73 ± 2.12 (95% CI [4.43, 5.03]) among juniors, to 5.48 ± 2.11 (95% CI [5.21, 5.75]) among seniors, to 6.33 ± 1.92 (95% CI [5.91, 6.74]) among professionals (see Figure 1, Panel a). As a result, the perceived knowledge gap steadily decreased, $F(4, 760)$, 15.68, $p < .001$, $\eta^2 = .08$, from 4.46 ± 2.89 out of 10 (95% CI [3.88, 5.04]) among freshmen, to 3.67 ± 2.74 (95% CI [3.22, 4.12]) among sophomores, to 3.58 ± 2.66 (95% CI [3.21, 3.95]) among juniors, to 2.61 ± 2.33 (95% CI [2.31, 2.91]) among seniors, to 2.06 ± 2.13 (95% CI [1.60, 2.52]) among professionals. The percentage of students perceiving that their knowledge of the exercise prescription guidelines was less than that needed "to be able to function as an exercise professional safely and effectively" remained at more than 80% across the 4 years of the curriculum (87.76%, 84.72%, 87.00%, and 82.77%, respectively).

Discussion

The present survey was the first to assess the knowledge of evidence-based exercise prescription guidelines across a typical 4-year higher-education kinesiology curriculum. The main finding was that learning of the exercise prescription guidelines does take place during the 4-year curriculum, as evidenced by a significant improvement in the knowledge score by 11.95% (from 24.30% among freshmen to 36.25% among seniors). Although the present study did not include a comparison sample of exercise professionals without a bachelor's degree, the scores of the 98 freshmen (averaging 0.17 relevant courses), the 67 students who had not chosen an option (averaging 0.25 relevant courses), and the 203 students who had reportedly not taken any courses containing elements of the exercise prescription guidelines can be considered meaningful proxies of the level of knowledge that can be expected of someone without a university-level education in kinesiology. The scores of these subsamples (24.30%, 27.86%, and 26.24%, respectively) were substantially lower than the score of seniors (36.25%). The problem, which should act as a stimulus for reflection for the field of kinesiology, is that the score of the seniors leaves considerable room for improvement. For example, the 82 seniors in prehealth professions, with 2.89 ± 0.97 courses relevant to exercise prescription and an average GPA of 3.42 ± 0.37, still averaged only

38.14% ± 17.17%. Likewise, the 74 seniors specializing in exercise science, with 3.28 ± 1.20 courses relevant to exercise prescription and an average GPA of 2.95 ± 0.56, still averaged only 37.35% ± 14.40%.

The practical implications of these scores become clearer when one considers the mistakes that the seniors made on the knowledge quiz. It is troubling that the great majority of seniors failed to pick the correct answers on questions inquiring specifically about the recommended intensity of exercise. Intensity is recognized as the most crucial element of exercise prescription, as it is associated not only with effectiveness in improving fitness and controlling risk, but also with adherence. Only 14.71% and 13.87% of seniors knew the correct definitions of the ranges of "moderate" and "vigorous" intensity, respectively, in terms of percentages of maximal heart rate. Similarly, only 23.95% and 14.29% could pick the correct definitions of "moderate" and "vigorous" intensity in terms of RPE. Most seniors (40.76%) believed that the range of moderate intensity starts at 55% of maximal heart rate rather than 64%. However, 55% of maximal heart rate falls within the range that the ACSM considers "very light" and, therefore, is unlikely to foster fitness gains for most healthy adults. Conversely, 43.46% of seniors believed that the range of "vigorous" intensity extends to a rating of 19 on the 6-to-20 RPE scale (i.e., "extremely hard") rather than 17 (i.e., "very hard"). As noted in the Methods section, a copy of the RPE scale was provided in the survey, so respondents could see the anchors associated with each rating. A rating of 19 fell within the "near-maximal to maximal" range, which corresponds to more than 91% of maximal oxygen uptake and more than 96% of maximal heart rate. Clearly, exercise associated with a rating of 19 or "extremely hard" on the RPE scale cannot be sustained for 10 min or 20 min. Yet 44.96% of seniors answered—correctly—that healthy adults who choose to exercise vigorously should accumulate at least 20 min per day, with each bout lasting for at least 10 min.

The fact that the score of the seniors was not significantly lower than that of professionals could be seen as positive, especially because nearly half of the professionals had multiple certifications and more than half of them had graduate degrees. At the same time, however, the fact that a group of highly educated professionals could only answer fewer than half of these basic questions about exercise prescription correctly may indicate an endemic problem with the guidelines (Zenko & Ekkekakis, 2015). In particular, the practice of revising the guidelines in very short cycles (e.g., every 3 to 5 years), before the updated figures can fully permeate textbooks, academic curricula, and continuing education programs, has been identified as a possible contributor to the extensively documented ignorance of the guidelines among medical professionals (e.g., Allen et al., 2000). Updates to the guidelines usually consist of minor upward or downward adjustments to the recommended ranges of intensity (primarily), duration, and frequency. It has been pointed out, for example, that the range of "moderate intensity" has been defined as extending from 60% to 79%, from 55% to 69%, and from 64% to 76% of maximal heart rate in consecutive updates of the ACSM guidelines (Ekkekakis, 2013). Although these changes may reflect the evolving evidence base, the practical value of such adjustments may be outweighed by the substantial potential for confusion that such inconsistency can generate.

Regardless of the causes, it is troubling that 82.77% of seniors perceived that their knowledge of the exercise prescription guidelines was below the level necessary "to be able to function as an exercise professional safely and effectively." The size of the perceived knowledge gap becomes even more disconcerting considering that the perceived level of knowledge among seniors overestimated their actual knowledge by 18.54%. This finding may provide empirical support to the impression of graduates that kinesiology degree programs did not adequately prepare them for the demands of their professional careers (De Lyon & Cushion, 2013; Melton et al., 2008). Nearly 4 out of 10 seniors (37.61%) admitted that they "knew fewer than half of the answers" (22.22%) or that they were "guessing for most of the answers" (15.39%).

In evaluating the results of this survey, readers should take into account its inherent limitations. First, a cross-sectional survey cannot be as informative as a longitudinal tracking survey, investigating the development of knowledge within the same students over time. Moreover, as noted previously, the content domain of "knowledge of exercise prescription guidelines" was delimited, for the sake of brevity and simplicity, only to cardiovascular exercise, thereby not addressing resistance exercise or flexibility. As a first investigation on this topic, it was also deemed appropriate to focus only on healthy adults. Likewise, it should not be assumed that the results would necessarily be representative of the national population of kinesiology students. Likewise, the comparison sample of certified exercise professionals consisted of individuals who not only chose to attend a national convention, but also volunteered to complete a survey, a behavior that likely indicates a higher-than-average level of confidence in their knowledge.

As kinesiology attempts to confront the persistent public health challenge of physical inactivity, the problems identified in this survey should receive the attention of leading scientific, professional, and academic

organizations. Guideline developers should contemplate the format in which the guidelines are presented, as well as the scientific necessity of short revision cycles. Within academic kinesiology, initiatives could revisit the structure of educational curricula, with the goal of assigning a higher priority to the knowledge of exercise prescription guidelines.

What does this article add?

Previous studies have indicated that graduates of kinesiology degree programs value their training in foundational areas like anatomy and physiology but otherwise feel inadequately prepared for their professional careers. This survey identified one crucial area that curricular changes could target—namely, knowledge of exercise prescription guidelines. In a typical kinesiology curriculum, more than 80% of seniors indicated that their knowledge was lower than the level they perceived as necessary to function safely and effectively as professionals.

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