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Training Current and Future Health-related Practitioners to Accurately and Appropriately Disseminate Physical Activity Guidelines

Jafrā D. Thomas[1], Winston Kennedy[2], Bethany C. Love[1] and Caroline N. Smith[1]

[1]California Polytechnic State University, San Luis Obispo
[2]Northeastern University, Boston, Massachusetts

Abstract

Current and future health-related practitioners have low awareness of physical activity guidelines (PAGs) for general and clinical populations. The purpose of the present study was to critically appraise the quality of one 2021 draft training video, which was designed to help current and future health-related practitioners give advice consistent with general adult PAGs. A descriptive qualitative analysis was performed on open-ended responses provided by undergraduate research assistants (or recent alumni) affiliated with the first author's lab and uninvolved in the video's creation. Participation was optional, anonymous, and through an online questionnaire, open for seven days in April 2021 (14 invited, 8 participated, response rate = 57.14%). Participant feedback was compared to applicable standards of the RE-AIM framework (i.e., reach, efficacy, and adoption). Face validity and other quality measures were determined through qualitative analysis. The first author performed the descriptive analysis, and the second author, acting as a critical friend, independently verified the trustworthiness of the analysis. No issues were identified (i.e., a succinct and veracious analysis). Participants generally agreed the draft video was clear, concise, informative, and interesting. Participants did not perceive any major concerns with the video (e.g., non-offensive/biased), and their suggestions were used to finalize the training video (e.g., to add closed captioning, further explain a graph). Results confirmed the video had good face validity and could be effective within real-world educational settings for current and future health-related practitioners (e.g., low time burden, stimulating, informative). Future research should investigate learning outcomes of the video and its real-world implementation.

Keywords: Exercise science, kinesiology, knowledge translation, health communication, physical activity promotion guidelines, RE-AIM

1 Introduction

While current and future health-related practitioners should be better trained in using health behavior theory to counsel patients/clients and to plan services (Thomas & Cardinal, 2021), another looming issue concerns their ability to accurately and appropriately disseminate physical activity guidelines (PAGs, i.e., the frequency, intensity, duration, and type of activities encouraged for health-related fitness and psychological well-being; U.S. Department of Health & Human Services, 2018; World Health Organization, 2020). Most health-related practitioners and college majors may lack PAG-awareness or precise knowledge of the guidelines (Cardinal et al., 2015; Vermeesch et al., 2020; Zenko & Ekkekakis, 2015). For example, Zenko and Ekkekakis (2015) used an 11-item multiple-choice test to assess practical knowledge of aerobic PAGs in a large and diverse sample of students and professionals. The mean score for the number of correct answers was 42.87% (95% CI = 42.08-43.65%). While job type

and educational attainment were positively associated with mean test scores, the 95% confidence interval of subgroups with scores above the sample average did not exceed 55% and ranged from 44.15% to 52.28%[1]. Another interesting finding from the Zenko and Ekkekakis study was that self-confidence in answer choice and perceived knowledge gaps lacked substantial association with test scores (i.e., mean scores were largely equivalent), which suggests two implications. First, professionals designing physical activity promotion material or counseling clients in exercise may overestimate their mastery of PAGs (Barton et al., 2021; Thomas et al., 2022b). Second, even if professionals recognize they have a knowledge gap, they may lack resources or understanding of how to close their knowledge gaps (Cardinal et al., 2015; Carter-Roberts et al., 2021). Despite a PAG knowledge gap, health-related practitioners may still counsel patients/clients about physical activity such as asking about physical activity and encouraging exercise (Barton et al., 2021; Das et al., 2018). For example, 87% of participants in Das et al.'s (2018) study of 30 health and medical professionals reported offering clients/patients advice about physical activity, despite only 7% self-reporting exact PAG-knowledge. Barton et al.'s (2021) multinational survey of physiotherapists (a.k.a., physical therapists) suggests that most physical activity counseling by providers/practitioners, however, may be in the form of exercise instruction to recover from an injury or manage a health condition, rather than framed as a lifestyle goal to pursue (e.g., something to work towards or keep-up after recovery). A much larger portion of participants from their study felt confident in their ability to deliver aerobic and resistance training interventions (e.g., 45-58%) than those who stated they used specific PAGs in their routine practice (e.g., 16-24%; Barton et al., 2021). Within that same sample, "37% correctly stated older adults should accumulate 150 minutes of moderate or 75 minutes of vigorous physical activity per week" and "68% correctly stated adults should complete strength training involving major muscle groups at least twice per week" (Barton et al., 2021, p. 100). To address these sort of issues (e.g., low PAG-knowledge, overconfidence in PAG-knowledge, low PAG application), continuing education workshops have focused on the following goals: (a) providing practitioners with resources, techniques, and perspectives to effectively promote physical activity (O'Brien et al., 2017) and (b) training practitioners in ways to give PAG-consistent advice (Calle et al., 2016). There remains a need to ensure that health-related practitioners convey PAGs accurately and appropriately. While continuing education workshops may enhance knowledge of some PAGs and motivation to counsel patients on physical activity, that is not always a consistent outcome (Wattanapisit et al., 2018). Moreover, the issue of inappropriate PAG communication may receive little attention. Thomas and Cardinal (2020) analyzed web articles developed by professional associations and other groups, and they found that messages consistent with PAGs for sedentary adults were the least disseminated. At least 25% of the US adult population engages in no leisure time physical activity (An et al., 2016), and at least half are active but less than the PAG recommendations to accumulate 150 minutes of moderate, or 75 minutes of vigorous, physical activity per week (An et al., 2016; Whitfield et al., 2021). Our assessment of the research literature on physical activity counseling programs suggests programs are designed to cover a narrow set of PAGs (e.g., aerobic PAGs for active adults; Calle et al., 2016; Wattanapisit et al., 2018). Moreover, continuing education workshops may not raise the issue of misinformation from health-related practitioners as part of their content or practicum instruction (Breckon et al., 2008; Wattanapisit et al., 2018). While overlap exists between PAG categories, specific guidelines raise important considerations for practitioners to keep in mind when counseling or providing resource material to patients and clients (U.S. Department of Health & Human Services, 2018). The purpose of this study was to examine the potential of one brief 2021 training video designed to enhance workshop (or classroom) PAG-instruction, by raising the need to understand the breadth of PAGs that exist and why PAG-miscommunication is problematic. Preliminary research on workshops not focused on PAGs suggests that educational videos can enhance workshop learning outcomes (Dilley et al., 2014; Johannesmeyer et al., 2023; Wolf et al., 2020). Moreover, problem-focused training videos may promote positive attitudes toward meeting evidence-based guidelines (Dilley et al., 2014; McNamara & Shaw, 2022). While research suggests training videos could enhance PAG-instruction within kinesiology undergraduate courses and elsewhere (McNamara & Shaw, 2022), we could not locate previous research in this specific area (e.g., using the terms "training video" or "educational video" and "physi-

[1] A confidence interval estimates how a mean value observed in a sample may vary (i.e., the range; Simundic, 2008).

cal activity" guidelines or counseling).

2 Methods

The present study was an exploratory investigation using pilot data collected on the quality (including face validity) of one training video (Love et al., 2021), which was produced in April 2021 by a California State University-based research lab focused on knowledge translation in kinesiology. The potential of the video to enhance PAG-instruction was critically appraised using qualitative feedback from its pilot test, which was descriptively analyzed in the present study. The university's institutional review board reviewed and approved the protocol used to administer the pilot test of the training video.

2.1 Video Description

The training video was a pre-recorded slideshow presentation. It focused on summarizing the results of one published peer-reviewed study, which examined how well advice from web articles matched US-adult PAGs (Thomas & Cardinal, 2020). An interactive exercise was created, allowing the audience to replicate the study's method of analyzing how well example text from one real-world web article matched strength training PAGs for sedentary or untrained adult populations. Text and graphics were used to summarize the research article (e.g., Figure 1). The video was concluded with a summary of its key points, followed by QR code links to additional resources (including a free online quiz based on the video and created using the web application *ProProfs*; Edwards, 2021). Guidelines for making distraction-free and plain-language presentations were used (Beqiri, 2018; The University of Melbourne, 2020). The slideshow was recorded using Screencast-O-Matic[2] and narrated using a typed transcript (Smith et al., 2022). A polished draft of the video was pilot tested (duration = 6.5 minutes). Feedback was used to finalize the video before it was published.

2.2 Participants

Fourteen individuals were invited to participate in the study. Participants were restricted to individuals 18 or older, attending or who graduated from a 4-year institution of higher education, and affiliated with the university lab between January and April of 2021 (i.e., research assistant). Given the focus of the pilot test was to appraise the quality of the training video (including its face validity), demographic data was not collected on the pilot test participants.

2.2.1 Pilot Test Questions and Protocol

The protocol by Smith and colleagues (2022) was adopted in the present study. The video's quality was assessed using an online questionnaire administered through a web application (i.e., Google Forms). There were five questions asking about the strengths and weaknesses of the video (see Table 1). For weaknesses, participants were asked to explain their observations. Participants had the choice to respond not applicable (i.e., N/A) to any question. The form was available to study participants for seven consecutive days. Consistent with social exchange theory, those invited to participate in the study were informed/reminded that their participation was voluntary, anonymous, and would be appreciated and helpful (Dillman et al., 2014). Email and text message notifications were used to communicate with participants. The response rate was 57.14% (n = 8).

Table 1: Pilot Test Questions in Order Presented to Participants

Question #	Question
One	What is at least one way this PowerPoint presentation could be improved?
Two	For each way the PowerPoint could be improved, what do you suggest we do specifically to meet your recommendation?
Three	What is at least one strength of this PowerPoint presentation?
Four	Do you have any suggestions to improve the grammar and/or spelling used in the video?
Five	Is there any other feedback you may have that was not addressed in the previous sections? If yes, please comment below. If no, please say so.

[2]Before this article's publication, the name "Screencast-O-Matic" was changed to "ScreenPal" (Edwards, 2023).

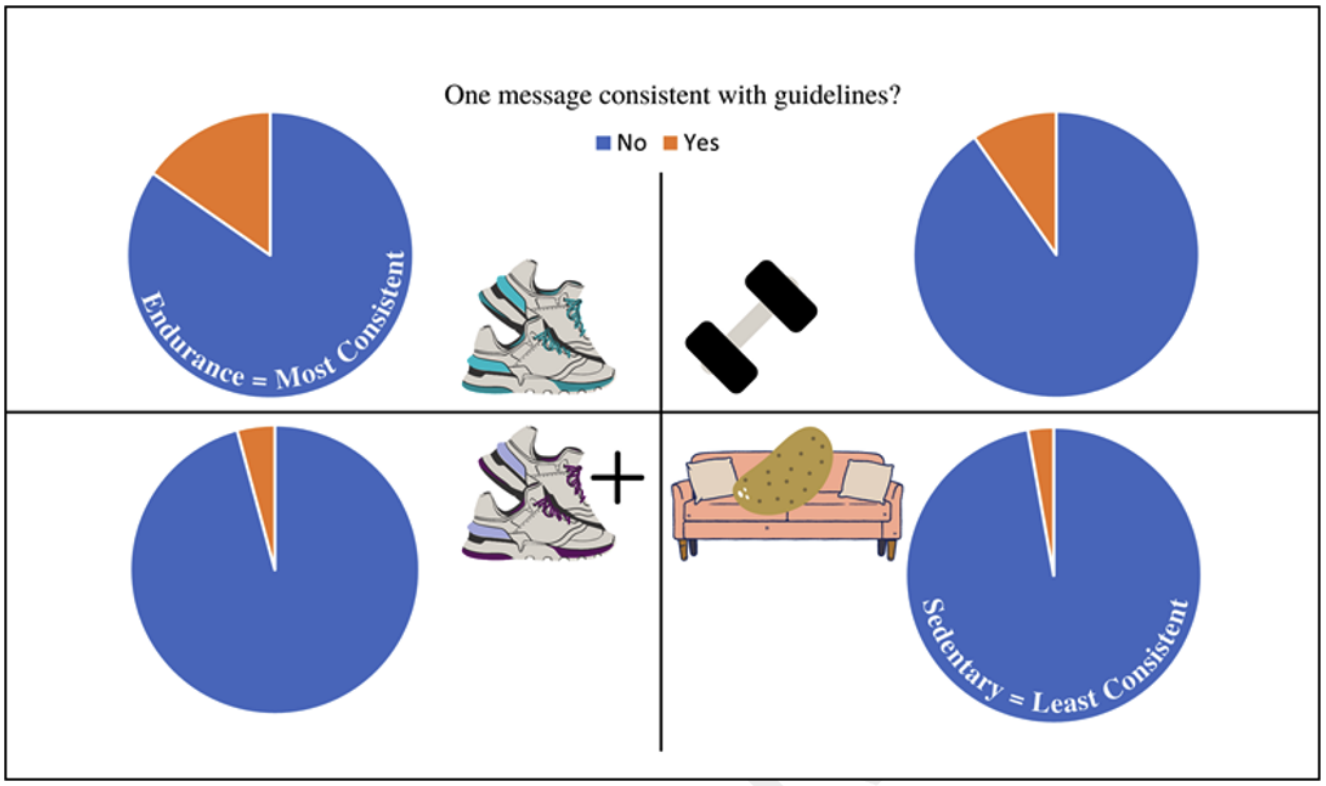

Figure 1: Training video pie chart. It shows portion of PA promotion web articles with at least one message matching PAG guidelines (i.e., orange portion). The data are from the case study research article discussed in the training video (Thomas & Cardinal, 2020).

2.2.2 Analytic Plan

This study (March-May 2023) was post-priori to the video's pilot test. We adapted the RE-AIM (Reach, Efficacy/Effectiveness, Adoption, Implementation, Maintenance) framework to critically appraise the quality of the training video (Glasgow et al., 2003). The RE-AIM framework is used to analyze whether an intervention would produce real effects beyond random chance and the likelihood those effects would occur within real-world settings (Glasgow et al., 2003). Pilot test responses were organized within a table. A descriptive qualitative analysis was then performed (Elliott & Timulak, 2021), which compared responses to applicable RE-AIM dimensions (i.e., reach, efficacy, adoption; Wu et al., 2022). The first author performed the qualitative analysis. The second author acted as a critical friend, who independently verified the trustworthiness of the results and discussion points produced by the first author (i.e., complete, accurate, and logical; Thomas et al., 2022a). The second author concurred fully with the first author; they judged the first author's analysis to be succinct and fully representative of the data.

3 Results

Two tables present the verbatim feedback from the pilot test participants. Table 2 presents areas for improvement. Table 3 presents strengths. No major concerns were identified by the participants (e.g., biased/offensive language). All suggestions were feasible and minor (e.g., add pauses; further explain one graph, the pie chart). Participants unanimously commented that typographic errors (e.g., spelling or grammar) were absent in the video. Strengths of the video identified by participants fit within at least three themes: (a) excitement or enthusiasm for the speaker's presentation style, (b) appreciation that only pertinent information was provided in a clear manner, and (c) satisfaction that the video was concise yet thorough and informative. Except for the feedback to change the slideshow background color, because that would have run counter to guidelines (Beqiri, 2018; The

University of Melbourne, 2020), edit suggestions from the pilot study participants were incorporated into the final draft of the training video (i.e., the transcript narration was revised, pauses in narration were incorporated, and closed captioning were added using the *YouTube Studios* webtool; Mbugua, 2021).

3.1 RE-AIM Results

According to the descriptive qualitative appraisal, the training video corresponded to each RE-AIM element considered in the present study.

3.2 Reach

Studies should purposefully select volunteer research participants and delineate inclusion criteria, which was done in the present study. Seven of the eight participants in the pilot study (87.5%) were undergoing professional preparation focused on health and wellness promotion. These participants were research assistants in the first author's lab, aspiring towards a career in health promotion and working to earn a Bachelor of Science degree in kinesiology or public health.

3.2.1 Efficacy

There was one efficacy criterion from the RE-AIM framework applicable to the present study: to assess both positive (anticipated) and negative (unanticipated) outcomes of an intervention. The pilot test provided insight into the training video's possible positive and negative outcomes. The positive outcomes observed were prevailing perceptions that the video would be helpful. For example, participants commented that the video was concise, informative, and easy to follow. Responses also suggested that participants found the content stimulating. This implies they enjoyed their engagement through the video, which included visual media, interactive exercises, and hyperlinked resources using QR code images. Negative (unanticipated) outcomes were identified through the feedback. One participant was confused by a graph used to summarize findings, even after re-watching that video segment three times. Others felt the video narration could be improved in some places, such as by adding pauses and reiterating statistics within the video's conclusion. The final draft addressed these potential hindrances. Detail was added for greater explanation and orientation of the pie-chart graph, pauses between speaking were added, and key research findings were reiterated more directly within the video's conclusion slide.

Table 2: Feedback on What to Improve in the Training Video and How to Do It

Participant	Feedback
One	"The 4 pie charts were confusing. Find a way to better explain and differentiate between the 4. I watched over that section 3 times and I still have confusion on those pie charts."
Two	"I think providing closed captioning may be beneficial! It helps the viewer read what she is saying as well as gain info from the slides themselves. You can upload to YouTube, caption it manually, and then download it as the final transcript."
Three	"The slides looked great overall! I think one thing to maybe do is focus on the amount of words on the slides. I personally didn't have a problem reading but I know sometimes too many words can be distracting during a presentation. The most wordy part is the bold text on PAGE #16. I like how you bolded the important information. Maybe adding color to make the contrast greater or breaking it up over two slides would be helpful."
Four	"By adding more color/graphics to hold the attention of the viewer. I would recommend adding a colored background as the white space can lose viewers' attention."
Five	"Put in benefits of correct data availability and how do we make sure future articles follow guidelines. More stats."
Six	"I think it summarizes the study well and is clear. No specific improvements come to mind."
Seven	N/A.
Eight	"Make ideas more clear/concise Speak with more purposeful pauses. Use more voice fluctuations/purposeful pauses to keep audience interested."

Table 3: Feedback on What to See as Strengths in the Training Video

Participant	Feedback
One	"Graphics and minimal words."
Two	"Very thorough and concise! Information is conveyed without confusing the viewer."
Three	"The pacing and flow was really great!"
Four	"The presentation does a good job of explaining the graphics used and what they actually mean."
Five	"It was presented nicely."
Six	"It is concise and clear in presenting a thorough summary of the research that was conducted. I liked it!"
Seven	"Great graphics, love the use of QR codes, and neat presentation overall."
Eight	"Very informative, straight to the point."

3.2.2 Adoption

One of two criteria for appraising the adoptability of an intervention was met in the present study (i.e., to include proxy measures of adoption using members of a target group). The target group was college students whose majors/career interests correspond to health/wellness promotion. There was no negative attitude toward the video (e.g., disliked), but rather, participants generally favored the video. These findings about attitude are a proxy measure of adoptability. The video's duration is another proxy measure of adoptability. Classroom time constraints suggest educators would like audiovisual media that is short and valued by their students. Pilot test feedback suggests learners would value the video because it is relatively short, interesting, and helpful (i.e., succinctly summarizes the issue at hand). Direct assessment of adoptability, however, was not performed (e.g., direct inquiry with prospective instructors or administrators in charge of classroom or workshop instruction).

4 Discussion

The focus of this study was to examine the potential of one training video to enhance PAG-instruction to pre and current health-related practitioners, delivered within workshop or classroom settings. Research points to a need to reinforce or clarify PAG-knowledge among health-related practitioners. Large portions of students and professionals seem to lack complete or accurate knowledge of PAGs that should be part of their communication repertoire when counseling clients/patients (Barton et al., 2021; Das et al., 2018; Douglas et al., 2006). Still, these knowledge gaps may not fully deter practitioners from encouraging or attempting to counsel patients or clients on physical activity (Das et al., 2018; Douglas et al., 2006). Arguably, these attempts are still meaningful and could be effective (Sanchez et al., 2015). While it may be beneficial for health-related practitioners to simply raise the subject of physical activity with their patients or clients, evidence-based, tailored communication is better (Sanchez et al., 2015). Without the opportunity to learn about PAG-communication or to verify their own PAG-knowledge, there is a risk that what practitioners advise about physical activity/exercise is imprecise and/or inaccurate. Surveys and interviews with specific populations report that laypeople feel exasperated about their lack of PAG knowledge (Health Information National Trends Survey, 2006; Maneze et al., 2019). Moreover, adults with low PAG-knowledge may be less physically active in a given week and more likely to reside within the precontemplation/contemplation stages of behavior change (Abula et al., 2018). This means while health-related practitioners may initiate conversations about physical activity or disseminate educational material through their office, what is relayed may often veer off-course to meeting the informational needs of patients/clients (e.g., inconsistent advice; unresolved safety concerns; Learmonth et al., 2017; Elshahat et al., 2021). These issues underscore the need to provide continuing education workshops in physical activity counseling and PAG-communication (Calle et al., 2016; O'Brien et al., 2017). They also stress the need to consider ways to enhance workshop and classroom instruction, given typical modes may be less than adequate (Ekkekakis et al., 2016; Zenko & Ekkekakis, 2015). The present study analyzed the potential of one training video to help health-related practitioners better counsel patients on physical activity (Cardinal et al., 2002). Using the RE-AIM framework, we found evidence that the video could be an effective teaching tool within classroom or workshop settings (Glasgow et al., 2003). Face validity was established through pilot test feed-

back. Further, efficacy and adoptability were inferable from participants' responses. All liked that the video was concise, interactive, and informative. These latter traits are critical, as the video's content focused on helping viewers understand blunders that practitioners may make when advising patients/clients about physical activity/exercise (e.g., contradicting guidelines for the current fitness level or activity habits of patients/clients). The training video was, in general, viewed favorably by pilot test participants, which aligned with the findings of previous research. First, pilot test participants praised the training video's brevity. Survey research shows college students may prefer educational videos that do not exceed 10-15 minutes in duration (Alpert & Hodkinson, 2019; Ottusch & Jordan, 2022). This has been reported for a traditional lecture format, where videos were embedded in the lecture as a class activity (Alpert & Hodkinson, 2019) and within asynchronous courses (Ottusch & Jordan, 2022). Second, the training video focused on a topic that may be uncommon in college courses or workshops that teach principles or strategies for physical activity promotion and counseling. The video taught a novel issue identified through research and using a real-world case example. These educational functions were among the top features popular with university students surveyed by Alpert and Hodkinson (2019). No function received greater than 46% of student votes in their survey, and the top three functions were videos that (a) add creativity, humor, or interest to the topic (45.9% of votes), (b) add variety to the class session (42.9% of votes), and (c) that either, explain a concept in a better way or present real-world examples (41.4% votes; Alpert & Hodkinson, 2019). Finally, the training video of the present study included a variety of interactive features midway through the video to quiz the viewer on what they retained from the video. Interactive features that test user knowledge or ability to apply content to a case example are viewed as helpful (Ottusch & Jordan, 2022). Learners feel these features support their learning and motivate them to pay attention to the video (Ottusch & Jordan, 2022). The generic open-ended questions during the pilot test asking participants to identify any weaknesses and strengths with the training video prevented a more in-depth analysis of its potential to enhance PAG-instruction, delivered through a university course or continuing education workshop. Previous research asked adult learners (undergraduate and graduate students) to rank features from most to least preferred (Alpert & Hodkinson, 2019; Ottusch & Jordan, 2022), and previous research asked students to subjectively rate how well a video supported their content mastery (i.e., lecture-specific topics; Ottusch & Jordan, 2022). Findings from Alpert and Hodkinson's (2019) study offer caution about how videos are facilitated. Just as students preferred videos to cover an interest area, students were least favorable of videos perceived to add additional knowledge on topics covered in a lecture. On average, approximately 60% of students preferred videos to be introduced by the instructor (e.g., its synopsis, why is it being shown, what to focus on when watching it), while 50% of students on average preferred instructors to facilitate a debrief of a video after it was shown in class[3]. Alpert and Hodkinson (2019) also found videos that simply explained a concept in a different way or summarized a lecture were the least preferred features. Prefacing how the training video supports the learning objectives of a lecture or workshop, or provides real-world examples of covered topics, could motivate learners to pay attention to and understand the video's content (Alpert & Hodkinson, 2019). Additionally, the most preferred video interactive feature within the study by Ottusch and Jordan (2022) was embedded multiple-choice test questions (followed by open-ended reflective-pause and answer-prediction questions). The training video analyzed within the present study outsourced its multiple-choice test questions to a separate website application, rather than embedding them at different points within the video. Learners may perceive the embedded design feature as more helpful to their learning (Carter-Roberts et al., 2021; Ottusch & Jordan, 2022). Moreover, embedding multiple-choice test questions may better motivate learners to understand a video's content (Carter-Roberts et al., 2021; Ottusch & Jordan, 2022).

4.1 Limitations

The present study contains limitations that should be kept in mind when interpreting its results. First, the aim of this study was not to generalize to specific populations of students or professionals, but rather to delineate effective and ineffective features of the training video (Kamp & Thomas, 2022). Analysis of pilot test feedback elucidated several strengths of the video which should enhance its perceived utility to end-users. Future research should investigate if similar findings are observed in diverse samples of college students (i.e., gradu-

[3]The reported average is the median value, computed from Table IV of the Alpert and Hodkinson (2019) study.

ate and undergraduate students) and professionals working in the field. Second, the sample size used in the present study was fairly small, which may affect the reliability of the observed trends (i.e., pilot testing in another sample of similar size or larger may result in the identification of different strengths and weaknesses). Moreover, responses favoring the video may have been influenced by pilot testers' affiliation with the lab (e.g., all students were mentored by the same faculty mentor, though uninvolved in the video's creation, and the feedback they provided was done anonymously). Thus, caution should be taken when drawing conclusions on the potential strengths and weaknesses of the present training video. Future research should test the video and other works with an unaffiliated audience recruited specifically to pilot test the materials (DeWalt et al., 2011; Le Marne et al., 2023). Third, the present study used a cross-sectional design to analyze the training video. Studies employing a pre-post design could capture potential ways the video might affect end-user knowledge, specifically in their ability to identify inappropriate or inaccurate communication of physical activity guidelines (Kamp & Thomas, 2022). Moreover, the utility of the training video was not evaluated within an instructional context involving students nor with professionals or clinicians working in the field (e.g., embedded within a course or workshop activity; Ross & Thomas, 2022; Zenko et al., 2023). This could affect the type of responses received about its strengths and weaknesses (e.g., does the video support meeting specific learning objectives or requirements of an activity or assignment; Carter-Roberts et al., 2021). Thus, future research should not only evaluate training videos within a learning environment involving more representative samples (Carter-Roberts et al., 2021), but it should also solicit feedback from course instructors or workshop leaders.

4.2 Conclusion

Physical activity promotion continuing education workshops for health-related practitioners focus on effectively communicating PAGs to patients/clients. Although audiovisual educational material may positively affect learning outcomes in kinesiology courses and related workplace training programs, limited research has focused on PAG instruction within classroom or workshop settings. The present study examined, qualitatively, the potential of one training video to aid current and future health-related practitioners in accurately and appropriately communicating PAGs to patients/clients. The video's potential was evidenced using the RE-AIM framework. Results suggested learners may positively view the training video, given its brevity, summary of relevant research, and use of several interactive features to elicit understanding. Future research directions were presented based on the findings and limitations of the present study.

Conflict of Interest

The authors have no conflicts of interest to declare.

ORCiD

Jafrā D. Thomas
https://orcid.org/0000-0002-0141-9933

Winston Kennedy
https://orcid.org/0000-0002-9839-927X

Caroline N. Smith
https://orcid.org/0009-0004-9529-1732

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Corresponding Author

Jafrā D. Thomas, Ph.D., M.P.H.
California Polytechnic State University
Department of Kinesiology and Public Health
1 Grand Avenue
San Luis Obispo, California 93407
Email: jthoma84@calpoly.edu

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Comparison of Myoelectric Activity Between Standing and Lying Plate Press Exercises in Recreationally-Trained Participants

Paulo Marchetti[1] Roberto A. Magalhaes[2]
Josinaldo J. da Silva[3] Silvio Pecoraro[4]
Rafael A.D. Baldin[5] Luis F.M. Teixeira[6]
Willy A. Gomes[3] William C. Whiting[1]

[1]Department of Kinesiology, California State University, Northridge
[2]Department of Physical Education, Mogi Guaçu University, SP, Brazil
[3]Department of Physical Education, Nove de Julho University, SP, Brazil
[4]Department of Physical Education, FMU, SP, Brazil
[5]BOS Institute, SP, Brazil
[6]Department of Physical Education, Campinas State University, Campinas, Brazil

Abstract

The plate press is a multi-joint exercise that involves the elbow and shoulder joints and can be performed in two different body positions (lying and standing). The purpose of this study was to evaluate the myoelectric activity between two different plate press exercises (lying and standing) in recreationally-trained men. Fifteen resistance-trained men (26.7 ± 3.2 years, 83.1 ± 6.8 kg, 176.0 ± 6.4 cm) performed one set of 10 repetitions with a standard weight of 10kg for the standing and lying plate press exercises at 60 beats per minute. Surface electromyography was used to measure the myoelectric activity (integrated electromyography, iEMG) of the pectoralis major (PM), anterior deltoid (AD), triceps brachii (TB), and biceps brachii (BB). Two-way ANOVA (2 x 4) with repeated-measures was used to test differences between exercises and muscle groups (PM, AD, TB, and BB) for the iEMG values. There were significant differences between exercises for AD (Standing > Lying: 41.7%, p=0.05), TB (Lying > Standing: 51.4%, p=0.047), and BB (Standing > Lying: 54.6%, p=0.001). In the comparison between muscle groups, TB presented the lowest myoelectric activation for the standing plate press exercise (57.6%, p<0.05) and BB presented the lowest myoelectric activation for the lying plate press exercise (48.1%, p<0.05). In conclusion, the lying plate press exercise showed a greater myoelectric activation of the TB and the standing plate press exercise showed greater myoelectric activation of the AD and BB. PM showed high myoelectric activation in both exercises but with no difference between exercises.

Keywords: Resistance training, strength, performance

1 Introduction

Resistance exercise is a key factor to activate specific muscle groups and, when associated with acute load variables (i.e. intensity, volume, frequency, rest intervals), aims to develop chronic adaptations such as hypertrophy, strength, power, and muscular endurance (Brown, 2008; Duchateau et al., 2021; Figueiredo et al., 2018; Floyd, 2021; Haff & Triplett, 2016; Marchetti, 2022; Ratamess et al., 2009; Zatsiorsky et al., 2019). In this way, exercise selection is based on movement specificity and takes into account factors such as the range of motion, number of joints, prime movers, stabilizers, types of routines (Split or Whole body), and periodization phase (Haff & Triplett, 2016; Marchetti, 2022; Ratamess et al.,

2009).

The plate press is a multi-joint exercise that involves the elbow and shoulder joints and can be performed in two different body positions (lying and standing). The press plate exercise is performed by practitioners and athletes aiming to stimulate muscles such as the pectoralis major (PM), anterior deltoid (AD), lateral head of the triceps brachii (TB), and biceps brachii (BB). However, the body position adopted in this resistance exercise can influence the level of activity of the prime muscles. Another important factor to be observed in this exercise is the act of squeezing the plate during the entire exercise, which could add an isometric component to the dynamic activity of the pectoralis major muscle.

To the best of the authors' knowledge, no study has analyzed the myoelectric activity between these two different plate press exercises. The rationale for this study is based on the assumption that changes in body position (lying or standing) may modify the myoelectric activity of pectoralis major (PM), anterior deltoid (AD), triceps brachii (TB), and biceps brachii (BB). Therefore, the body position related to the external load may or may not intensify the participation of each prime mover. Understanding the effects of body position on changes in target muscles facilitates the correct selection of these exercises within training or rehabilitation programs. Therefore, the purpose of this study was to evaluate the myoelectric activity between two different plate press exercises (lying and standing) in recreationally-trained men. The main hypotheses are that (1) PM and AD activation are similar between both plate press exercises, (2) TB is more active during the lying plate press exercise, and (3) BB is more active during the standing plate press exercise.

2 Methods

2.1 Participants

The sample size was justified by a priori power analysis based on a pilot study where the superficial electromyography (vastus lateralis and gluteus maximus), in four recreationally-trained participants, an alpha level of 0.05, and a power (1-β) of 0.80 (Eng, 2003). Fifteen resistance-trained men were assigned to this study [age 26.7 ± 3.2 years, total body mass 83.1 ± 6.8 kg, height 176.0 ± 6.4 cm]. All participants had 5±3 years of resistance training experience (at least 3 times a week) with hypertrophy-type training and were familiar with the plate press exercise. Participants had no previous surgery or history of injury with residual symptoms (pain) in the upper limbs or spine within the last year. The participants were informed of the risks and benefits of the study prior to any data collection and then read and signed an institutionally informed consent document approved by the Institutional Review Board at the University (IRB # 6.003.724).

2.2 Procedures

All procedures were randomized and counterbalanced across participants and experimental conditions. Participants attended one session in the laboratory and refrained from performing any upper body exercise other than activities of daily living for at least 48 hours prior to testing. All participants were asked to identify their preferred arm for writing, which was considered their dominant arm (Maulder & Cronin, 2005). Then, anthropometric data were evaluated (height and weight).

Next, all participants performed a familiarization and specific warm-up for both plate press exercises (lying and standing). The warm-up followed the following procedure: 1 set of 10 repetitions without external load, followed by 1 set of 10 repetitions with 5 kg for each resistance exercise, and a 5-min rest interval was given between sets. To perform the plate press exercise, all participants remained with their elbows extended in line with their shoulders and holding a standard weight of 10 kg plate. The external load was previously defined during a pilot study where the use of a 10 kg plate was a viable external load for performing 10 repetitions in both exercises. The participants started the movement by flexing their elbows and extending their shoulders until the plate touched the sternum region. The participants then performed the opposite movement, returning to the initial position. Participants kept their hands compressing the plate throughout the exercise. No time was given between concentric and eccentric actions. The same movement pattern was used in both exercises but with differences in the body position.

For the lying plate press exercise, all participants laid down on a bench (Figure 1a-b), and for the standing plate press exercise, all participants remained standing (Figure 1c-d). All participants performed 1 set of 10 repetitions for each resistance exercise in a random order and the movement velocity was controlled by a metronome at 60

beats per minute. In the same session, both exercises were performed with a 30-min rest interval. The sEMG electrodes were not removed during both exercises. Participants received similar verbal encouragement during both exercises. All measurements were performed between 9 am and 12 pm and measured by the same researcher (Certified Strength & Conditioning Specialist, CSCS).

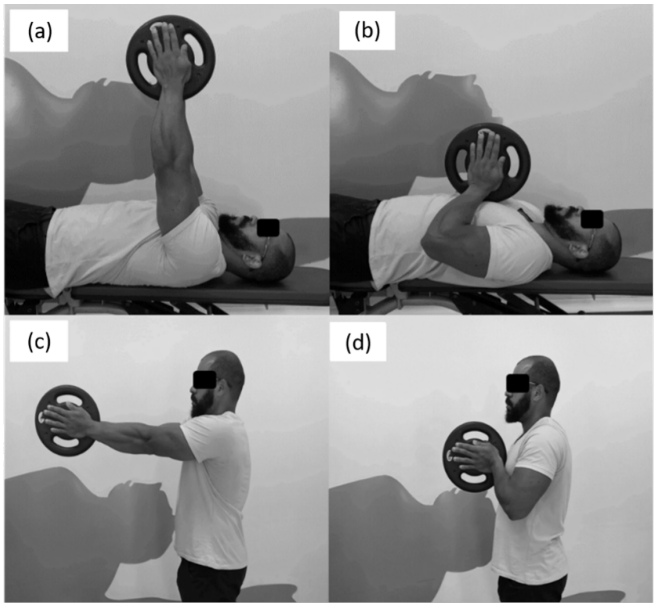

Figure 1: Plate Press Exercise in lying body position (a-b) and standing body position (c-d).

2.3 Measurements

Electrogoniometry: An electrogoniometer was positioned at the center of the elbow joint and the data were used to define the phases (concentric and eccentric) of each repetition. Data were acquired and synchronized with the sEMG using the same acquisition system and software (EMG832C, EMG system Brasil, São José dos Campos, Brazil) with a sampling rate of 2000 Hz.

Surface Electromyography (sEMG): The participants' body hair was shaved at the site of electrode placement and the skin was cleaned with alcohol before affixing the sEMG electrodes. Bipolar active disposable dual Ag/AgCl snap electrodes spanning 1-cm in diameter for each circular conductive area with 2-cm center-to-center spacing were used in all trials. Electrodes were placed on the dominant upper limb along the axes of the muscle fibers according to the SENIAM/ISEKI protocol (Hermens et al., 2000b): pectoralis major (PM): electrodes were positioned at 50% on the line between the muscular belly and the middle fibers (sternal-costal); anterior deltoid (AD): electrodes were positioned one finger width distal and anterior to the acromion; triceps brachii: lateral head (TB): electrodes were positioned at 50% on the line between the posterior crista of the acromion and the olecranon at 2 finger widths lateral to the line; and biceps brachii (BB): the electrodes were positioned on the line between the medial acromion and the fossa cubit at 1/3 from the fossa cubit, according to the SENIAM reference (Hermens et al., 2000a). The sEMG signals were recorded by an electromyographic acquisition system (EMG832C, EMG system Brasil, São José dos Campos, Brazil) with a sampling rate of 2000 Hz using a commercially designed software program (EMG system Brasil, São José dos Campos, Brazil). EMG activity was amplified (bi-polar differential amplifier, input impedance = 2MΩ, common-mode rejection ratio > 100 dB min (60 Hz), gain x 20, noise > 5 μV), and converted from an analog to digital signal (12 bit). A ground electrode was placed on the right clavicle. The sEMG signals collected during all conditions were normalized to a maximum voluntary isometric contraction (MVIC) against a fixed strap resistance. One trial of five-second MVICs was performed for each muscle with a one-minute rest interval between actions for the dominant upper limb. The first MVIC was performed to familiarize the participant with the procedure. For PM and AD MVICs, the participants were positioned in the supine position with the shoulder joint abducted at 90º, the participants performed a horizontal shoulder abduction against the external load applied at the elbow region. For TB and BB MVICs, the participants were positioned in the supine position with the elbow flexed at 90º and resistance placed at the wrist region. The participants performed elbow extension for TB MVIC and then, elbow flexion for BB MVIC (Boettcher et al., 2008; Criswell, 2011). Verbal encouragement was given during all MVICs. The order of MVICs was counterbalanced to avoid any potential neuromuscular fatigue.

The sEMG and electrogoniometer data were analyzed with a customized Matlab routine (MathWorks Inc., Massachusetts, USA). All sEMG data were defined by the electrogoniometer data, characterizing both the concentric and eccentric phases of each repetition. The digitized angle data were low-pass filtered at 10Hz using a fourth-order zero-lag Butterworth filter. The first and last two repetitions were removed from the data to ensure any body adjustment, neuromuscular fatigue, or change in movement velocity. Then, all six repetitions were used for further analysis. The digi-

tized sEMG data were band-pass filtered at 20-400 Hz using a fourth-order zero-lag Butterworth filter. For each muscle group, the root mean squared (RMS) (250ms moving window, sEMG RMS) was calculated for the MVICs and the sEMG data. The peak MVIC for each muscle (PM, AD, TB, and BB) was used to normalize the sEMG RMS data. Then, for each muscle group, the sEMG RMS was integrated (iEMG) and used for further analysis.

2.4 Statistical Analyses

The normality and homogeneity of variances within the data were confirmed by the Shapiro-Wilk and Levene's tests, respectively. Mean, standard deviation, delta percentage (Δ%), and 95% confidence interval (CI95%) were calculated. Two-way ANOVA (2 x 4) with repeated-measures was used to test differences between exercises and muscle groups (PM, AD, TB, and BB) for the iEMG values. Post-hoc comparisons were performed with the Bonferroni test when necessary. Cohen's formula for effect size (d) was calculated, and the results were based on the following criteria: <0.35 trivial effect; 0.35-0.80 small effect; 0.80-1.50 moderate effect; and >1.5 large effect for recreationally-trained participants (Rhea, 2004). An alpha of 5% was used to determine statistical significance. Test-retest reliability was calculated by intraclass correlation coefficient (ICC) for all dependent variables. The test-retest reliability for Lying Plate Press was 0.96 for PM, 0.97 for AD, 0.93 for TB, and 0.94 for BB; and for Standing Plate Press was 0.97 for PM, 0.92 for AD, 0.91 for TB, and 0.96 for BB.

3 Results

For iEMG, there was a significant main effect only for exercises ($p = 0.001$) and muscle group ($p = 0.001$). There was significant interaction between exercises and muscle group ($p = 0.002$).

For PM, there was no significant difference between lying and standing plate press exercises [Δ% = 19.4, CI95% = (-61.2 / 25.4), $p = 0.134$], figure 2.

For AD, there was a significant difference between exercises with a higher value observed in the standing plate press [Δ% = 41.7, d = 1.22 (moderate), CI95% = (-75.3 / 0.41), $p = 0.05$], figure 2. For TB, there was a significant difference between exercises with a higher value observed in the lying plate press [Δ% = 51.4, d = 1.47 (moderate), CI95% = (-10.7 / 13.9), $p = 0.047$], figure 2. For BB, there was a significant difference between exercises with a higher value observed in the standing plate press [Δ% = 54.6, d = 1.60 (large), CI95% = (-47.0 / -10.5), $p = 0.001$], figure 2.

There were observed significant differences between PM, AD, and TB vs. BB in the standing plate press exercises ($p < 0.05$) and between PM, AD, and BB vs. TB in the lying plate press exercises ($p < 0.05$) (Table 1).

4 Discussion

The main purpose of this study was to evaluate the myoelectric activity between two different plate press exercises (lying and standing) in recreationally-trained men. The main findings include (1) PM presented a similar myoelectric activation between the standing and lying plate press exercises; (2) AD and BB presented a greater myoelectric activation during the standing plate press exercise; (3) TB presented greater myoelectric activation during the lying plate press exercise. To the best of the authors' knowledge, no study has analyzed the myoelectric activity between two different plate press exercises (lying plate press and standing plate press) in recreationally-trained men.

The plate press is considered a multi-joint exercise that involves elbow and shoulder movements. This resistance exercise can be performed in two body positions (lying and standing) with important biomechanical differences when considering the direction of external load (gravity-based force). For the lying plate press, in the starting position (Figure 1a), the external load is vertically aligned with the elbow and shoulder, reducing substantially the external torque in both joints. At this position, there is a low level of muscle effort against the external load to maintain the upper limb position in a vertical direction. During the eccentric phase (Figure 1a→b), in the sagittal plane, the external load remains constantly aligned with the shoulder joint, producing a low external torque. During this phase (descending), the elbow joint moves away from external load increasing external torque in the direction of elbow flexion. Additionally, in the transverse plane, the elbow joint moves away from the external load creating an external torque in the horizontal shoulder abduction direction. During the concentric phase (Figure 1b→a), the opposite effect, in both joints, is observed. Regarding myoelectric activation evaluated in the present study, the PM

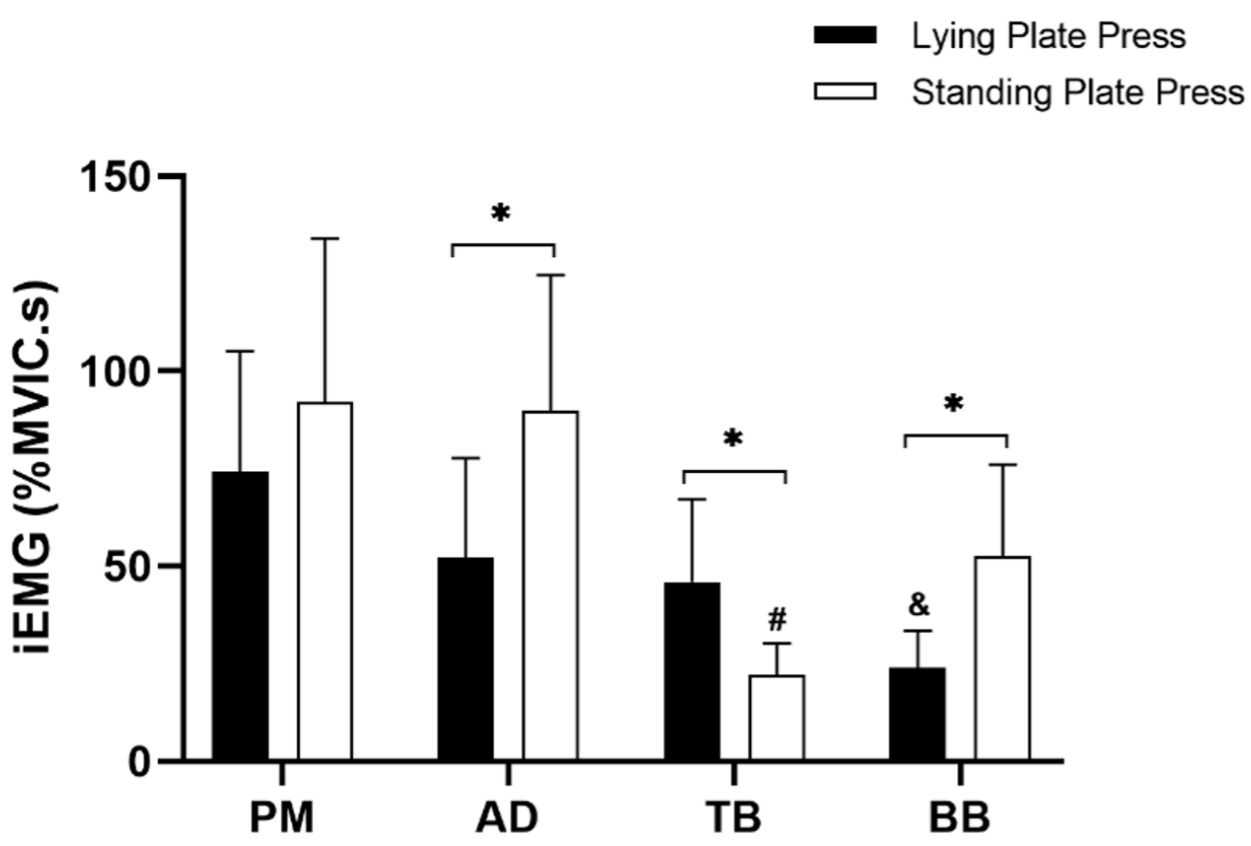

Figure 2: Mean ± standard deviation of the myoelectric activation (iEMG) of the pectoralis major (PM), anterior deltoid (AD), triceps brachii (TB), and biceps brachii (BB) for standing and lying plate exercises. Legend: *Significant difference between exercises, $p<0.05$. #Significant difference between TB vs. PM, AD, and BB for Standing Plate Press Exercise, $p<0.05$. &Significant difference between BB vs. PM, AD, and TB for Lying Plate Press Exercise, $p<0.05$.

and AD were active during concentric and eccentric actions and TB showed high activity while BB showed low activity.

On the other hand, for the standing plate press, the direction of the external load changed based on the body position. In the starting position (Figure 1c), the external load is positioned away from both joints (elbow and shoulder) increasing the initial effort. At this position, there is a high level of muscle effort against the external load regarding the large moment arm in both joints (shoulder>elbow). Therefore, from the initial position to the final position (Figure 1c→d), each joint moves in a different pattern. Initially, the external load induces an external torque in the direction of shoulder and elbow extension. In this matter, both AD and PM were active during the eccentric phase in bringing the plate close to the thorax. Additionally, the BB activity (concentric action) was necessary to flex the elbow and keep the plate in a linear horizontal trajectory. Finally, from the final position (Figure 1d) to the initial position (Figure 1c), the external load was moved in a linear horizontal trajectory but in the opposite direction (Figure 1d→c). During this phase, the PM and AD participated concentrically in shoulder flexion. On the other hand, BB showed great eccentric participation in order to control elbow extension and low TB activation in both phases of elbow movement (Knudson, 2007; Marshall & Elliott, 2000; Miller, 1980). Therefore, the observed movement of a segment may have been influenced by external torque, which influences the entire segment (Chapman, 2008; Knudson, 2007).

Table 1: Comparison between muscle groups by exercise. Effect size values, 95% confidence interval (95%CI), and percentage delta (Δ%).

Muscle Groups	p-value	Effect Size (*d*)	95% Confidence Interval ($CI_{95\%}$)	Delta Percentage (Δ%)
Standing Plate Press Exercise				
PM > BB	<0.001	1.17 (Moderate)	-9.2 / 88.3	43%
AD > BB	<0.001	1.25 (Moderate)	-1.1 / 75.4	41.4%
TB < BB	0.009	1.74 (Moderate)	-55.1 / -5.6	57.6%
Lying Plate Press Exercise				
PM > TB	0.001	1.07 (Moderate)	-67.8 / 11.1	38.2%
AD > TB	0.039	0.27 (Trivial)	-43.3 / 30.4	12.4%
BB < TB	0.003	1.33 (Moderate)	6.2 / 37.9	48.1%

We hypothesized that PM and AD activation would be similar between both plate press exercises. Both muscle groups play an important role as prime movers in resistance exercises involving shoulder flexion and horizontal shoulder adduction (Campos et al., 2020; Escamilla et al., 2009; Mausehund et al., 2022; Rodríguez-Ridao et al., 2020; Saeterbakken et al., 2021; Stastny et al., 2017). The results of this study partially corroborate the initial hypothesis. For PM, high myoelectric activity was observed in both exercises with a statistically non-significant increase of 19% (standing plate press > lying plate press exercise). This difference may be related to the position of the PM electrode in the sternocostal portion and not in the clavicular portion. For AD, the myoelectric activation was 41.7% higher during the standing plate press exercise when compared to the lying plate press exercise, corroborating the initial hypothesis. This difference might be attributed to a greater moment arm induced by the distance between the external load (external vector) and the shoulder and elbow joints. As well documented in the scientific literature, AD is a very active muscle during shoulder flexion (Botton et al., 2013; Campos et al., 2020; Coratella et al., 2020; Escamilla et al., 2009; Rodríguez-Ridao et al., 2020; Saeterbakken et al., 2021). Finally, consideration should be given to the fact that part of the myoelectric activity recorded from PM and AD, in both exercises, was directed towards maintaining pressure between the hands in order to maintain the position of the plate. This constant isometric action, in both exercises, could not be separated from the dynamic activity in the present study.

We hypothesized that TB would be more active during the lying plate press exercise. The results of this study corroborate this initial hypothesis. The lying plate press exercise produced 50.1% higher myoelectric activation when compared to the standing plate press exercise. Therefore, considering the direction of external load throughout the resistance exercise, a high TB activity would be expected, as observed in other studies with similar movement patterns (Mausehund et al., 2022; Saeterbakken et al., 2021; Stastny et al., 2017). Additionally, TB presented the lowest myoelectric activation when compared to PM (43%), AD (41.4%), and BB (57.6%) for the standing plate press exercise.

We hypothesized that BB would be more active during the standing plate press exercise and the results of this study corroborate this initial hypothesis. The standing plate press exercise produced 54.6% higher myoelectric activation when compared to the lying plate press exercise. This level of activation was expected due to the high external torques produced by the external load on elbow extension during both phases of the exercise. Additionally, the long head of the biceps brachii acts as a shoulder flexor as shown in the study by Landin et al. (Landin et al., 2008). Interestingly, it can be assumed that the BB remained active during the entire movement; with no concentric action due to the type of torque created by the external load (Knudson, 2007; Landin et al., 2017; Marshall & Elliott, 2000; Miller, 1980). Additionally, BB presented the lowest myoelectric activation when compared to PM (38.2%), AD (12.4%), and TB (48.1%) for the lying plate press exercise.

This study has some limitations that should be considered when interpreting the current results. Both resistance exercises were evaluated in the same session. However, both exercises were randomized for each participant and 30-min of rest was sufficient to remove any level of fatigue as observed in the pilot study. We evaluated the pectoralis major in only one region (sternocostal por-

tion). Possibly, the clavicular portion could present a different pattern. However, even knowing that the pectoralis major is a pennate muscle, this position minimizes electrode movement during both exercises. Another limitation was the use of a similar external load (10kg) between subjects and exercises, limiting the study's ecological validity. We also measured only healthy, recreationally-trained men, and, therefore, our findings are not generalizable to other conditions, populations, or women.

4.1 Conclusion

In the present study, the plate press is a multi-joint exercise and the body position can affect the myoelectric activity of the PM, AD, BB, and TB. The lying plate press exercise showed a greater myoelectric activation of the TB and the standing plate press exercise showed greater myoelectric activation of the AD and BB. PM showed high myoelectric activation in both exercises but with no difference between exercises. Therefore, when the objective of training or rehabilitation is to increase the myoelectric activity of the TB, the lying plate press exercise is recommended.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Ethical Approval

Was obtained from the Human Research Ethics Committee of the University of Sorocaba, under a protocol (#6.003.724), and was written according to the standards established by the Declaration of Helsinki.

ORCiD

Paulo Marchetti
https://orcid.org/0000-0002-2016-936X

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Corresponding Author

Paulo H. Marchetti, Ph.D.
California State University, Department of Kinesiology Department of Kinesiology
18111 Nordhoff Street
Northridge, CA, 91330
Email: dr.pmarchetti@gmail.com

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Comprehension of Physical Activity Promotion Material: A Retrospective and Comparative Analysis

Jafrā D. Thomas[1] Jasmine C. Wong[1]
Regina F. Hockert[1] Yi Sheng Wu[1]
Solana R. Martin[1] Zachary Zenko[2]

[1]California Polytechnic State University, San Luis Obispo
[2]California State University, Bakersfield

Abstract

The readability of health promotion material is often judged using reading grade level (RGL) formulas. However, formulas do not reliably factor in prior knowledge and context clues, which affect readability. Only one known study has directly measured physical activity promotion material comprehension (i.e., Cardinal & Seidler, 1995, using the cloze procedure). The purpose of the present study was to analyze the generalizability of the prior study's findings using a two-step study design. Study 1 compared subgroup comprehension scores from the prior study to cloze procedure interpretive cut-points since that step was not taken previously. Study 2 tested mock material comprehension using the cloze procedure, then analyzed comprehension scores from each study compared to the interpretive cut-points. Study 1 participants were adults purposively sampled, then categorized by educational attainment (i.e., college/no college degree, $N = 56$, test material RGL = 18.52, per SMOG-formula). Study 2 participants were adult college students conveniently sampled ($N = 25$), then randomized by test material SMOG RGL: 11th (typical level) versus 8th (max level recommended for lay adult audience). The conclusions from the previous study were partially confirmed: only one subgroup had inadequate comprehension (no college degree group). The 11th RGL material had inadequate comprehension, too. The 8th RGL material needed revision (better context clues) before performing as expected (i.e., greatest comprehension level, met cut-point for adequate comprehension). The findings of this study signify the need to pilot test physical activity promotion material to ensure writing at recommended RGL levels would likely promote adequate comprehension.

Keywords: Exercise science, health communication, health equity, health literacy, replication science

1 Introduction

Educational practices in physical activity promotion can promote health literacy specific to exercise (e.g., for self-care and self-management against chronic diseases; Hosseinzadeh et al., 2022). Readability research, however, suggests most materials in print and online circulation are not ready to be disseminated because they are hard to understand (Thomas et al., 2022b). Designing health promotion materials to meet recommended reading grade levels (i.e., at/below an 8th-grade level) would help ensure materials are understood by adults with low and high health literacy (Kim & Lee, 2016; Sheridan et al., 2011). Personalized understanding of physical activity guidelines and achieving adequate/proficient health literacy are positively correlated with meeting one or more recommendations for physical activity per week (Abula et al., 2018; Buja et al., 2020; Kickbusch et al., 2013; Lim et al., 2021).

Cardinal and Seidler (1995) were the first to directly study the degree to which lay adults may understand physical activity promotion material. Their innovative results suggested that writing

above the 8th reading grade level (the max-cut point recommended)[1] would likely cause inadequate comprehension in lay adults, regardless of educational attainment. According to the interpretive cut-points of their employed method (i.e., cloze procedure)[2], mean subgroup scores did not meet the cut-point for fully comprehending the test material without supplemental instruction. An implication of their study is that promotion material developed to foster understanding of physical activity guidelines is not suitable for end-users with a wide-range of educational attainment (i.e., high school, some college, college and graduate degree; Cardinal & Seidler, 1995).

Given the implications of the Cardinal and Seidler (1995) study results for public health (Smith et al., 2022a,b), it is surprising that the present study, currently, is the only known study that has sought to replicate their results. Thomas et al. (2021) did a systematic search of readability research in kinesiology and found only one study that measured comprehension directly, the one by Cardinal and Seidler (1995). Thomas et al. performed their search in 2020, and we replicated their search process one year later while including method-specific search terms (e.g., "comprehension", "cloze procedure"). Despite this more detailed search, we drew the same conclusion (Vega et al., 2021). Before this present investigation, there was only one known published study that has directly investigated the comprehension of physical activity promotion material. That study was Cardinal & Seidler (1995).

While illuminating the need to pilot test physical activity promotion material for readability and other suitability issues (e.g., Cardinal, 1995; Vallance et al., 2008), the study by Cardinal and Seidler (1995) had its limitations which should have been addressed by future research testing the replicability of their results (Halperin et al., 2018). Beyond using a single condition design, their test material was written at a graduate school reading grade level (e.g., 18.52 per the SMOG formula; McLaughlin, 1969); this estimate may have been seven to eight grade levels higher than the typical reading grade level of physical activity promotion material. For example, Cardinal (1993) analyzed a representative sample and showed the typical reading grade level for physical activity promotion material may be at the high school level (i.e., M = 11.28, SD = 1.83, 99% CI = [10.70, 11.86], N = 75). Per the confidence intervals reported in that study, the mean reading grade level would not statistically differ from the meta-mean reported by Thomas and colleagues (2018) in their meta-analysis (i.e., M = 10.25, 95% CI = [9.62, 10.91], N = 819, K =14), which also suggested a high school reading grade level is typical for physical activity promotion material. Moreover, Cardinal and Seidler (1995) grouped their participants by level of educational attainment, but they did not test their subgroup scores against their procedure's interpretive cut-points for (a) *not capable of comprehension*, (b) *somewhat capable of comprehension*, and (c) *fully capable of comprehension without supplemental instruction* (Cardinal & Seidler, 1995). Descriptively, all subgroups fell within the middle category per their mean values, but the college degree group appeared close to the latter cut-point.

Given the implications and limitations of the only known study to directly investigate physical activity promotion material comprehension in lay adults, the purpose of the present study was to retrospectively test the Cardinal and Seidler subgroup data against the interpretive cut-points of their procedure. This retrospective analysis aims to clarify the generalizability of their findings. Another purpose was to compare the Cardinal and Seidler subgroup results to our pilot test results done as part of an ongoing study to systematically replicate their methods (i.e., using the cloze procedure) to directly test the comprehension of mock physical activity promotion material written at two reading grade levels: i.e., (a) the 11th reading grade level (a typical level for physical activity promotion material) and (b) the 8th reading grade level (what is recommended). This comparative analysis will further clarify the generalizability of their findings.

2 Methods

2.1 Theoretical Framework

Cardinal and Seidler (1995) used the cloze procedure to directly test comprehension of one physical activity promotion material (a brochure).[3] The

[1] Health communication research suggest most adults read comfortably at the 8th reading grade level (Mayer & Villaire, 2009), and numerous government agencies and professional associations have endorsed that cut-point as the max level for lay communication (Han & Carayannopoulos, 2020).

[2] The cloze procedure derives from Gestalt psychology. It requires participants to guess the exact word(s) missing from a passage of text, which were removed systematically (Taylor, 1953, 1957). For a visual example, see Nielsen, (2011).

[3] The brochure analyzed by Cardinal and Seidler was presumed to be light reading for the general public. It was co-

cloze procedure is based on Gestalt psychology. It requires participants to complete sentences from a passage of text after the words are removed. The procedure assumes writing is a relationship where effective writing is predictable. It presumes that the easier readers can use prior knowledge and context clues to correctly guess exact words missing from a passage of text, the easier the text is to read, understand, and retain. The cloze procedure was developed to study text written in English, which has redundancy within how sentences are formed (e.g., articles, prepositions; Taylor 1953). Second, for a given passage of text, some words make more sense to use than others to complete a sentence due to the implied context of the passage of text and habitual ways things are phrased within a broader culture (Taylor, 1953). For example, try completing the following example sentence (for each blank, only use one exact word):

*If you lift with [**blank**] back instead of your [**blank**], you are more likely [**blank**] get hurt.*

See the footnote[4] for the answer. After some thought, we suspect most people reading this article would have correctly guessed the missing words.

Taylor (1953) argued that formulas used to estimate the reading grade level of a passage of text do not reliably capture factors that impede comprehension (e.g., little to no prior knowledge or awkward sentences). His preliminary study showed the number of correct guesses was a better predictor of reading difficulty (i.e., literacy demand) than formulas used to estimate reading grade level alone (because reading grade level formulas rely mainly on counting syllables and sentences; Taylor 1953). Doak et al. (1985, cited in Cardinal & Seidler, 1995) proposed interpretive cut-points for evaluating the degree adults comprehended health-related materials based on the results of the cloze procedure: i.e., correctly guessing $\geq$ 60% of the missing words means, likely capable of fully comprehending text without supplemental instruction (i.e., independently); correctly guessing 40 to 59.99% of the missing words means, likely needs supplemental instruction to fully comprehend text; and correctly guessing $<$ 40% of the missing words means likely not capable of comprehending text as written—revise the text and use verbal and visual communication. These same interpretive cut-points were presented within the second edition of their textbook, the latest known edition of the textbook (i.e., Doak et al., 1996b).

It appears that Doak et al. (1985/1996b) based their suggested interpretive cut-points on experimental research showing two key outcomes: (a) a cloze percentage score of 57-61% on average correlated with a multiple-choice comprehension score of 90%, the established cut-point indicating ability to fully understand text without instruction (i.e., independently), and a score of 41-44% on average correlated with a multiple-choice comprehension score of 75%, the established cut-point indicating a need for instruction before text could be fully understood (Rankin & Culhane, 1969). Similar findings were observed for oral reading tests (Bormuth, 1968a). Doak et al. (1996b) provided little detail explaining why their cut-points differed slightly from the published studies. They suggest their cut-points provide a conservative estimate for interpreting cloze scores across diverse populations (Doak et al., 1996b; for example see Aitken, 1977, p. 63; Bormuth, 1968b, pp. 193-194; Rankin & Culhane, 1969, pp. 197-198). Cardinal and Seidler (1995) used the suggested interpretive cut-points by Doak et al. (1985) to determine the degree their adult sample could comprehend the test brochure. The aforementioned cut-points were republished within the second edition of the Doak et al. textbook (Doak et al., 1996b). For the present investigation, we used the same cloze procedure protocol and interpretive cut-points as Cardinal and Seidler (1995).

2.2 Study Design

Two studies were performed and reported in this article to address the aims of the present investigation. In summary, a retrospective analysis (Study 1) was performed on the Cardinal and Seider (1995) summary data (i.e., a reanalysis). Study 1 investigated if the mean scores of each subgroup significantly differed from cloze procedure interpretive cut-points (e.g., the 40% correct answer cut-point, the 60% correct answer cut-point). Study 2 tested the cloze comprehension for test material written at two reading grade levels not investigated in the Cardinal and Seidler (1995) study (i.e., 11th and 8th grade). The results from Study 1 and 2 were then compared (e.g., mean scores and cut-point comparisons).

published by the US Centers for Disease Control and Prevention and the American College of Sports Medicine (Cardinal & Seidler, 1995).

[4]Answer key: If you lift with your back instead of your legs, you are more likely to get hurt.

2.2.1 Study One

The first study was a retrospective analysis. The summary statistics Cardinal and Seidler (1995) reported for their sample subgroups were extracted from their article for statistical comparison against the interpretive cut-points of the cloze procedure (i.e., tested if means differed from the cut-point values). While health literacy level is a more robust predictor of comprehension than educational attainment, educational attainment is still positively associated with comprehension (Weiss et al., 2005). For example, Weiss et al. (2005) showed that educational attainment strongly predicted which adults had adequate and low health literacy skills 72% of the time (Weiss et al., 2005), according to the ROC curve test statistic (Weiss et al., 2005; Carter et al., 2016). The Cardinal and Seidler (1995) study results, however, suggest regardless of educational attainment, most individuals in their sample would have likely needed supplemental instruction to fully understand their test brochure written at a graduate school reading level (i.e., Sample M cloze score = 54%, SD = 13.4%). This implication should be verified using retrospective analysis since the mean scores for their college degree-level-subgroups appeared equivalent with the cut-point (60%), indicating an ability to fully understand the material without instruction (i.e., Bachelor's degree versus Master's degree, M was 59.2%, SD = 12.2% and M was 57.4%, SD = 8.2%, respectively).[5]

2.2.2 Study Two

Study two was to test the efficacy of a research protocol developed to systematically replicate the Cardinal and Seidler (1995) study. Specifically, study two was to verify if their protocol could be adapted to test the comprehension of mock online physical activity promotion material (i.e., web articles) written at two reading grade levels (11th and 8th grade). Thomas and colleagues (2023a) developed the mock material, and they chose the two reading grade level targets because of their ecological validity: the first target (an 11th reading grade level) is the typical reading level of online written advice about physical activity (e.g., web articles or blogs; Thomas et al., 2022b), and the second target (an 8th reading grade level) is the target level that health-related resource material should not exceed according to experts in health communication (Han & Carayannopoulos, 2020). Twenty-five individuals, eighteen years or older, enrolled as undergraduate students at the first author's university, participated in study two.

Study two had three phases: (a) phase one, was a pilot test of the survey website designed to administer the online cloze procedure (participants were volunteers from the first author's lab, n = 12)[6]; prior to pilot testing in phase one, a valid and reliable rating form was used to ensure the website had good usability (e.g., it had easy navigation and was screen-reader friendly; Wu et al., 2022, 2023) (b) phase two occurred because the 8th reading grade level material did not have better comprehension than the 11th reading grade level material, thus the 8th reading grade level material was revised per the theoretical underpinnings of the cloze procedure (Taylor, 1953), then comprehension for the revised material was checked in phase two (participants were undergraduate research assistants uninvolved with the material's creation or adaptation, n = 3) and (c) phase three, was to check if the results previously observed, for the 11th reading grade level material and the revised 8th reading grade level material, would replicate with a new sample of participants (i.e., a randomly stratified subsample recruited for the larger replication study, n = 10). For more detail, refer to Figure 1.

The research protocol for study two was approved by the university institutional review board of the first author (primary investigator). Given the aims of study two was not to generalize to specific populations (but rather to investigate the functionality and validity of the research protocol and instruments), demographic data was not recorded for study two participants beyond what was already reported (i.e., college attending adults, 18 years or older, completing an undergraduate degree program).

2.3 Analytic Plan

The analytic plan had several components. First, intra and inter-rater reliability was checked using the cloze forms completed in study two, phase 3. Two measures of rater reliability were used: (a) the intraclass correlation coefficient (ICC) for ab-

[5]Cardinal and Seidler (1995) used the analysis of variance (ANOVA) test to test difference between subgroups, only, not against cut-points used to interpret cloze procedure results.

[6]The survey website was developed using the Canvas web application software. The mock material was converted into an online cloze form using the quiz-option for fill-in-the blank prompts (i.e., the entire mock article was a single quiz "question/prompt", with each blank space an answer option; Instructure, n.d.).

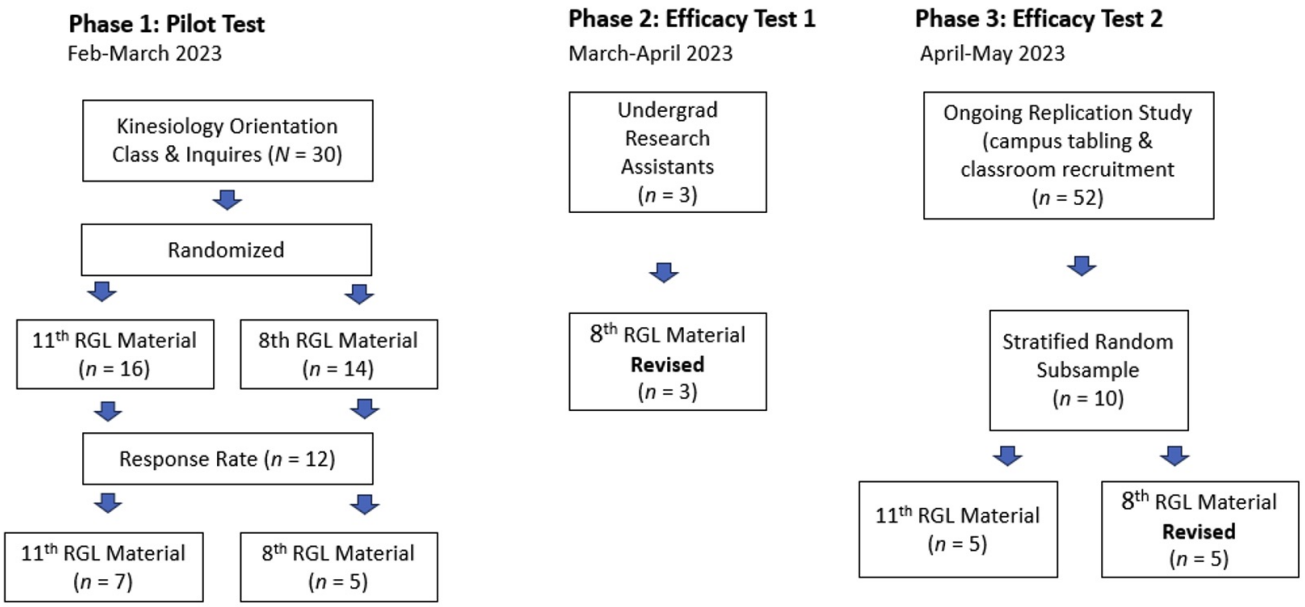

Figure 1: Three panel figure, showing the sampling procedure to each phase of study two within the present investigation. The "revised" label denotes that the test material was revised and then retested, given the pilot-test results suggested low construct validity (i.e., cloze comprehension scores for the original 8th reading grade level material were less than the scores for 11th reading grade level material). Two efficacy tests were performed to test if edits improved the 8th-grade reading material's construct validity (i.e., Phase 2: Efficacy Test 1), then confirm if those findings would replicate (i.e., Phase 3: Efficacy Test 2). According to both efficacy tests, the revised 8th-grade material had improved construct validity (i.e., greater comprehension scores).

solute rater agreement and using a two-way random effects model (Landers, 2015) and (b) Krippendorff's alpha coefficient for ordinal measures (Freelon, 2013; Thomas et al., 2022b). Intra-rater reliability was assessed using a 3-day grace period for the first author, the primary coder for the study. Inter-rater reliability was assessed using the ratings of the first and second authors. Rater reliability scores were evaluated using the established interpretive cut-points for the ICC measure (Cicchetti, 1994) and Krippendorff's alpha coefficient (Landis & Koch, 1977). Second, one-sample t-tests were used to test if subgroup means differed from cloze score interpretive cut-points. A web tool for conducting one-sample t-tests using summary statistics was used (@ZACH, 2020). Third, independent samples t-tests were used to compare within and between-study subgroups. Summary statistics were used, and this computation was done in SPSS (*Statistical Package for the Social Sciences*).

Statistical significance was set at $p \leq .10$, given the exploratory nature of the present investigation (Vaske, 2019). Bonferroni adjustments were made in the event of multiple comparisons (but this correction was used sparingly, given the formula is a bit too conservative; see Morgan et al., 2006, pp. 155, 184). Using a free web tool, we computed effect size estimations to determine the magnitude of observed differences (i.e., Hedge's g for between-group differences and Glass' delta (Δ) for cut-point comparisons; SocialScienceStatistics.com, n.d.). Established interpretive cut-points were used to evaluate the effect size results (Vaske et al., 2002).

3 Results

3.1 Reliability Results

Scoring for the cloze submissions had excellent intra- and inter-rater reliability. For more detail, refer to Table 1. Inter-rater reliability revealed one discrepancy with the 11th reading grade level (RGL) material. The wrong word was deleted for space 42 within the online cloze form. The cause of this error is unknown, given the answer key was

correct. Moreover, the first author noticed similar errors when pasting the cloze form from the Microsoft Word document into the Canvas text editor (e.g., spaces would be deleted). While the forms were checked systematically by the research team before their utilization, the aforementioned error did slip through. The answer key was adjusted to correctly code the space for item 42 within the online form, before performing descriptive and analytic analyses. Additionally, the first author conducted a line-by-line check using print copies of the answer key and online cloze form. No other errors were observed.

Table 1: Rater Reliability Test Results in Scoring Cloze Submissions

	Intra-Rater Reliability	
Material	ICC[1]	K. alpha
8th RGL[2] Cloze	.99	.98
11th RGL[2] Cloze	.83	.97
	Inter-Rater Reliability	
Material	ICC[1]	K. alpha
8th RGL[2] Cloze	.99	.98
11th RGL[2] Cloze	.98	.97

Notes. (1). ICC stands for intra-class correlation. A two-way random effects model for absolute agreement was used. (2). RGL stands for reading grade level. K. alpha stands for Krippendorff's alpha.
Three-day grace period used for the test-retest period.
Random sample subset (n = 10, 5 per condition), sampled from ongoing replication study (i.e., Study 2, phase 3 sample of the present study).
ICC interpretive cut-points (Cicchetti, 1994): Poor < .40, Fair = .41—.59, Good = .60—.74, Excellent = .75—1.0.
K. alpha interpretive cut-points (Landis & Koch, 1977): Poor < .00, Slight = .00—.20, Fair = .21—.40, Moderate = .41—.60, Substantial = .61—.80, Almost Perfect = .81—1.0.

3.2 Study One Results

When compared to the 40% cut-point, t-test results substantiated descriptive results for the no college degree group.[7] On average, scores were not different from the minimum cut-point, and differences were small/minimal in magnitude. As suspected, the mean score for the no college degree group was significantly less than the 60% cut-point. Observed differences were large/substantial in magnitude. Finally, the college degree group, on average, was similar to the 60% cut-point. Observed differences were small/minimal in magnitude. For more detail, refer to Table 2 and Table 3.

Table 2: Combined Group Means for the Study Subgroups

	Cardinal & Seidler Study[1]	
	No College Degree[3]	College Degree[4]
n	19	37
Mean (%)	44.59	58.86
SD (%)	12.07	11.47
	Present Study[5]	
	11th RGL[2]	8th RGL[2]
n	12	8
Mean (%)	50.81	65.94
SD (%)	6.84	2.83

Notes. (1) The Cardinal and Seidler test material had a graduate school RGL (i.e., 18.52 per the SMOG formula). (2) RGL stands for reading grade level. (3) Individuals with a high school diploma and who completed some college courses. (4) Individuals who earned a bachelor's and master's degree. (5) Participants were current undergraduate students (mostly majoring in kinesiology); they would fall under the "no college degree group," for comparative purposes.

3.3 Study Two Results

The 11th RGL material group scores were larger than the 40% cut-point on average. Observed differences were large/substantial.[8] At the same time, this group was less than the 60% cut-point on average. The 8th RGL material group scores exceeded the 60% cut-point on average. Observed differences were large/substantial.[9]

On average, the 8th RGL material group had greater comprehension than any other group. Compared to both the no college degree group (Cardinal & Seidler 1995 study) and the 11th RGL material group (present study), the difference was large/substantial. Compared to the college degree group (Cardinal & Seidler 1995 study), the difference was moderate/typical.

[7] We combined Cardinal and Seidler's (1995) educational attainment subgroups into two groups: (a) no college degree (high school diploma & some college course work; $t = 0.124$, $df = 17$, $p = .903$) and (b) college degree (bachelor's degree & master's degree; $t = 0.369$, $df = 35$, $p = .714$); equal variance assumed, Bonferroni-adjusted p-value = .05. A free webtool was used (StatsToDo.com, n.d.)

[8] The independent samples from phase 1-3 were combined as follows: 11th RGL material (phase 1 & 3; $t = 0.370$, $df = 7.343$, $p = .722$) and 8th RGL revised material (phase 2 & 3; $t = 1.465$, $df = 2.335$, $p = .263$); equal variance not assumed.

[9] According to study two descriptive statistics, it was only necessary to compare the 8th RGL material group to the 60% interpretive cut-point.

Table 3: Results Showing Subgroup Mean Difference Compared to the Cloze Interpretive Cut-Points[1]

	M difference	*t*-value	*df*	*p*-value[7]	Effect size[8]
	Compared to 40% Cut-point (Somewhat Comprehensible)[3]				
Cardinal & Seidler Study					
No College Degree[4]	4.59	1.658	18	.114	0.38
Present Study					
11th RGL[2]	10.81	5.475	11	< .001	1.58
	Compared to 60% cut-point (Fully Comprehensible)[6]				
Cardinal & Seidler Study					
No College Degree	-15.41	5.565	18	< .001	1.28
College Degree[5]	-1.14	0.605	36	.549	0.09
Present Study					
11th RGL[2]	-9.19	4.654	11	< .001	1.34
8th RGL[2]	5.94	5.936	7	< .001	2.09

Notes. (1) Difference scores are by percentage points. The minus sign was used on values for the M difference to indicate a negative difference. (2) RGL stands for reading grade level. (3) Difference was not tested against the 40% cut-point for the "college degree group" and "8th RGL group" because they were much closer to the 60% cut-point, per their descriptive statistics. (4) Individuals with a high school diploma and who completed some college courses. (5) Individuals who earned a bachelor's and master's degree. (6) Bonferroni adjustment for two total comparisons (i.e., $\alpha = .10/2 = .05$). (7) Bonferroni adjustment for four total comparisons (i.e., $\alpha = .10/4 = .025$). (8) Exact p-values reported. (9) Effect size measure = Glass's Δ. Interpretive cut-points: 0.10 = small/minimal, .50 = medium/typical, .80 = large/substantial.

For the 11th RGL material group, comprehension was equivalent to the no college degree group on average. Based on the descriptive statistics, we suspected comprehension scores of the 11th RGL material group would have been statistically larger than the no college degree group. This outcome was not observed, however. For more detail, refer to Table 4.

4 Discussion

The purpose of the present retrospective and comparative analysis study was to investigate the generalizability of the Cardinal and Seidler (1995) study findings, which suggested lay adult's ability to comprehend one physical activity promotion brochure was inadequate (i.e., not capable to somewhat capable, on average), for a wide range in educational attainment (Cardinal & Seidler, 1995). Within the present study, we found considerable overlap between our findings and those reported by Cardinal and Seidler. Material written above the established 8th RGL would likely result in inadequate comprehension in lay adults without considerable effort and supplemental instruction (Miller & Stine-Morrow, 1998; Ng et al., 2019). Specific to our study, we confirmed reducing the reading grade level may improve comprehension of physical activity promotion material, but only partially if the text remains above the 8th RGL cut-point. Within this section, we discuss the implications of our findings and present recommendations for future research.

One implication concerns the ecological validity of mediated interventions to promote physical activity. Mediated interventions are strategies to support behavioral change without interpersonal interaction with professionals. Generally, mediated print- and web-based interventions have been shown to increase baseline physical activity levels in sedentary and somewhat active adults, across a wide range in age, with effects sustained post-intervention for weeks to months (Marcus et al., 2007; Müller & Khoo, 2014; Parrott et al., 2008). The present study's findings underscore the need to ensure all recipients understand mediated messages to fully understand behavioral prompts, suggested strategies, and other guidelines (Harrison et al., 2019; Zhang, 2014). According to cognitive load theory, working memory is crucial for the accurate and appropriate application of health-related information received, including from print and online media (Wilson et al., 2012). The more mental energy needed to comprehend information (e.g., to perceive and decode messages), the less energy is available to integrate message information with prior knowledge or identify ways to effectively apply message information to health-related deci-

Table 4: Results Showing Mean Difference between Subgroups[1]

	t-value[2]	*df*	A priori *p*-value	Adjusted *p*-value[3]	*p*-value observed	Effect size[4]
	8th RGL Group Mean Cloze Score (% Points) versus Remaining Subgroups					
No college degree	7.251	22.041	.10	.017	< .001	2.06
College degree	3.317	42.002	.10	.017	.002	.67
11th RGL	6.835	15.743	.10	.017	< .001	2.69
	11th RGL Group Mean Cloze Score (% Points) versus Remaining Subgroups					
No college degree	1.829	28.782	.10	.017	.078	.59
College degree	-2.948	32.064	.10	.017	.006	.76
8th RGL	-6.835	15.743	.10	.017	< .001	2.69

Notes. (1) Equal variance between groups not assumed for any analysis (i.e., p < .05); corrected t-test used in each comparison. (2) Since mean difference values are not reported here, minus signs were used on t-values to indicate direction, if referent group mean score was smaller (e.g., 11th RGL group).
(3) Bonferroni adjustment for six total comparison (i.e., 3 per 8th RGL group, 3 per 11th RGL group). (4) Effect size measure = Hedge's g. Interpretive cut-points: 0.10 = small/minimal, .50 = medium/typical, .80 = large/substantial.

sions and behaviors (Wilson et al., 2012).

It is not clear how often and the ways in which the literacy demand of educational materials used in physical activity promotion interventions are pre-tested before their wide use (Thomas & Cardinal, 2018). However, pre-tested physical activity promotion materials may have a greater chance of being understood by a diverse group of lay adults across clinical and non-clinical settings (Cardinal, 1995; Vallance et al., 2008). The caveat is that messages and material design suit the cultural habits and prior knowledge of end-users. Beyond making messages salient by matching them to motivational readiness for behavior change or the cultural values of end-users (Cardinal et al., 2002; Morgan et al., 2016), our findings underscore the need to pre-test messages for predictability. Specifically, we observed the 8th RGL mock material published by Thomas et al. (2023a) had worse comprehensibility than its 11th RGL material counterpart. Although the 8th RGL mock material was suspected of having areas for improvement, as a case material for teaching lay communication techniques, the research team likely did not expect our findings. Unlike their 11th RGL material, their 8th RGL material was not pilot-tested for face validity with end-users. Doing so could have helped the research team correct any awkward phrases or vocabulary that may have held back comprehension, as suggested by the present study's findings.

Finally, the present study's findings suggest that literacy-sensitive research should be a focus of kinesiology research (Smith et al., 2022a). Literacy-sensitive research is a methodology to ensure positive intervention outcomes (Kim & Lee, 2016), regardless of a person's literacy ability (e.g., to perceive and process new and unfamiliar information) or regardless of a person's health literacy level (e.g., ability to understand health guidelines and instructions specific to a person's life situation or health goals). Our findings suggest that individuals with basic and high literacy skills could achieve the same level of comprehension if health materials are (appropriately) written at/below the 8th RGL cut-point. Taylor (1953) argues that, theoretically, the cloze procedure was designed to compare the readability of different topics of material so long as there was cultural overlap between end-users. Our comparative analysis suggests that if the brochure written at a graduate school reading level was (appropriately) written at/below the 8th RGL cut-point, then adults with a high school degree or higher would likely achieve equivalent comprehension of such material and would not require supplemental instruction. These findings mirror literacy-sensitive research interventions focused on diabetes management and health-related lifestyle changes in clinical populations (Kim et al., 2004; Rothman et al., 2004). In fact, reviews of health literacy research suggest adults with low/limited literacy skills could achieve similar gains from health interventions when lay communication principles are met (and health behavior theory is utilized; Kim & Lee, 2016; Sheridan et al., 2011). The extent to which this applies to physical activity promotion intervention within and outside clinical settings remains to be seen (Thomas, 2019). Few studies in kinesiology may examine the relative effectiveness of their interventions for individuals with low, basic, or proficient

(health) literacy skills (Eckman et al., 2012; Lam & Leung, 2016), let alone investigate which design features may level the playing field for all participants (Espigares-Tribo & Ensenyat, 2021; Lattimore et al., 2010).

4.1 Future Research Recommendations

The limitations of the present study and discussion of its findings provide several avenues for future research.

First, this study's comparative analysis was somewhat underpowered for detecting if the mock test material had greater comprehensibility than the brochure studied by Cardinal and Seidler (1995) (for greater discussion, see Thomas et al., 2023b). If the present study's findings are replicated, they could be combined to produce a larger sample for comparison against the Cardinal and Seidler subgroups (Cardinal, 1993). Towards that end, studies replicating the present study are advised to check the predictive validity of the cloze forms first, then systematically adjust the 8th RGL material if needed (followed by a retest). This systematic formative assessment into how well the test materials (i.e., cloze forms) function before using them within the main study would give insight into what may work when attempting to edit health-related material to meet reading grade level recommendations or other suitability standards for effective lay communication (Doak et al., 1996a; Espigares-Tribo & Ensenyat, 2021). For example, our results suggest that text predictability is crucial (Taylor, 1953).

Second, future research should test if the present study's findings can be replicated in large and diverse samples (Halperin et al., 2018). Specifically, we recommend that researchers test if our revised material written at the 8th-grade reading level (measured by the SMOG formula) has greater comprehension than the materials developed by Thomas and colleagues (2023a). Refer to Supplemental Content File 1 to obtain the test material used in this study (i.e., the revised 8th grade reading level, the original 8th grade reading level, and the 11th grade reading level, mock material). Additionally, more systematic approaches could be used to pilot test those materials (Thomas et al., 2023c), including asking end-users to rate the materials on their appropriateness and clarity in addition to how realistic they look (Cardinal, 1995; Espigares-Tribo & Ensenyat, 2021; Vallance et al., 2008). Several studies have published their methodologies for systematically pilot testing their intervention material with lay end users (Cardinal, 1995; Espigares-Tribo & Ensenyat, 2021; Vallance et al., 2008), which could be used to further analyze (and pilot test) the mock material used in the present study. Moreover, adapting these pilot testing methods as a student learning activity by college and university instructors should provide students with more opportunities to achieve significant learning on lay communication techniques (Kamp & Thomas, 2022; Ross & Thomas, 2022).

Finally, our discussion brought to light a need for future research in kinesiology to examine the extent to which physical activity promotion researchers disclose/report testing the suitability (and usability) of their intervention activities or materials before implementation (Watson & Thomas, 2024). We suggest parsing such work into two projects, one focused on interpersonal or combined interventions and another on mediated interventions. Wilson et al. (2012) adapted procedures for a systematic review to perform a comparative synthesis of health research testing the relative effectiveness of print and multimedia material in promoting health literacy and health behavior. We encourage the systematic replication of their methods to studying mediated physical activity promotion interventions, and interpersonal interventions, in kinesiology (APA, n.d.). Moreover, we recommend future review studies investigate the degree to which researchers conducting physical activity promotion interventions report outcomes by health literacy level. While several literacy-sensitive, review studies contain reports showing (or implying) favorable behavioral health outcomes regardless of health literacy level in the physical domain (e.g., self-reports for exercise or physical activity, HgbA1c measures; Kim & Lee, 2016; Sheridan et al., 2011), these studies likely are not representative of intervention studies in kinesiology (Hosseinzadeh et al., 2022).

4.2 Conclusion

The present study was a retrospective and comparative analysis of the Cardinal and Seidler (1995) study directly measuring lay comprehension of physical activity promotion material. The results of our study suggest physical activity promotion material written above the 8th-grade reading level (measured using the SMOG formula, McLaughlin, 1969) would likely disadvantage lay adults, especially those without a college degree. Furthermore, the results suggest this equity issue can be mit-

igated, but revised health-related material should be pilot-tested with end-users before their wide dissemination. Discussion of these findings brought to light a concerted need to evaluate the kinesiology intervention literature in order to understand the extent materials and activities focused on physical activity promotion are tested for suitability (and usability) for adults with varied levels of health literacy (e.g., low, basic, proficient; Thomas et al., 2022a; Wilson et al., 2012). Towards that end, we concluded our discussion with recommendations for future research, including the suggestion to systematically replicate the present study—including its pilot testing procedures.

Conflict of Interest

The authors have no conflicts of interest to declare.

ORCiD

Jafrā D. Thomas
https://orcid.org/0000-0002-0141-9933

Jasmine C. Wong
https://orcid.org/0009-0003-0828-8731

Regina F. Hockert
https://orcid.org/0009-0006-7913-0124

Yi Sheng Wu
https://orcid.org/0009-0007-9389-3379

Solana R. Martin
https://orcid.org/0009-0005-1692-160X

Zachary Zenko
https://orcid.org/0000-0002-2887-6739

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Corresponding Author

Jafrā D. Thomas, Ph.D., M.P.H.
California Polytechnic State University
Department of Kinesiology and Public Health
1 Grand Avenue
San Luis Obispo, California 93407
Email: jthoma84@calpoly.edu

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The Status of Physical Education in Arizona's Colleges and Universities

Steven Ross Murray[1] and Kristin J. Heumann[2]

[1]Physical Education Program, University of California, Berkeley
[2]Department of Kinesiology, Colorado Mesa University

Abstract

One hundred years ago, physical education was nearly universal in American higher education, with 97 percent of institutions requiring it. The standard mostly continued through the 1960s, when 84-87 percent of institutions required it. By 2012, though, the percentage fell to 39.5, and in 2023, researchers reported, via sampling, that 31.7 percent of institutions required all undergraduate students to take physical education, and another 12.1 percent partially required it. Sampling, while statistically sound, has limitations. To better assess the prominence of physical education across America, examining offerings state-by-state is necessary and has been undertaken for several states thus far. This study investigated the status of physical education in Arizonan higher education institutions to compare to other states' data and the recently published national sampling data. The specific graduation requirements of each institution were analyzed. Of Arizona's 29 traditional colleges and universities, 24 (82.75%) offer physical education; none (0%) dictates physical education as a graduation requirement for every student, and 15 (51.7%) have physical education as requirements in particular disciplines or as a general education option. The current trend in higher education is that required physical education is declining, and the results from this study, unfortunately, support this trend. However, most Arizonan higher education institutions offer physical education, and over half allow physical education to count as an option for a graduation requirement. Faculty can use these results to advocate for maintaining and initiating physical education in higher education because the research is clear: Physical education is known to improve students' health and wellness.

Keywords: Basic instruction, graduation requirements, higher education, physical activity, physical education

1 Introduction

In 2019, we issued a call for a detailed study of the status of physical education (also known as basic instruction programs, college and university physical activity programs, physical education requirements, and instructional physical activity programs) in American higher education on a state-by-state basis by analyzing the requirements of each institution's website or published catalog (Heumann & Murray, 2019). Szarabajko et al. (2021) answered that call by looking at the programs within the state of Oregon, and we added to our previous study on Colorado (Heumann & Murray, 2019) by examining the programs within Utah's tertiary educational institutions (Murray et al., 2021). Ladd (2023) provided information regarding Texas's community colleges and the status of health and health-related physical activity courses within their curricula. In addition to these studies, Szarabajko and Cardinal (2023) updated the national data regarding physical education in institutions of higher education via sampling to draw their conclusions, rather than performing a comprehensive analysis of each institution nationwide that the authors of the previous studies had completed on the state level. In this study, we

examined the physical education in the Arizonan higher education institutions to provide the most current information available and compared these findings to the results of the studies mentioned above. The following section is an updated historical review that mimics much of our previous work on this topic (Heumann & Murray, 2019; Murray et al., 2021) but with added information from recently published papers, as this effort is a continuation of our call for state-by-state analyses of physical education in higher education.

1.1 Historical Review

Physical education (often called basic instruction programs, physical activity programs, service programs, etc.) in the United States dates to the 1800s when Amherst College began the first such program in American academe (Allen, 1869). Other institutions followed, and required physical education became nearly universal in American higher education in the 1920s, with 97% of institutions mandating it as a graduation requirement (Cardinal & Casebolt, 2022; Szarabajko & Cardinal, 2023). Since the 1930s, researchers (see Figure 1) have investigated the status of physical education on the national level (Boroviak, 1989; Cardinal et al., 2012; Cordts & Shaw, 1960; Hensley, 2000; Hunsiker, 1954; McCristal & Miller, 1939; Miller et al., 1989; Oxendine, 1961, 1969, 1972; Oxendine & Roberts, 1978; Strand et al., 2010; Szarabajko & Cardinal, 2023; Trimble & Hensley, 1984, 1990). These researchers found that up through the 1960s, 84 and 87 percent of higher education institutions required physical education as a graduation standard. By the 1990s, the percentage fell to the mid-60s, and in 2010 and 2012, it sank to 42.5 and 39.5 percent, respectively (Cardinal et al., 2012; Szarabajko & Cardinal, 2023). The latest study analyzing the national percentage by sampling indicated that 31.7 percent of tertiary educational institutions required all undergraduate students to take physical education, with another 12.1 percent partially requiring it (Szarabajko & Cardinal, 2023). Irrespective of how the data are collected, the national trend is clear: Required physical education is declining in academe, and fewer higher education institutions are mandating it as a graduation requirement.

Szarabajko and Cardinal's (2023) data suggest that most physical education currently in American higher education is voluntary instead of required. More disconcerting, however, is that quality physical education is often being substituted for voluntary recreational programming (Kim & Cardinal, 2019a; Kim & Cardinal, 2019b), which frequently caters to active and likely, already fit individuals, is, by definition, more recreationally focused than pedagogically driven, is less effective at long-term behavioral change because of low participation rates (Zakrajsek, 1994) and, thus, lower long-term compliance, conflicts with other campus departments (Schneider et al., 2007), and ignores the needs of the sedentary, less-skilled, and indifferent students (Wilson et al., 2020; Wilson, Bhuiyan, et al., 2021). Simply put, recreational programming often ignores "the students who might very well benefit the most" from regular, physical activity and, thus, required physical education (Szarabajko & Cardinal, 2023, p. 2).

Research shows that even though college students note access to a recreation center is of great value to them when they choose an institution to attend (Kampf et al., 2018), historically, few, i.e., 3.43%, consistently use campus recreational facilities (Zakrajsek, 1994). Depending on the accuracy of these data today, many colleges and universities in the United States are failing most students concerning quality physical education by employing voluntary recreational activities (Cardinal, 2017). Research indicates that only 39 percent of students state that they participate in campus recreational activities thrice weekly, at a minimum, and 21 percent indicate that they never participate in recreational programming (Forrester, 2014). These results are supported by recent research from the American College Health Association (2021), where some 42 percent of the student population has been shown to meet the recommended level of physical activity for active adults. While research has limitations, particularly when involving self-reported data, the historically trivial percentage of college students actively engaged in voluntary recreational programming is concerning.

More troubling, however, is that those not active in regular, voluntary recreational activity generally are individuals who have been "historically disenfranchised in society" (Cardinal, 2020, p. 288; Hoang et al., 2016; as cited in Murray, 2021, p. 86); as such, voluntary collegiate recreational programming potentially contributes to the reported health disparities among differing groups (McArthur & Raedeke, 2009; Rababah et al., 2019). These issues are more bothersome, too, because research shows that college students often become more sedentary (Nelson et al., 2007; Small et al., 2013), gain excessive body fat (Pope et al., 2017; Yan & Harrington, 2020), and incur

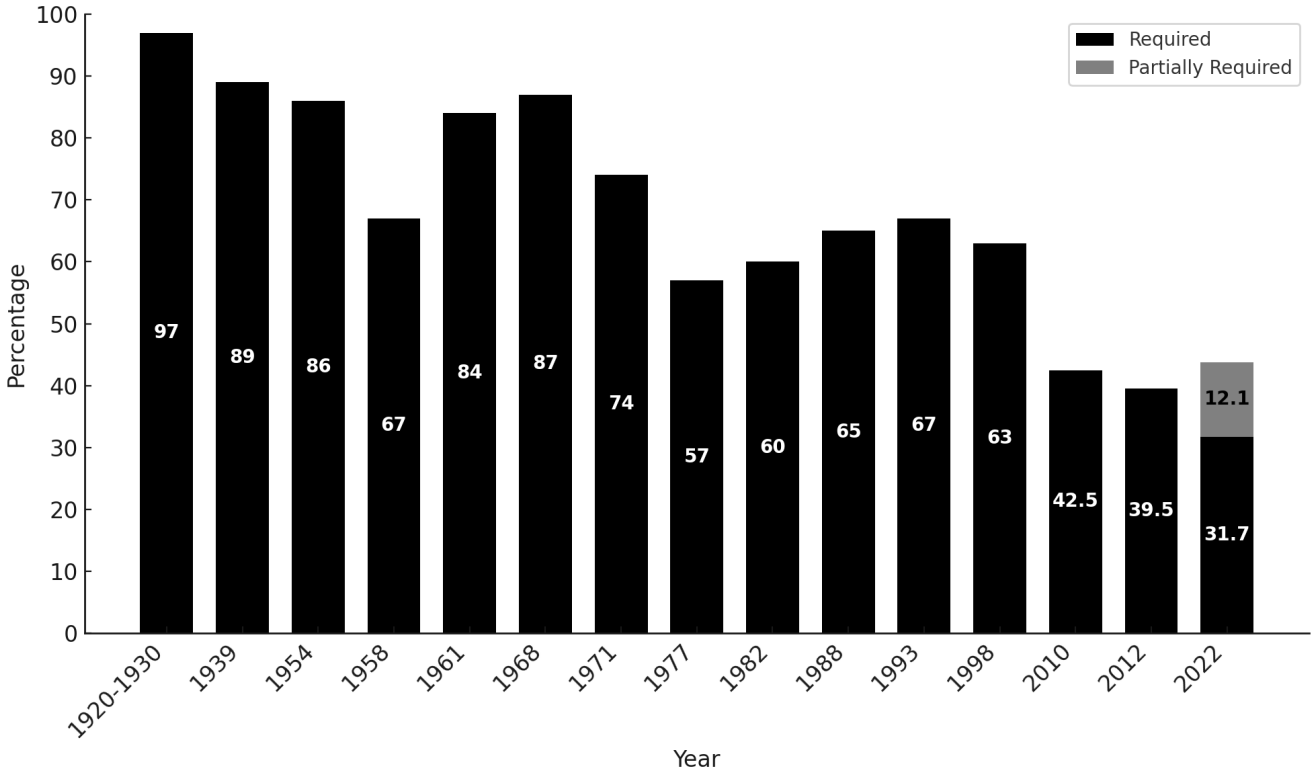

Figure 1: The percentage of American institutions of higher education requiring physical education from 1920 to 2022. Note: Adapted from Cardinal et al. (2012) and Szarabajko and Cardinal (2023).

more distress (Petruzzello & Box, 2020), which contributes to the development of damaging health behaviors, often eventually becoming lifelong habits (Sparling, 2003). These results are the antithesis of what should be expected as the desired outcomes of a well-rounded education, or, as the Latin phrase *cura personalis* – "'care for the whole person' in all aspects of a person's health, including the physical, mental, and spiritual" (Szarabajko & Cardinal, 2023, p. 6) – suggests. The modern-day principle of wellness (Dunn, 1959) epitomizes *cura personalis*. It is listed as a key component of the mission of one of the most influential professional organizations for collegiate recreation: NIRSA: Leaders in Collegiate Recreation (formerly known as the National Intramural-Recreational Sports Association), where it states, "NIRSA believes that collegiate recreation is a significant and powerful key to inspiring wellness in local, regional, and global communities" (NIRSA, n.d.). Paradoxically, the previously mentioned data concerning low usage rates among voluntary collegiate recreational programming indicate an incongruity with the mission and the purported outcomes of collegiate recreation, weakening its effectiveness at best and serving as a severe critique at worst.

As we remarked in Murray (2021), physical education's value is indisputable, especially for student wellness, as extensive research shows that physical activity is necessary for good health (Centers for Disease Control and Prevention [CDC], n.d.). Physical activity builds cardiorespiratory endurance (Warburton & Bredin, 7), helps with weight management (World Health Organization [WHO], 2010), improves the awareness and actions of collegiate alumni (Pearman III et al., 1997), increases social connectivity (VanKim & Nelson, 2013), cultivates favorable health behaviors (Quartiroli & Maeda, 2016), improves scholastic performance and retention rates (Chang et al., 2014; Sanderson et al., 2018), positively affects mental well-being (Currier et al., 2020; Petruzzello & Box, 2020), fosters public health (Cardinal, 2016), and improves students' moods (Annesi et al., 2017). In addition to these benefits, Barney et al. (2014, p. 150) explicitly report, "when college students were physically active [in collegiate physical activity courses], tension was relieved, anger lowered, fatigue lessened, depression reduced, per-

sonal satisfaction improved, and vigour increased." Research also reveals undergraduate students request colleges and universities offer physical activity courses to support their abilities to handle academic, mental, physical, and social demands (Lackman et al., 2015), and participation in these courses "significantly increases the physical activity levels of students and also significantly increases the physical activity enjoyment of students with the most sedentary lifestyles" (Hill et al., 2018, p. 118), counterbalancing the major limitations of volitional collegiate recreational programming. Lastly, scholastic achievement has been shown to relate positively with physical fitness (Donnelly et al., 2016), leaving no doubt about the worth of physical education in higher education.

Regrettably, these truths frequently are disregarded by administrators and faculty in higher education. Physical education faculty members regularly must defend their continuation of physical education requirements despite the prevailing evidence that required physical education is efficacious at enhancing student wellness (Cardinal, 2017, 2020; Szarabajko & Cardinal, 2023). The entire situation is best summarized by Cardinal (2017, p. 535), "Having to continually justify and prove the worth of one's discipline and its curricular offerings is tiresome, and at times shockingly disappointing, though, especially with the preponderance of the evidence—evidence beyond a reasonable doubt, really—that has been accumulated over the past sesquicentennial." It seems that the fight is being lost by many physical educators today. Required physical education has been declining in American tertiary educational institutions, with numerous administrators and faculty replacing it with voluntary programming in physical education, dance, campus recreation, or some combination of them (Heumann & Murray, 2019; Murray et al., 2021; Szarabajko & Cardinal, 2023).

Students' health-related behaviors have been negatively affected by the elimination of required physical education and wellness programming on college and university campuses (Ansuini, 2001; Szarabajko & Cardinal, 2023). A "marked decrease in campus well-being" related to nutritional and exercise-related matters was found within three years of terminating a wellness/physical activity requirement at a state university, and Ansuini (2001, p. 455) asserted, "[t]he magnitude of these results should reaffirm the need for mandatory wellness/activity programming." In addition, the COVID-19 pandemic altered many college students' behaviors by making them more sedentary and adding more mental anguish to their lives (Dziewoir et al., 2021; Wilson et al., 2021). As such, research investigating physical education is currently both germane and worthwhile, especially considering the low percentage of students habitually participating in voluntary collegiate recreational programming with any regularity coupled with the continuing negative effects of the recent pandemic.

Physical education is undeniably valuable, as much research supports its worth (Szarabajko & Cardinal, 2023). Further, historical utilization rates alone show that required programming is more effective than voluntary collegiate recreational programming. However, new data from sampling have been reported, indicating that required physical education is declining nationwide (Szarabajko & Cardinal, 2023). As we recommended in 2019 (Heumann & Murray, 2019), detailed, state-by-state analyses are needed to give an up-to-date and complete picture of the status of physical education in American tertiary educational institutions. Using the previous studies (Heumann & Murray, 2019; Ladd, 2023; Murray et al., 2021; Szarabajko et al., 2021) conducted on the state level for Colorado, Texas, Utah, and Oregon, respectively, as models, this study's purpose was to assess the status of physical education in Arizona's tertiary educational institutions.

2 Methods

2.1 Participants

The methodology for determining the participants was the same as what was used for our previous studies on Colorado and Utah (Heumann & Murray, 2019; Murray et al., 2021). Using the website of the National Center for Education Statistics (2023), a listing of all the institutions (n = 64) of higher education in Arizona was obtained. Specialized schools, such as computer science, online, post-graduate, and for-profit institutions – a total of 33 – were deleted from the listing because they normally do not offer physical education nor general education courses; institutions with multiple campuses were combined and counted as one institution, where applicable, so that left 29 (6 private; 23 public), traditional, not-for-profit colleges or universities on the list. Of those, 10 were four-year institutions, and 19 were two-year institutions. The definition of a traditional institution was "a brick-

and-mortar school, offering a comprehensive curriculum, with a general education component, often based in the liberal arts" (Murray et al., 2021, p. 86).

2.2 Procedure

Except using the latest-available catalogs (2021-2022) for each institution, the procedures were identical to Heumann and Murray (2019), Murray et al. (2021), and Szarabajko et al. (2021), where each institution's website was searched for the undergraduate requirements for graduation and physical education courses. As with the previous studies mentioned above, "the operational definition of Tomaino et al. (2001, p. 10) was used for physical education: 'Physical education was considered any activity or academic course pertaining to health, wellness, sports, or physical activity. For the course to be considered 'required,' it had to be listed by the institution as a requirement for graduation. If not, it was considered an elective.' Additional information, such as the types of courses offered, was collected, and this differed from the two previous studies on Colorado and Oregon that were used as models. To better compare the results of the Oregonian and Utahn studies, the availability of a campus recreation or fitness center and accompanying programming was also searched for" (Murray et al., 2021, p. 86). The information gathered and used was publicly available and did not involve human contact; thus, an Institutional Review Board (IRB) review was unnecessary.

2.3 Analysis

The data analysis was identical to Murray et al. (2021, p. 86) and "was conducted by determining the current number of four-year and two-year colleges and universities. After reviewing the catalogs, the total number of programs that required these courses also was calculated. The percentage was then calculated by reporting the total number required out of the total number of institutions at that level."

3 Results

Table 1 (see Appendix A) lists the requirements for physical education in Arizona's colleges and universities. Twenty-four (82.75%, i.e., 24 of 29; 70%, i.e., 7 of 10 four-year institutions, and 89.47%, i.e., 17 of 19 two-year institutions) colleges and universities had physical education offering a broad range of activities to their students (see Table 2 in Appendix B). None (0%, i.e., 0 of 29) of the institutions required physical education, but 51.72 percent (i.e., 15 of 29; 50%, i.e., 5 of 10 four-year institutions, and 52.62%, i.e., 10 of 19 two-year institutions) partially required physical education as a graduation requirement. The definition of partially required was the same one we used previously in our study on Utah's tertiary educational institutions and was defined as a situation where: "some degrees required some sort of physical education course, or physical education courses were listed as an option to fulfill a specific requirement" (Murray et al., 2021, p. 86). Twenty-six institutions (89.65%, i.e., 26 of 29; 100%, i.e., 10 of 10 four-year institutions, and 84.21%, i.e., 16 of 19 two-year institutions) had a campus recreation or fitness center or associated recreational programming.

4 Discussion

Arizonan higher education institutions do not mandate physical education as a graduation requirement for all undergraduate students. Not a single institution of higher education in Arizona requires physical education for all undergraduates, earning Arizona the lowest rate of required physical education studied to date on the state level (and the lowest rate possible). The neighboring states of Colorado and Utah have rates of 15.6 percent (5 of 32; Heumann & Murray, 2019) and 10 percent (1 of 10; Murray et al., 2021), respectively, and fellow western state, Oregon, has a rate of 14.29 percent (5 of 35; Szarabajko et al., 2021). The lone other state's rate currently known is Texas, and it is for community colleges only and is 6 percent (3 of 50; Ladd, 2023). The current national rate of higher education institutions requiring physical education is purported to be 31.7 percent (Szarabajko & Cardinal, 2023). The Arizonan rate for required physical education is incongruent with the purported national rate, which makes Arizona an extreme outlier. However, the trend for Colorado, Oregon, Texas (for two-year institutions), Utah, and now, Arizona is that these states all are below the currently reported national rate. Is this just a regional trend? Are states west of the Mississippi River – the traditional landmark separating the East from the West in the United States – less

likely to require physical education? More states must be studied for required physical education at the tertiary educational level to get a clearer position. However, for now, it seems that the western states' rates are well below the levels of their national peers.

Fortunately, not all is lost with respect to required physical education in Arizona's institutions of higher education. Fifteen (51.72%, i.e., 15 of 29; 50%, i.e., 5 of 10 four-year institutions, and 52.63%, i.e., 10 of 19 two-year institutions) of the Arizonan tertiary educational institutions partially require physical education for students in certain disciplines, indicating that physical education is valued and is not as low as initially indicated. This partially required percentage is far greater than the current purported partially required national rate of 12.1 percent. The sum of the required (i.e., 31.7) and partially required (i.e., 12.1) national rates is 43.8 percent. As such, Arizona's summed rate of 51.72 percent is superior to the national summed rate. An even more promising finding is that 82.75 percent (24 out of 29) of the Arizonan colleges and universities offer physical education of some sort (see Tables 1 and 2). This finding is similar to Colorado (27 of 32, or 84.4%; Heumann & Murray, 2019) and Oregon (30 of 35, or 85.7%; Szarabajko et al., 2021), but well below the percentages in Utah (10 of 10, or 100%; Murray et al., 2021) and Texas (49 of 50, or 98% [two-year institutions only]; Ladd, 2023). So, physical education is in over four-fifths of the tertiary educational institutions of Arizona, which is a promising statistic, but the dearth of required physical education is troublesome. This raises the question: Why is required physical education so low in Arizona's tertiary educational institutions? How does the populace of Arizona rate concerning physical activity to the residents of its western neighbors of Colorado, Utah, and Oregon?

According to the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System, Colorado, Utah, and Oregon rank first, second, and seventh, respectively, for physical activity, and Arizona ranks 19th (CDC, n.d.). With Colorado, Oregon, and Utah ranking so highly in physical activity, it may explain why physical education is abundant, but not necessarily required, in their respective tertiary educational institutions. Arizona's rates are bucking this trend somewhat in that it is ranked lower for physical activity at 19 out of 53 entities (i.e., 50 states, the District of Columbia, Guam, and Puerto Rico), has no fully required physical education standard at any institution of higher education, but does have a near 52-percent partially mandated physical education requirement across all colleges and universities. This trend can be better established as more research is gathered on a state-by-state basis concerning physical education programming in higher education. We are eager to see the relationship between each state's physical activity rating and its tertiary educational physical education programming and believe this to be a fertile area of investigation. The data on Texas's colleges and universities are incomplete because only the two-year institutions' information is available. Texas ranks 40th on the CDC's list for physical activity. Yet, it has a higher percentage of required physical education and has a near-perfect percentage rate (i.e., 98%) for physical education programming availability compared to Arizona's tertiary educational institutions. More data regarding Texas's tertiary educational institutions are needed to make sounder comparisons.

For campus recreational programming, 89.65 percent (i.e., 26 of 29) of Arizona's colleges and universities either have a recreation center or provide some recreational activities or programming. Data on recreational programming were not collected in the studies on Colorado's or Texas's tertiary educational institutions, but 100 percent of Utah's colleges and universities (i.e., 9 of 9, or 100%, for the four-year institutions, and 1 of 1, or 100%, for the two-year colleges), and 65.71 percent of the Oregonian institutions (i.e., 15 of 18, or 83.33%, for the four-year institutions, and 8 of 17, or 47.05%, for the two-year institutions) have recreational programming. By looking at these data, it seems the faculty and administrators in Arizona are replacing required physical education with voluntary recreational programming to meet their students' health and wellness needs. More research is needed in this area, and specific questioning of key administrators and faculty as to why recreational programming and not required physical education is implemented on their campuses is needed. We suppose that because recreational programming is frequently supported by auxiliary student fees, often via a student referendum and not by tuition (Taylor et al., 2003) and that student-affairs administrators often are initiating "a new model" where student well-being is integrated into campus life (NASPA, 2017), administrators are more than happy to go along with this model, especially because of the fiscal benefits. With students willing to essentially tax themselves with a recurring fee for recreational programming, administrators can then reduce or eliminate required physical educa-

tion and reallocate funding to enhance other academic disciplines. The administrators look at it as a win-win scenario: The physical activity needs of the students are addressed, however modestly and in all likelihood ineffectively, with voluntary recreational programming (from a volitional fee, no less), and instructional resources then can be redirected. However, as mentioned previously, the research regarding the effectiveness of voluntary recreational programming has shown it to have modest efficacy, often only for a minority of students, and generally serving mostly the already fit and highly motivated students (Szarabajko & Cardinal, 2023).

Our philosophical view is that physical education should be provided and required of every undergraduate student. In addition, voluntary recreational programming should also be available so that the students can work on the skills they are learning in their physical education courses and make them lifelong habits. We believe educational and recreational programming should work symbiotically and neither be an "either-or" situation nor a parasitic relationship; one should not take away from the other. Instead, the two should work in unison to develop the whole individual, enhance individual student wellness, and help tertiary educational institutions return to the *cura personalis* mission of education.

Limitations occur with all research, and this study had the same limitations as the previous studies investigating tertiary physical education in Colorado and Utah, respectively. We followed the same data-collection techniques we used in Heumann and Murray (2019), and Murray et al. (2021, p. 90), where "all data were taken from the most up-to-date information available from each institution's website, but the precise offerings for each institution are unknown. Further, the filtering of the institutions based on the traditional brick-and-mortar criterion was a limitation and affected the sample size."

4.1 Conclusion

American colleges and universities have supported physical education since the mid-1800s. These programs were initiated to prevent illness via physical activity and to promote hygiene. Prevention was the centering theme, so mandating physical education for all students was the norm. In our view, this approach, once again, needs to be effected in today's academy, as the rates for required physical education have been trending downward for several decades (Szarabajko & Cardinal, 2023). In 2019, we called for more state-level research on the status of physical education in higher education (Heumann & Murray, 2019). Several authors (Szarabajko et al., 2021; Murray et al., 2021; Ladd, 2023) answered that call by adding Oregonian, Utahan, and Texan information, respectively. This study provides current data on Arizona's colleges and universities. It adds information on the status of physical education within the institutions of the constituents of the Western Society for Kinesiology and Wellness.

Conflict of Interest

The authors have no conflicts of interest to declare.

ORCiD

Steven Ross Murray
https://orcid.org/0000-0001-5779-1497

Kristin J. Heumann
https://orcid.org/0009-0007-1270-7731

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Corresponding Author

Steven Ross Murray, D.A., M.S.
Hearst Memorial Gymnasium
University of California, Berkeley
Email: smurray@berkeley.edu

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Appendix A

Table 1. *PE and HW Requirements in Various Institutions*

Institution	Type	PE Activity	Required HW	HW Courses	Rec. Center
Arizona Christian University	4-year, Private	None	Partial; only required in coaching emphasis for secondary education. (3 credits)	Introduction to health and fitness, teaching lifetime health and fitness	Yes
Arizona State University (multiple campuses: Cochise, Lake Havasu, Pima, Phoenix Downtown, West)	4-year, Public	None	Partial; application-based movement courses are required in sports science and performance programming major	HPE 179 Lifelong Wellness (Cochise); An Exploration of Well-being, Introduction to health and wellness, optimizing health and performance (Lake Havasu); Self-care for personal wellness, FSS 154 - Healthy Living and Mind-Body Training (Pima); Exercise and wellness seminar, health promotion (Phoenix Downtown); foundations of health and fitness, health and wellness, health promotion, sustainable wellness (Polytechnic); foundations of health and fitness (West); Required for College of Health Solutions majors-Optimizing your health and human performance OR an exploration of well-being	Yes
Arizona Western College	4-year, Public	None	Partial; application-based movement courses are required in sports science and performance programming major	Health and Wellness; Healthy Living	Yes
Central Arizona College	2-year, Public	None	No	HES 100 can be taken as social and behavioral science course in Arizona general education curriculum	Yes
Chandler-Gilbert Community College*	2-year, Public	Only for PT certificate, Exercise Science AAS	Partial; HES 100 can be taken as social and behavioral science course in Arizona general education curriculum; required for Exercise Science AAS	HES100 Healthful Living	Yes
Cochise County Community College District	2-year, Public	None	None	Lifelong Wellness	Yes
Coconino Community College	2-year, Public	None	None	None	No
Dine College	2-year, Public	None	None	None	Yes
Eastern Arizona College	2-year, Public	Partial; offered for general education credit for Associate of Applied Science (2 credit max, dance included)	Partial; offered as an option under Social Sciences which is a requirement for AAS degrees (6-9 credits)	HHP 100 Personal Health (N.B., meets Diversity and Inclusion requirements)	Yes
Embry-Riddle Aeronautical University—Prescott	4-year, Private not-for-profit	None	None	None	Yes
Estrella Mountain Community College	2-year, Public	None	None	Fitness for Life, Weight Training for Wellness	Yes

Continued on next page

Table 1. *(continued)*

Institution	Type	PE Activity	Required HW	HW Courses	Rec. Center
GateWay Community College (multiple campuses)*	2-year, Public	Partial; option to take courses in recreation for social science credit. Also exercise science can count towards literacy and critical inquiry requirement	Partial; Principles of Physical Fitness and Wellness can be taken as Social-Behavioral Science course in Gen Ed requirements	HES100 Healthful Living, lifetime fitness, leisure and the quality of life, Principles of physical fitness and wellness, meditation and wellness Principles of Physical Fitness and Wellness	No
Glendale Community College*	2-year, Public	Partial; required in AAS in Exercise Science: Health, Fitness, and Sports Performance; Personal Training Certificate requires strength training; Personal Training: Advanced requires strength training and another activity course	AGEC Pathway SB	Healthful Living	Yes
Mesa Community College*	2-year, Public	None	None	Healthful Living	Yes
Midwestern University—Glendale	4-year, Private not-for-profit	None	None	None	Yes
Mohave Community College	2-year, Public	None	None	None	Yes
Northern Arizona University	4-year, Public	Partial; FIT 100 Physical Education P/F courses only count as general elective credits- all are listed as FIT 100 topics; required in health sciences - fitness wellness BS and health sciences - physical education	None	Facilitating Active Living, Mind-Body Health	Yes
Northland Pioneer College	2-year, Public	None	None	None	No
Ottawa University	4-year, Private not-for-profit	None	None	Personal and Community Health	Yes
Paradise Valley Community College*	2-year, Public	Partial; strength training required for AA and personal training certificate	Partial; required for AA in Exercise Science	Healthful Living	Yes
Phoenix College*	2-year, Public	None	None	Healthful Living	Yes
Pima Community College	2-year, Public	None	Partial; coursework required for fitness and wellness certificate program or fitness professional certificate.	Health, Wellness, and Physical Activity; Healthy Living and Mind-Body Training; Self Care for Personal Wellness	Yes
Prescott College	4-year, Private not-for-profit	None	Partial; Holistic Health and Wellness is under Human Dynamics and Interpersonal Literacies Distribution Area; required for holistic health and wellness emphasis	Yoga, Philosophy and Practice, Life Centering: Mindfulness and Mediation Courses, Holistic Health and Wellness	Yes; outdoor recreation
Rio Salado College*	2-year, Public; mostly online, but does have in-person courses in Tempe	None	Partial; can be taken for AGEC SB requirement	Healthful Living	No; but online recreational courses

Continued on next page

Table 1. *(continued)*

Institution	Type	PE Activity	Required HW	HW Courses	Rec. Center
Scottsdale Community College*	2-year, Public	Partial; strength training and PED 101 course of their choosing for exercise science; strength training required for personal training certificate as well as personal training: advanced certificate (which also requires a PED course)	Partial; HES 100 (Healthful living) is required for exercise science	Healthful Living, Wellness for law enforcement officers; health and wellness coaching in professional resiliency; fitness and wellness for firefighter candidates; personal wellness and safety; principles of physical fitness and wellness	Yes
South Mountain Community College*	2-year, Public	Partial; required for exercise science and personal trainer: advance	Partial; Healthful Living required for Exercise Science	Healthful living; Cultural Aspects of Health and Illness	Yes
Tohono O'odham Community College	2-year, Public	None	None	Personal Health and Wellness; Introduction to Community and Public Health; Health, Safety and Nutrition	No
University of Arizona	4-year, Public	None	None	Public Health courses	Yes
Yavapai College	2-year, Public	None	Partial; Personal Health and Wellness can count for SBS	Personal Health and Wellness; Stress, Lifestyle and Health; Foundations of Mind-Body Exercise	Yes

Note: *Maricopa Community Colleges have the same general education curriculum options, but each campus offers different courses based on the expertise of its faculty.

Appendix B

Table 2. *Physical activity courses offered at Arizona's colleges and universities*

Institution	List of Activity Courses Offered
Arizona Christian University	Weight training for sport (listed for each intercollegiate sport) intercollegiate sports: soccer, basketball, bowling, volleyball, cross country, golf, baseball, softball, tennis, track, football, swimming, acrobatics and tumbling, beach volleyball, swimming, wrestling, cheer, dance.
Arizona State University	Body conditioning, weight training, athletic conditioning, personal fitness, individualized fitness, Indoor court sports, open water scuba diver, varsity rodeo, golf, baseball, basketball, soccer; conditioning, individual fitness: running, walking, swimming, strength and conditioning, weight training, cardio cross training, Zumba, circuit training, indoor cycling, Pilates, strength and flexibility, yoga, kickboxing, tennis, golf, martial arts, self-defense, tai chi chaun, football, baseball, basketball, soccer, softball, volleyball; yoga, circuit training, resistance training, cardio and flexibility; resistance training, cardio and flexibility, soccer, yoga, circuit training, basketball, flag football, core fitness; yoga, resistance training, cardio, badminton (West).
Arizona Western College	Personal Fitness Training, Sambaerobics, Aerobics: Step, Strength and Conditioning Training, Aerobics: Water, Aerobics: Pilates, Speed and Agility Training, Smart Cycling, Golf 1, Golf 2, T'ai Chi, Yoga, Judo 1, Judo 2, Karate 1, Karate 2, HAPKIDO, Self-Defense, Desert Hiking, Swimming, Swimming: Beginning, Walking and Jogging, Scuba, Baseball, Softball, Basketball, Football, Soccer, Volleyball, Beginning Resistance Training, Intermediate Resistance Training, Advanced Resistance Training, Varsity Sports.
Central Arizona College	Intermediate weight training, physical fitness: core emphasis, aerobics and weight training, total body conditioning, theory and practice of basketball I (and II), theory and practice of baseball I (and II), theory and practice of track and field I (and II), theory and practice of softball I (and II), theory and practice of cross country I (and II), physical education varsity sports: rodeo sports events I, varsity basketball I, varsity baseball I, varsity track and field I, varsity softball I, varsity cross-country I, varsity basketball II, varsity baseball II, varsity track & field II, varsity softball II, varsity cross country II.
Chandler-Gilbert Community College	Group fitness/aerobics, kickboxing, Latin dance, hatha yoga, yoga, power yoga, restorative yoga, gentle yoga, Pilates, Tai Chi, physical conditioning, bootcamp, stretch and relaxation, body sculpting, Zumba fitness, cycling indoor, cardiorespiratory fitness, strength training, suspension training, physical activities basic, physical activities intermediate, lifetime fitness, weight training for wellness, strength and conditioning for sport performance: basic (intermediate and advanced), Olympic style weight lifting, physical activities: advanced, strength and conditioning for sport performance: elite.
Cochise County Community College District	Body conditioning, body dynamics, weight training (I-II), athletic conditioning (I-IV), personal fitness (I-II), individualized fitness (I-II), indoor court sports and physical fitness, open water scuba diver, varsity rodeo (I-IV), beginning golf, baseball (I-IV), men's and women's basketball (I-IV), soccer (I-IV).
Coconino Community College	Pilates (I-II), cardio-fitness, yoga (I-II).
Dine College	Not listed in catalog under course descriptions.
Eastern Arizona College	Beginning body conditioning I, beginning bowling I, beginning golf I, beginning hiking I, beginning jogging I, beginning jogging-hiking I, beginning cheerleading, beginning racquetball I, beginning swimming I, beginning tennis I, beginning volleyball I, beginning weights I, beginning baseball I, beginning varsity baseball I, beginning basketball I, beginning varsity softball I, beginning varsity volleyball I, beginning varsity basketball I, mountain bike riding I, beginning aerobics I, beginning t-ai Chi Ch'uan I, beginning varsity golf I, beginning varsity tennis I, beginning physioball I, Pilates for fun and fitness I, beginning mixed martial arts I, beginning hatha yoga I, beginning chi gong I, beginning swim aerobics I, beginning strength and flexibility training I, beginning power walking I, beginning softball I, beginning body conditioning II, beginning bowling II, beginning golf II, beginning hiking II, beginning jogging II, beginning jogging-hiking II, beginning cheerleading II, beginning racquetball II, beginning swimming II, beginning tennis II, beginning volleyball II, beginning weights II, beginning baseball II, beginning varsity baseball II, beginning basketball II, beginning varsity softball II, beginning varsity volleyball II, beginning varsity basketball II, beginning aerobics II, beginning t'ai chi ch'uan II, beginning varsity golf II, beginning varsity tennis II, beginning physioball II, Pilates for fun and fitness II, beginning hatha yoga II, beginning chi gong II, beginning swim aerobics II, beginning strength and flexibility training II, beginning power walking II, beginning softball II, physical conditioning and assessment I, physical conditioning and assessment II, advanced body conditioning I, advanced bowling I, advanced golf I, advanced jogging I, advanced jogging-hiking I, advanced cheerleading I, advanced racquetball I, advanced swimming I, advanced tennis I, advanced volleyball I, advanced weight I, advanced baseball I, advanced varsity baseball I, advanced basketball I, advanced varsity softball I, advanced varsity volleyball I, advanced varsity basketball I, advanced aerobics I, advanced varsity golf I, advanced varsity tennis I, advanced hatha yoga I, advanced chi gong I, advanced swim aerobics I, advanced strength and flexibility training I, advanced power walking I, advanced softball I, advanced body conditioning II, advanced bowling II, advanced golf II, advanced jogging II, advanced jogging-hiking II, advanced cheerleading II, advanced racquetball II, advanced swimming II, advanced tennis II, advanced volleyball II, advanced weights II, advanced baseball II, advanced varsity baseball II, advanced basketball II, advanced varsity softball II, advanced varsity volleyball II, advanced varsity basketball II, advanced aerobics II, advanced varsity golf II, advanced varsity tennis II, advanced hatha yoga II, advanced chi gong II, advanced swim aerobics II, advanced strength and flexibility training II, advanced power walking II, advanced softball II, physical conditioning and assessment III, physical conditioning and assessment IV.
Embry-Riddle Aeronautical University—Prescott	None.
Estrella Mountain Community College	None.
GateWay Community College	Pilates, soccer, yoga, baseball.

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Table 2. *(continued)*

Institution	List of Activity Courses Offered
Glendale Community College	Physical activities: basic, aerobic dance, aikido, adapted PE, aquatic fitness, baseball, basketball, boot camp, ballroom dancing, belly dance, ballet, backpacking, body sculpting, bowling, country dance, camping, cycling - indoor, self-defense, dance sampler, football, fencing, fitness for life, fitness walking, group fitness/aerobics, golf, hip hop, hiking, jogging/running, Japanese swordsmanship, judo, jazz, karate, kickboxing, kung fu, Latin dancing, modern dance, pickleball, physical conditioning, Pilates, Qi Gong, rock climbing, racquetball, resistance training for improved sports performance, salsa, softball, social dance, downhill snow skiing, swimming, soccer, stretch and relaxation, strength training, scuba diving, swing dancing, tango, tai chi, tap dance, tennis, track and field, taekwondo, triathlon training, suspension training, volleyball, west coast swing, weight training for women, gentle yoga, hatha yoga, Iyengar yoga, kundalini yoga, yoga, power yoga, restorative yoga, Zumba fitness, physical activities: intermediate, baseball- intermediate, basketball - intermediate, boot camp - intermediate, ballroom dancing - intermediate, belly dance - intermediate, ballet - intermediate, cheerleaders - intermediate, self-defense - intermediate, football - intermediate, fencing - intermediate, fitness for life-intermediate, golf-intermediate, hip hop-intermediate, hiking - intermediate, jogging/running - intermediate, Japanese swordsmanship - intermediate, jazz-intermediate, karate-intermediate, kickboxing-intermediate, Latin dancing-intermediate, physical conditioning-intermediate, Pilates-intermediate, rock climbing-intermediate, resistance training for improved sports performance-intermediate, salsa-intermediate, softball-intermediate, soccer-intermediate, strength training-intermediate, swing dancing-intermediate, tai chi-intermediate, tap dance-intermediate, tennis-intermediate, track and field-intermediate, taekwondo-intermediate, triathlon training-intermediate, volleyball-intermediate, weight training for women-intermediate, yoga-intermediate, power yoga-intermediate, physical activities: basic, aquatic fitness, boot camp, ballroom dancing, belly dance, body sculpting, cycling-indoor, self-defense, group fitness/aerobics, hiking, kickboxing, kung fu, Latin dancing, physical conditioning, Pilates, Qi Gong, salsa, swimming, stretch and relaxation, Tai Chi, suspension training, volleyball, weight training for women, gentle yoga, hatha yoga, Iyengar yoga, kundalini yoga, yoga, power yoga, restorative yoga, Zumba fitness, Army master fitness, fitness, lifetime fitness, cardiovascular fitness, weight training for wellness, Exercise is Medicine, Strength and Conditioning for Sport Performance: Basic, Intermediate, Olympic Style Weight lifting, baseball -advanced, basketball -advanced, ballroom dancing -advanced, cheerleaders -advanced,, football -advanced, golf -advanced, physical conditioning -advanced, salsa -advanced, softball -advanced, soccer-advanced, strength training -advanced, scuba diving -advanced, tai chi -advanced, track and field -advanced, volleyball -advanced, weight training -advanced, yoga -advanced, physical activities: elite, baseball-elite, basketball-elite, football-elite, softball-elite, soccer-elite, track and field-elite, volleyball-elite, strength and conditioning for sport performance: advanced, strength and conditioning for sport performance: elite.
Mesa Community College	Physical activities: basic, aerobic dance, Aikido, baseball, basketball, boot camp, belly dance, backpacking, indoor cycling, self-defense, fitness for life, fitness walking, group fitness/aerobics, hip hop, hiking, jogging/running, kickboxing, Latin dancing, Pilates, rock climbing, salsa, strength training, scuba diving, tai-chi, track and field, Taekwondo, weight training, gentle yoga, hatha yoga, yoga, baseball-intermediate, basketball-intermediate, belly dance-intermediate, golf-intermediate, hip hop-intermediate, Latin dancing-intermediate, rock climbing-intermediate, salsa -intermediate, track and field-intermediate, taekwondo-intermediate, weight training for women-intermediate, yoga-intermediate, lifetime fitness, baseball-advanced, basketball-advanced, salsa-advanced, track and field-advanced, baseball-elite, basketball-elite, track and field-elite, physical education of the atypical.
Midwestern University—Glendale	None.
Mohave Community College	None.
Northern Arizona University	FIT 100-Physical education (all are topics).
Northland Pioneer College	Yoga.
Ottawa University—Surprise	Weight training, lifetime fitness, non-traditional team sports, yoga, walking for fitness, intro to dance, special topics: physical activity.
Paradise Valley Community College	Backpacking, body sculpting, self-defense, fitness for life, group fitness/aerobics, golf, hip hop, kickboxing, kung fu, physical conditioning, Pilates, Qi gong, soccer, strength training, tai chi, tennis, gentle yoga, yoga, Zumba fitness, physical conditioning-intermediate, soccer-intermediate, tai chi-intermediate, tennis-intermediate, Pilates, fitness, lifetime fitness, cardiovascular fitness, weight training for wellness, physical conditioning-advanced, soccer-advanced, physical activities: elite, soccer-elite.
Phoenix College	Physical activities basic, lifetime fitness, cardiovascular fitness, weight training for wellness.
Pima Community College	Group Fitness Access I-II, Conditioning: Speed, Agility, and Quickness; Strength and Conditioning for Sport I-II; Individual Fitness: Running; Individual Fitness: Swimming; Weight Training and Cardiovascular Fitness Level I-III; Ballroom/Latin Dance; Belly Dance; Salsa/Latin Dance; Cardio Cross-Training; Zumba; Boot Camp Style Circuit Training; Indoor Cycling; Kickboxing; Pilates; Strength and Flexibility; Yoga; Golf; Tennis; Martial Arts; Basic Self-Defense; Baseball I-II; Basketball I-II; Soccer I-II; Softball I-II.
Prescott College	Canoeing: Introduction to Expeditionary; Introduction to Rock Climbing; Intermediate Rock Climbing; Rock Climbing and Yoga; Rock climbing and geology; Sea Kayaking & Marine Natural History; Search & Rescue; Backcountry skiing and avalanche training; Yoga: Philosophy & Practice.
Rio Salado College	Gentle Yoga; Hatha Yoga; Power Yoga; Lifetime Fitness.

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Table 2. *(continued)*

Institution	List of Activity Courses Offered
Scottsdale Community College	Physical activities: basic, Aerobic dance, aikido, adapted PE, aquatic fitness, baseball, basketball, bootcamp, ballroom dancing; belly dance; ballet; backpacking, body sculpting, bowling, country dance; camping; cycling-indoor, self-defense, dance sampler, football, fencing, fitness for life, fitness walking, group fitness/aerobics, golf, hip hop, hiking, jogging/running, judo, jazz, karate, Japanese Swordsmanship, kickboxing, kung fu, Latin dancing, life guard training, modern dance, pickleball, physical conditioning, Pilates, qi gong, rock climbing, racquetball, resistance training for improved sports performance, salsa, softball, social dance, downhill snow skiing, swimming, soccer, stretch and relaxation, strength training, SCUBA diving, swing dancing, tango, tai chi, tap dance, tennis, track and field, Taekwondo, triathlon training, suspension training, volleyball, west coast swing, weight training for women, gentle yoga, hatha yoga, Iyengar yoga, kundalini yoga, yoga, power yoga, restorative yoga, Zumba, physical activities: intermediate, baseball-intermediate, basketball-intermediate, boot camp-intermediate, ballroom dancing-intermediate, belly dance-intermediate, ballet-intermediate, cheerleaders-intermediate, self-defense-intermediate, football-intermediate, fencing-intermediate, fitness for life-intermediate, golf-intermediate, hip hop-intermediate, hiking-intermediate, jogging/running-intermediate, Japanese Swordsmanship-intermediate, Jazz-intermediate, Karate-intermediate, Kickboxing-intermediate, Latin dancing-intermediate, physical conditioning-intermediate, Pilates-intermediate, rock climbing-intermediate, Resistance training for improved sports performance-intermediate, salsa-intermediate, softball-intermediate, soccer-intermediate, strength training-intermediate, swing dancing-intermediate, tai chi-intermediate, tap dance-intermediate, tennis-intermediate, track and field-intermediate, taekwondo-intermediate, triathlon training-intermediate, volleyball-intermediate, weight training for women-intermediate, yoga-intermediate, power yoga-intermediate, Army Master Fitness; Cardiovascular Fitness; weight training for wellness, exercise is medicine, special emphasis activities: weight training, Olympic style weight lifting; tradition and practice of yoga III, corrective exercise for athletes: basic, corrective exercise for athletes-intermediate, baseball-advanced, basketball-advanced, ballroom dancing-advanced, cheerleaders-advanced, football-advanced, golf-advanced, physical conditioning-advanced, salsa-advanced, softball-advanced, soccer-advanced, strength training-advanced, scuba diving-advanced, tai chi-advanced, track and field-advanced, volleyball-advanced, weight training-advanced, yoga-advanced, physical activities: elite, baseball-elite, basketball-elite, football-elite, softball-elite, soccer-elite, track and field-elite, volleyball-elite, strength and conditioning for sport performance: advanced; strength and conditioning for sport performance: elite.
South Mountain Community College	Fitness for life, golf, resistance training sport performance-intermediate, softball, soccer, strength training, volleyball, weight training, yoga, physical activities: intermediate; baseball: intermediate; basketball-intermediate; golf-intermediate; resistance training for improved sports performance-intermediate; softball-intermediate; soccer-intermediate; strength training-intermediate; volleyball-intermediate; weight training-intermediate; yoga-intermediate; boot camp; lifetime fitness; special emphasis activities: weight training; strength and conditioning for sport performance: basic; strength and conditioning for sport performance: intermediate; baseball-advanced; golf-advanced; softball-advanced; volleyball-advanced; weight training-advanced; softball-elite; volleyball elite.
Tohono O'odham Community College	Beginning physical fitness; intermediate physical fitness; advanced physical fitness.
University of Arizona	None.
Yavapai College	Karate; hatha yoga; intermediate yoga; fitness workshop; water fitness workshop; stretch and flex; total body TABATA; Pilates, mat flex & ball; cardio mix; insanity; total body conditioning; NIA; power Pilates and barre fitness; Zumba; pumping iron; cardio core; aqua fit; water cross training; swimming fitness; warm water exercise; fitness, machine and free weight training; power & Olympic lifting for athletic populations; basketball; tennis; pickleball; competitive swimming; advanced weight training; in recreation management: backcountry navigation and orienteering; backpacking; outdoor survival skills; intermediate backpacking.

WSKW Chronicles

2024 WSKW Conference Abstracts

Journal of Kinesiology and Wellness, 2024

2024-01-01

Keynote Presentation: Integrative Healing

Rachel Hollingsworth, Arizona State University

E.C. Davis Lecture

Bethany Shifflett, Professor Emeritus, San Jose State University

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ABSTRACTS

Instructional Applications of Pecha Kucha Presentations

Jim Ave (Fresno Pacific University)

PechaKucha (pronounced pe-cha-ku-cha) means "chitchat" in Japanese and are fast-paced presentations using images rather than text. The purpose of this presentation is to 1) explain the PechaKucha (PK) application and research that supports its effectiveness, 2) use of PK in higher education, and 3) how to develop a PK presentation and the inherent challenges. PK was developed in Japan by Astrid Klein and Mark Dytham of Klein Dytham architecture to help presenters tell a story rather than describing slides. Typical PKs are limited to 20 slides at a rate of 20 seconds per slide for a total presentation time of 6 minutes and 40 seconds. Research has found this style of presentations are more interesting and engaging as compared to typical presentations. It has been shown to improve student learning and engagement, supports critical thinking skills, and builds confidence. This presentation style provides an option for students to experience learning in a new way. PKs can be used as a substitution for instructor's lectures and can assist students to effectively and concisely communicate concepts and theories. Some of the challenges with this presentation method includes: requiring more practice time, difficulty in finding images that represent the material or topic, and limits content due to time constraints.

Using A Strengths Perspective to Advance Students Education

Jim Ave (Fresno Pacific University)

Traditional educational systems use a deficit remediation model to correct student deficiencies. A strengths perspective offers an alternative model which suggests that educators focus their energy, time, and resources on developing what students do best, while managing their deficiencies. A

strength is defined by Clifton as "… the ability to provide consistent, near-perfect performance in a given activity" and is made up of several components: talent, energy, knowledge, and skill. The purpose of this presentation is to provide 1) an overview of the strengths perspective principle, 2) a summary of higher education strengths perspective research, 3) how to use this perspective for enhancing student performance, and 4) highlights potential applications of this perspective to promote student achievement in all educational settings.

Ethnic Differences in Health-Related Quality of Life, Physical Activity, and Health Locus of Control

Kimberly Feiler (La Sierra University)

Introduction: Although people know the importance of physical activity (PA), not everyone engages in it regularly and in sufficient amounts. The Centers for Disease Control and Prevention (CDC) gathers PA data among different ethnic groups in the United States. Asians have the highest number of adults with at least some leisure-time PA at nearly 80% (79.9%), followed by Caucasians/Whites (C/Ws) at 73%, Alaska Natives/American Indians (AN/AIs) at 70.9%, Blacks/African Americans (B/AAs) at 70%, and Hispanics/Latinos (H/Ls) at 67.9%.

Purpose: This research aimed to better understand the differences in health-related quality of life (HRQoL: general health, physical functioning), PA, and health locus of control (HLOC: internal, external-chance, external-powerful others, God) among various ethnic groups.

Methods: Participants voluntarily answered questions about their ethnic identity, HRQoL, PA level, and HLOC. A multiple regression analysis was conducted to analyze the interaction of variables.

Results: The study's sample included 185 individuals, 22 to 81 years of age, who attended or worked at one of three religiously-affiliated higher education institutions during 2020 to 2021.

Conclusion: The majority of respondents showed high levels of PA. However, the scores for HLOC and HRQoL varied widely among ethnicities, with minority groups showing higher scores than non-minorities for external HLOC categories, as well as lower scores for both HRQoL categories. Such differences call for better understanding of HLOC and HRQoL in different ethnic groups.

Impact of Academic Role on Physical Activity, Health Locus of Control, and Health-Related Quality of Life

Kimberly Feiler & Anusha Thomas (La Sierra University)

Introduction: Nearly 80% of adult Americans do not achieve enough physical activity (PA). Insufficient PA health risks include weaker bones and muscles, poor weight management, diabetes, high blood pressure, increased risk of heart disease, and some cancers. These dramatically impact quality of life. The long-term financial and physical costs of physical inactivity average $90 billion annually.

Purpose: This research investigated physical activity (PA), health locus of control, and health-related quality of life for adults working and or enrolled at higher education institutions in California.

Methods: Roles were full-time or part-time: student, faculty, or staff. One questionnaire combined four surveys, with added demographic questions.

Results: Over 65% of respondents reported high PA, 28% moderate, and 5% low. Part-time staff reported the greatest amount of high PA; full-time students showed the highest scores for health locus of control's "God" scale; and part-time faculty reported the highest scores for health-related quality of life's general health.

Conclusions: The college and university campus is a vital space for health education. Through improving understanding of how role impacts PA, health locus of control, and health-related quality of life, health programs can be better designed for health behavior changes and improve health outcomes. This research was the first to look at differences among students, staff, and faculty.

Integrative Healing

Rachel Hollingsworth (Arizona State University)

Keynote address.

Heroes & Mentors

Karen Hostetter (Northern Arizona University)

Introduction: With the theme of the 2024 WSKW Annual Conference being about historical figures and how they shaped our paths,

Purpose: The goal of this presentation is to introduce unique features of this year's conference and to ignite thoughtful reflection and discussion about the people in our lives, famous and personal, who have influenced the direction our lives have taken.

Method: Key influencers and their role will be identified, followed by opportunity for audience members to share about important figures in their lives.

Discussion: The importance of personal and professional history cannot be understated. An understanding of historical milestones and personalities keeps us humble and helps us avoid attitudes of privilege. Sharing with others what is important to us promotes respect, interest, and empathy.

Surviving & Thriving in a Multigenerational Workplace

Karen Hostetter (Northern Arizona University)

Introduction: News and social media outlets are full of reports of young professionals leaving positions after just a few years, or less. Not only are young professionals leaving for similar positions with better salaries, but they are leaving entire professions for which they invested countless hours and tuition to enter. Anecdotally, more seasoned professionals are frustrated with a perceived lack of commitment from younger colleagues; young professionals are tired of the "stuffy," senior employees, who cannot relax in the workplace.

Purpose: The primary purpose of this presentation is to introduce the theoretical framework of generational diversity and to summarize research identifying each workforce generation from the 1950s through the 2020s. The secondary purpose is to describe challenges and benefits of working in a multigenerational workforce setting. Finally, this presentation will serve as a catalyst to a round-table discussion on the topic of the multigenerational workforce.

Method: This presentation was developed after attending the 2024 Annual Conference of the Rocky Mountain Athletic Trainers' Association, where a colleague addressed similar information specifically about multigenerational athletic trainers. Additional references were gathered to ensure the presentation addresses new, updated information and kinesiology-supported professional disciplines beyond athletic training.

Results: After attending this presentation participants will be challenged to adopt a culture of support and stability in the workplace conducive to generational diversity.

Conclusion: As the presentation ends the audience will be asked to gather into groups, attempting to include each of the identified generations in each group to provide a variety of perspectives during the discussion.

Using Service Learning in Undergraduate Adapted Physical Activity Courses

Minhyun Kim, Boung Jin Kang, Yeonhak Jung & Dal Hyun Moon (Sam Houston State University; Elizabeth City State University; California State University, Northridge; California State University, East Bay)

Introduction: Service learning (SL) has been extensively incorporated in kinesiology. Adapted physical activity (APA) is an ideal course for providing kinesiology students with SL opportunities to work with individuals with disabilities.

Purpose: The SL project in APA is designed to bridge the gap between theory and practice. Specifically, SL provides kinesiology students with an opportunity to teach a wide range of sports skills and physical activities to local K to 12 children with disabilities (130 students from 8 schools). The SL project takes place during class hours, six times in 12 weeks, that is, every other week, each semester. The current project focused on differentiating instruction to meet each participant's needs, interests, and abilities.

Method: To examine kinesiology students' experiences in an SL project for children with disabilities, 33 undergraduates' reflection essays were collected. Each reflection essay was evaluated via a directed approach to qualitative content analysis.

Result: Five main themes emerged from the data: (a) contact and prior experience, (b) personal growth and academic learning, (c) future career aspirations, (d) biased language, and (e) recommendations for adapted physical education SL.

Discussion: The results of this study provide several implications for the design and structure of SL projects in APA courses. The future direction is how to incorporate the best practices about contact time, duration, and course structure to successfully accomplish the academic objectives for kinesiology students and provide the best services to children with disabilities.

The Coaches' Dilemma: What Will You Do to Win?

Samantha Lewis & Sharon K. Stoll (University of Idaho)

Introduction: Presently 70% of youth sport athletes drop out by the age of 13. The reason: burnout from the pressure to win and succeed. It is just not fun anymore. Winning, results, and scores are valuable and do create the game. Humans, however, are complex, multi-dimensional beings who cannot be defined by game stats. Competition can be positive, but balance is needed to find enjoyment and healthy outcomes. Coaches need help in using a healthier alternative to the objective goal of results and numbers. The subjective, joyful, lived experience is why we play and compete. Coaching through the subjective experience creates success.

Purpose: This oral presentation will offer an effective approach to coaching through the subjective, using examples from novel research involving modern technologies like podcasting combined with Socratic maieutic reflective practices.

Method: A podcast, "The Coach's Dilemma: What Will You Do to Win?" was created in 2024 based on a coach development program of 12 episodes using tenets of philosophy of sport like the aesthetic experience and play.

Result: Each podcast episode discusses topics that pertain to the lived experience, discussed with topic experts, and engages the audience with reflective questions.

Discussion: Early research using this format has succeeded in developing athlete self-reflection and personal competitive philosophy (Sowa, 2022). The research aim is to aid coaches in their daily dilemma to balance the objective and subjective coaching tools to ensure athletes do not experience burnout and regain why they became an athlete, the love of game and play.

Perception is Everything: Factors that Influence Inclusion of Students with Physical Disabilities in Physical Education

Aubrey Shaw & Sharon K. Stoll (University of Idaho)

Introduction: The Rehabilitation Act (1973), the Americans with Disabilities Act (1990), and the Individuals with Disabilities Education Act (2004) are to create inclusion for students with physical disabilities. Even though the laws are in place, school administrators and teachers find themselves in a moral conundrum regarding including students with physical disabilities. How does the physical education teacher engage both able-bodied students and students with physical disabilities equally? Most would argue the teacher cannot serve both populations to the best of each population's physical ability.

Perception is everything and certain factors influence inclusion. First, the professional notion exists amongst teachers that able-bodied students will not have an optimal experience or reach their physical potential if students with physical disabilities are included in the same classroom setting. The result is limited examination of exclusionary ideologies. Second, a professional fear exists amongst teachers that students with physical disabilities will get hurt while participating with able-bodied students. Thus, segregation of students with physical disabilities from able-bodied peers is rationalized with little to no questioning of this ideology by educators, administrators, and the public. However, are the arguments for segregation valid?

Purpose: The purpose of this presentation is twofold: 1) discuss the moral conundrum of inclusion with students who have divergent physical abilities and 2) provide counterpoints against segregated physical education spaces which could enhance inclusion of people with physical disabilities in sport, exercise, and physical recreation activities.

The Moral Conundrum for Pre-service Physical Educators while Teaching Inclusion: How Do We Include Students with Physical Disabilities? A Case Study

Aubrey Shaw (University of Idaho)

Introduction: Teachers always try to do good. However, how does one do so when a moral conundrum appears? For example, how does a teacher do good when two diametrically different populations are enrolled in physical education class. How does the physical education teacher engage both able-bodied students and students with physical disabilities equally? Most would argue the teacher cannot serve both populations to the best of each population's physical ability. Attitudes are powerful and are formed through various experiences. It is not that the profession or professionals are trying to exclude, rather, the reality is life gets in the way. Experience clouds much of what we do. The result is pre-service teachers justifying exclusion learned from their own collegiate instructors. The cycle of exclusion and discrimination continues not because the teachers are unfair, but rather occurs because of a moral conundrum.

Purpose: The purpose of this presentation, therefore, is threefold: 1) to discuss attitudes towards students with physical disabilities, 2) to give examples through a case study of how inclusion can be a fruitful part of the classroom curriculum for pre-service teachers and 3) to provide results and a discussion of a case study completed in the 2020 to 2021 academic year in which university pre-service teachers were immersed in an inclusion curriculum.

Discussion: Pre-service teachers can be prepared to teach this population and attitudes can positively shift. The conclusion focuses on a solution for collegiate instructors to solve a moral conundrum and prepare pre-service teachers to include.

In Concert We Shape the Future

Bethany Shifflett (Professor Emeritus, San Jose State University)

E.C. Davis Lecture.

DEI, Diversity, Equity and Inclusivity, and Research: A Talk on the Role Manuscript Submission Guidelines May Play in Mitigating Representation Issues in Kinesiology Research

Jafra Thomas, Jill M. Maples, Shannon R. Siegel, James W. Navalta, Matthew J. Garver, Vivianne Felker, Deanna Jun, Alexis W. Willing, Joel D. Reece & Dustin W. Davis (California Polytechnic State University, San Luis Obispo; University of Tennessee; University of California, San Francisco; University of Nevada, Las Vegas; University of Central Missouri; Brigham Young University, Hawaii)

Introduction: Limited and biased representation in kinesiology research has been documented and is concerning.

Purpose: Given these findings, can we truly generalize study outcomes to the general population? Does study design or reporting tendencies perpetuate problematic societal biases?

Method and Results: Jo et al. (2024) systematically reviewed 854 original research articles from peer-reviewed literature on sport-related concussion; only 15.5% reported participant race and 7.6% reported ethnicity. Hagstrom et al. (2021) analyzed original cohort research in sports medicine between 2004 and 2020 (K = 29), and found unisex male-only studies (k = 19) were nearly twice as common as mixed-sex studies (k = 10). Scholars have even examined patterns in original research presented and discussed at kinesiology academic conferences.

Discussion: These findings illustrate recurrent representation issues: (1) under-reporting, such as few studies of diverse demographics, (2) misreporting, such as incomplete reporting within study abstracts, and (3) biased recruitment favoring demographic groups who have unjustifiable and problematic societal privileges. These representational issues, frequently overlooked, raise doubt about the applicability, reliability, and validity of kinesiology empirical knowledge. This presentation further summarizes these issues in kinesiology research, then discusses their impact on kinesiology higher education instruction and areas of practice. Before concluding, the presenters share a draft protocol for how manuscript submission guidelines may improve representation in kinesiology research and invite audience feedback.

The Invisible Labor of Love to Promote Equitable Grading Using Active In-Class Learning: Is Student-Led Discussion Necessary?

Jafra Thomas & Victoria Bradshaw (California Polytechnic State University, San Luis Obispo)

Introduction: Most college students may be unwilling to contribute frequently, if at all, to verbal class-wide discussions intended to progress organically. Within their 2023 WSKW Conference presentation titled "Asking Questions in Class," Dr. Gioella Chaparro discussed the challenges faced when attempting to elicit organic verbal discussion from students taking an undergraduate biomechanics course. Those observations are not isolated events.

Purpose: This presentation builds off Chaparro's 2023 analysis and discussion through a focus on the presenters' own experiences teaching general education, upper-division kinesiology undergraduate courses focused on psychosocial topics.

Method: The presenters utilize an autoethnographic and reflective mode of inquiry to recount and critically examine student reticence to participating in class discussions, despite utilizing inclusive teaching practices and active learning activities.

Discussion: After the summary, the audience is invited to discuss ways stalled, or under-participation within, synchronous class-wide discussions may undermine efforts to close grade-equity gaps within kinesiology undergraduate courses. Students who proactively contribute to organic verbal discussions engage in high-impact learning practices known to foster deeper learning by promoting integrative understanding of concepts, topics, and research perspectives examined within a course, and by rectifying potential pieces of misinformation held by the student. These learning outcomes catalyzed

through verbal discussions are the things mainly assessed through summative learning assessments utilized within upper-division courses.

Remembering Trailblazers! Dr. Walter S. Hamerslough: Mentor and Leader for Over Four Decades

Robert Thomas (La Sierra University)

This presentation celebrates Dr. Walt Hamerslough's contributions to the field of kinesiology and is built upon his publications, presentations, and interviews. Dr. Hamerslough was a distinguished educator and advocate for holistic wellness who participated and led in the Western Society from the 1960s through the 2000s. In his teaching, presentations, and publications he championed the successful fusion of moral values with pedagogical practices while emphasizing the importance of character development.

Walt Hamerslough was an active member of the Western College Men's Physical Education Society from the 1960s into the 2000s. It was during his year as President in 2006 that the organization transformed its name to become the Western Society for Kinesiology and Wellness. His passion for young faculty members' personal and professional growth exemplified the core values of WSKW with its motto, "Where the conferee is the program and mentoring and networking are the foundation." He annually brought faculty colleagues and undergraduate students to the conference, was a regular contributor to business meetings, and often collaborated to update the Operating Code.

While Dr. Hamerslough addressed several domains within the field such as motor learning, strength training, and health, he was most active in exploring with others the interactions of philosophy, moral values, and Christianity within the field of sport and competition.

Through this presentation, attendees gain valuable insights into fostering a culture of integrity and compassion in their local workspaces and within the profession.

Changing Landscapes in Higher Education: Personal and Professional Reflections

Cathy Tingstrom & Cuauhtemoc Carboni (Utah Valley University; Imperial Valley College)

Introduction: Young professionals and future leaders in higher education will be tasked with navigating a different and ever-changing landscape when striving for student success in their classrooms. From legislative initiatives that impact workforce development and teacher education, relationships with university programs and state systems of higher education regarding retention of students, to the impact of AI on classrooms and scholarship, these changes are substantial.

Purpose: Provide insight to key issues that are facing systems of higher education that impact the classroom and to provide young professionals suggestions for navigating these challenges.

Method: Discussion.

Desired Outcome: Increased awareness and practical strategies to improve classroom effectiveness and professional success.

Discussion: Brainstorm potential areas of research.

Her Story in Sports History: Impact, Influence & Leadership of Female Trailblazers in Kinesiology and Sport

Heather Van Mullem & Karen Hostetter (Lewis Clark State College; Northern Arizona University)

Introduction: The recent elevation in popularity of women's collegiate, professional, and international sports has been a long time coming. Women are gaining visibility and recognition of the skills and dedication it takes to perform at the highest level of athletics. Physical activity and wellness are a cornerstone of a productive society. Trained in physical education, fitness, wellness, and sport, physical activity and wellness professionals, and their knowledge, are essential to creating healthy communities.

Purpose: Aligning with the WSKW conference theme, this shared presentation blends a historical perspective of some of the pioneers in women's sports and the impact of their dedication on today's professionals and participants, and explores findings of a qualitative study which examined the lived experiences of female physical educators, kinesiologists, and or sports studies scholars (N = 16) through semi-structured interviews.

Methods: Information for this presentation was gathered using two separate methods. The primary information was gathered by performing a literature search using MeSH terms such as Title IX, women in sport, and women's sports history. The second portion of data was gathered from a qualitative study which examined the lived experiences of female physical educators, kinesiologists, and or sports studies scholars through semi-structured interviews.

Results: The literature search produced references with information about women's sports participation pre and post Title IX, as well as defining intent and limits of the law. The interviews revealed careers that have spanned decades, and the significant impact on the field, and influence on current best practices.

Discussion: Session attendees will: 1) explore the findings of this study, 2) examine suggestions to improve mentoring of the next generation of physical education, kinesiology, and sport professionals, 3) discuss effective leadership strategies identified and modeled by study participants, and 4) identify tangible strategies to implement positive mentoring and leadership techniques to continue to help grow the field and invest in the success of future professionals.

Progress Report on the Relationships Between Muscle Fitness and Radial Bone Strength in Older Adults

Emily Van Horn (California State University, East Bay)

Faculty Sponsors: Cathy Inouye, Albert Mendoza, Jennifer Sherwood, Vanessa Yingling

Introduction: Declining muscular fitness and bone mass disproportionately affect older adults and are associated with declining functional ability and loss of an independent lifestyle. This project studied the relationships of sit-to-stand velocity (STSv) and hand grip strength (HGS) to bone strength (BS). STSv, an assessment of lower limb power, and HGS, indicative of overall strength, are easily performed in the field.

Bone strength has been associated with muscle fitness, however the relationship to muscle strength and power has yet to be resolved in older adults. Here, relationships between HGS and lower limb power to bone parameters of the radius are examined in older adults ages 60 to 95 years.

Methods: Sixty participants, 55% women, were recruited from the community. Bone strength was assessed with peripheral quantitative computed tomography (pQCT), lower limb power with a linear position transducer, and HGS with a hand-grip dynamometer.

Results: High correlation was found between combined HGS, the sum of peak HGS for right and left, and peak lower limb power (r = 0.63). HGS was associated with cortical area (r = 0.65), moment of inertia and bone strength (r = 0.69; r = 0.71), and total area at the 66% site (r = 0.70). Peak lower limb power was associated with cortical area (r = 0.58), moment of inertia and bone strength (r = 0.67; r = 0.68), and total area at the 66% site (r = 0.71). Moderate correlation was found for HGS and trabecular density (r = 0.41).

Conclusions: These data suggest that muscle fitness testing may be a promising tool to monitor bone strength in older adults.

Baseball Antitrust Exemption: Historical Perspectives and Recent Case Development

Sungho Cho (Bowling Green State University)

Introduction: Sport leagues produce entertainment services by organizing athletic competitions. Their business requires coordination among diverse stakeholders such as teams, media, merchandisers, and sponsors. Leagues also implement restrictive labor practices, such as restricted free agency, draft, salary cap, franchise tag, and others, to maintain competitive balance. Such collaborative governance and labor policies are frequently subject to antitrust scrutiny since the Sherman Act prohibits concerted action among competitors that may unreasonably restrain trade in a relevant market.

Purpose: The purpose of this study is the examination of the baseball exemption doctrine in federal antitrust law and its current jurisprudence to understand how the legal doctrine has affected the baseball industry and to extrapolate the future of the controversial precedent.

Method: Legal analysis of relevant case law is conducted. Selected antitrust cases filed against sport leagues are scrutinized: *Toolson v. New York Yankees* (1953), *Flood v. Kuhn* (1972), *American Needle v. NFL* (2010), *NCAA v. Alston* (2021), *Concepcion v. MLB* (2023), and *Casey's Distributing Inc. v. MLB* (2022).

Results: While the controversial legal doctrine has been upheld by various courts, the apparent anachronism and relevant economic dynamics have prompted legislative intervention and or judicial reexamination of the doctrine.

Conclusions: The current bench of the U.S. Supreme Court might be more open to challenges to the validity of the precedent, evidenced in *NCAA v. Alston* (2021) and *Dobbs v. Jackson Women's Health Organization* (2022). Legislative intervention would be possible too.

Leisure Participation Methods of Active Seniors Pioneering Death: A Cross-sectional Study

Young Jae Kim, A Young Kong, Seung Hee Jang, Yeon Kim & Jeong Hyung Cho (Chung-Ang University; Kyungil University)

Introduction: Active seniors, aged 65 and older, eventually face the later stages of life and death. Preparing for this stage is crucial for a meaningful conclusion to life. Engaging in leisure activities, driven by internal satisfaction and voluntary participation, is key to enhancing quality of life, with outcomes varying based on involvement. This study explored how leisure engagement among active seniors influences well-dying, focusing on differences based on gender, age, income, health, leisure type, and participation frequency.

Methods: A total of 289 active seniors from Seoul, South Korea, participated in this study, which used convenience sampling. The research instruments included the Leisure Engagement Scale and the Well-Dying Scale. Exploratory analyses were conducted to ensure data reliability and validity.

Results: Among the participants, 140 were males (48.4%) and 149 were females (51.6%), with sports being the most common leisure activity (35.6%). The analysis showed that age, income, subjective physical and mental health, leisure type, and frequency of participation were significantly associated with leisure engagement. Additionally, gender and leisure frequency were associated with well-dying perception. A positive correlation was found between leisure engagement and well-dying.

Conclusions: This study highlights the positive impact of leisure activities on the well-being of seniors. The findings provide essential insights for developing tailored leisure programs to improve seniors' quality of life, offering valuable guidance for elderly care providers in designing health promotion strategies.

Motives Related to Physical Activity for Older Adults with Different Types of Residential Environments

Minyong Lee, Sung-Jin Lee, Elizabeth Hopfer & Sheryl Robinson (North Carolina A&T State University, Greensboro)

Introduction: Social-ecological models suggest that influences on physical activity for older adults should be examined on multiple levels. Previous research indicates that significant behavioral determinants of regular physical activity participation include motives, environmental factors, psychological factors, and demographic characteristics. However, most prior studies have investigated these determinants separately.

Purpose: The purpose of the study is to examine older adults' motivation to participate or not participate in physical activity on a regular basis by integrating these factors through their particular motives for participation and their residential environments.

A Gender-Inclusive Approach in Common Sport and Exercise Science Measurements Using the All of Us Research Program Dataset

James Navalta, Dustin W. Davis, Jason Flatt, Joshua D. Wooldridge, Juliet L. Moore, Jafra D. Thomas & Whitley J. Stone (University of Nevada, Las Vegas; North Dakota

State University; University of Southern California; California Polytechnic State University, San Luis Obispo; Western Kentucky University)

Introduction: Few sport and exercise science studies are gender-inclusive. Of 151,043 participants in a recent evaluation, one identified as transgender, and three as another gender identity. Using inclusive methods is important.

Purpose: The purpose was to quantify how a lack of representation affected data interpretation.

Method: All of Us subgroup data were analyzed for adults 18 to 30 years (N = 29,415) with gender as the grouping variable: female, male, non-binary, transgender, and additional options. Outcomes included body mass and body mass index. Measures were initially compared using independent t-tests between females and males. Measures were then compared via one-way ANOVA among gender groups.

Results: Body mass and BMI were different between females and males ($p < 0.001$). When other genders were included, differences were present for both outcomes ($p < 0.001$). Notably, body mass differences were observed to be lower in females than non-binary, transgender, and additional options. Females had lower BMI than non-binary, while males were lower than transgender, non-binary, and additional options. Non-binary, transgender, and other options did not differ from each other in any outcome.

Conclusions: Overall, these data reveal the need for a more gender-inclusive approach in sport and exercise science measurements. Given that body mass measures are important aspects of many progressive training programs, gender-inclusive measures should be employed to thoroughly understand diverse physiologic training responses.

Playful Teaching & Engaged Learning: Strategies to Infuse Play into Your Sport Psychology Class

Heather Van Mullem & Linda Sterling (Lewis Clark State College; University of Colorado Boulder)

Introduction: Creating meaningful classroom learning experiences can positively impact student understanding of course material, enhance student engagement, improve student accountability for learning, and develop a sense of connectedness and belonging between students and with their campus community. One way to create meaningful learning experiences is to build play into course design and delivery. Play is a powerful and effective teaching and learning strategy.

Purpose: This poster will 1) explore play as a teaching strategy, 2) identify and describe examples of games and playful learning activities designed to help students learn, retain, and apply sport psychology concepts, and 3) provide tangible strategies to help instructors design and deliver a curriculum centered around using games and play as a teaching tool.

The Gut Microbiome and How ADHD and Parkinson's Disease May be Linked

April McCoy (California State University, Monterey Bay)

Faculty Mentor: Dr. Maria Bellumori

Introduction: There is growing interest in the gut microbiome and its effects on the central nervous system. Good bacteria in the gut play a role in neurotransmitter synthesis and regulation which contribute to central nervous system control. Excess bad bacteria may lead to leaky gut syndrome and neuroinflammation. Dysbiosis is a negative imbalance of the two bacteria and is associated with disease and decreased dopamine synthesis. Decreased dopamine plays a pivotal role in the manifestation of symptoms associated with attention-deficit hyperactivity disorder and Parkinson's disease.

Methods: A review of five articles was utilized for this project.

Results: Supporting the hypothesis, results from this literature review demonstrate a potential link between ADHD and Parkinson's disease due to disruption in dopamine synthesis. Additionally, probiotic supplementation has been shown to decrease symptoms in those with ADHD and is hypothesized to decrease symptoms of Parkinson's disease. Probiotic supplementation is also hypothesized to protect the central nervous system and prevent neurological disorders.

Conclusion: Utilization of probiotics may serve as an inexpensive and non-invasive intervention to protect against development of neurological disorders and warrants more research.

The Influence of Pre-Workout Supplement Trends on Exercise Performance and Health

Dustin Orluck (San Jose State University)

Faculty Mentor: Daniel Bohigian

Introduction: Growing social media platforms such as TikTok have showcased influencers that have spurred a new popularity surrounding fitness content that heavily influences a largely young adult audience. The popular trend of dry-scooping pre-workout supplement powder, which is ingesting the supplement powder orally without solvent, has given the product a social correlation with improved sport performance as well as stereotyped dry scooping ingestion as the main way pre-workout should be taken.

Purpose: In this literature review, the author addresses ingestion of supplemental pre-workout powders to determine if dry-scooping is an effective and safe method of ingestion.

Methods: Five scholarly articles were cited via the Martin Luther King Jr. Library from San Jose State University, utilizing the SPORTDiscus and PubMed databases. Articles were chosen based on their date of publication, ranging from 2010 to 2024.

Results: Pre-workout supplement powder was found to have varying effects on general sport performance, notably to the same degree as caffeine. Additionally, pre-workout products on average were labeled incorrectly, omitting important ingredients in the composition list thus compromising product purity, which the FDA has maintained a passive role in regulating since the 1980s. Furthermore, dry scooping was reported by individuals 16 to 30 years of age as a habit they emulated from fitness influencers, with more instances rising as more time was spent on social media.

Conclusion: Overall, given the lack of efficacy and compromised safety of pre-workout powder, individuals should not engage in dry scooping and should opt for caffeine products such as coffee or energy drinks.

Keywords: Pre-workout, supplements, social media, dry scooping, social media influencers.

Inequality in Healthcare Access and Utilization among Undocumented Latinx Individuals in the US: What Should the Position of Kinesiology & Wellness Professionals be on this Issue?

Kevin Castaneda (California Polytechnic State University, San Luis Obispo)

Faculty Mentor: Dr. Jafra D. Thomas

Introduction: To ensure individual wellbeing, institutions and political factors must be understood and addressed by kinesiology and wellness professionals. However, kinesiology and wellness students may seldom learn about research perspectives examining institutional and political factors undermining undocumented immigrants' timely access and utilization of preventative healthcare services, including wellness screenings and healthy lifestyle counseling.

Purpose: This presentation's purpose is to engage WSKW conference attendees in discussion about research examining viewpoints for and against healthcare for all.

Methods: Components of this presentation come from two assignments from two undergraduate courses at Cal Poly, San Luis Obispo, Sociology of Health and Illness and Intro to Interdisciplinary Studies, which resulted in a research-informed blog post and two slideshow presentations. The student analyzed relevant scholarly articles addressing institutional and political factors preventing or delaying healthcare utilization by undocumented Latinx immigrants.

Results: Key findings were that the US does not provide universal healthcare unlike many other countries; anti-immigrant policy and rhetoric increase prevalence of poor mental and physical health not only among undocumented immigrants; and healthcare is very expensive even with insurance or community-volunteer clinics, thus many demographic groups delay seeking healthcare or services regardless of immigration status.

Conclusion: These findings explain why many individuals become pessimistic or apathetic about their health, as the student personally experienced and observed. The audience will be invited to contemplate and discuss the relevance of these findings to kinesiology and wellness professionals.

Tackling Obesity in the Pacific Islander Population: A Call for Community-Level Solutions

Joshua Eng (California Polytechnic State University, San Luis Obispo)

Faculty Mentor: Dr. Jafra D. Thomas

Introduction: Nearly 75% of Pacific Islander adults are overweight or obese, according to the World Health Organization.

Purpose: Given obesity is often defined as an individual problem, the purpose of this project was to understand this health concern from a wider lens, by researching historical and systemic causal factors and community-level solutions.

Methods: Findings of this original project were composed into an opinion-editorial essay completed through an undergraduate course on Health, Stress, and Chronic Illness. The student produced the op-ed by adhering to op-ed writing guidelines, completing scaffolding assignments within peer-learning communities, and revising preliminary drafts following peer review.

Results: Several historical and systemic causes were identified, including disruption of traditional food systems and lifestyles following colonization, leading to reliance on imported unhealthy foods; forced economic dependencies on colonial powers made island communities vulnerable to market fluctuations and food insecurity; and commercial practices replacing traditional diets rich in fish, root vegetables, and fruits with highly processed foods high in sugar and unhealthy fats. Identified community-level solutions included implementing community-based agricultural initiatives aimed at promoting food sovereignty and security, revitalizing food systems and enhancing access to nutritious food through school-based programs, and bolstering economic empowerment within communities.

Conclusion: Findings of this op-ed raise awareness of the ways historical injustice, structural inequalities, and socioeconomic pressures cause pervasive obesity epidemics in Pacific Islander populations. Implications for teaching and collaborating in community-level strategies addressing historical and systemic causes of obesity health disparities will be discussed.

Reflections on Improving the Taekwondo Judging System for People With Disabilities

Geun Wook Son (Sangmyung University)

Co-Authors: Jong Yoo Lee, Hyeon June Rah, and Ji Won Jung

Faculty Mentor: Dr. Sang Keon Yoo

Introduction: This study investigates the current status and challenges of Taekwondo examination rules for individuals with disabilities. Key issues identified include the lack of standardized procedures, insufficient expertise among judges, and inadequate examination venues. The study emphasizes the importance of creating inclusive practices to ensure fair assessments.

Purpose: The study's primary goal is to explore the shortcomings of current examination rules for disabled Taekwondo practitioners, identify specific challenges in their implementation, and propose actionable solutions to enhance fairness and accessibility.

Methods: Five experts in disabled Taekwondo were selected through purposeful sampling. Data were gathered using semi-structured interviews and analyzed with inductive category analysis.

Results: The study found significant gaps, such as non-standardized procedures, a lack of specialized judge training, and inadequate facilities for disabled practitioners. Recommendations include establishing uniform procedures nationwide, providing specialized training for judges, and ensuring accessible examination venues.

Conclusion: Standardized and inclusive examination practices are crucial for the fair treatment and advancement of disabled Taekwondo practitioners. Implementing the proposed improvements will create a supportive environment, fostering the physical and mental growth of all practitioners. The study's findings and recommendations aim to contribute to a more equitable Taekwondo community.

Proximal Hypoalgesic Effects of Blood Flow Restriction in the Upper Extremity

Evan Carvalheira (Point Loma Nazarene University)

Faculty Mentor: Dr. Ryan Nokes

Introduction: Blood Flow Restriction (BFR) is an intervention that is growing in physical therapy and sports rehabilitation settings. Occlusion of blood flow and venous return to exercising muscles during BFR intervention, coupled with low intensity exercise, has been shown to elicit muscular strength and hypertrophic effects similar to high intensity resistance training. Little is known regarding pain reduction and functional improvements after BFR intervention, especially in muscles proximal to the occlusion site.

Purpose: Determine whether BFR, applied to the most proximal portion of the upper extremity, coupled with low intensity exercise elicits pain and functional improvements in individuals suffering from shoulder impingement syndrome or associated rotator cuff pathology.

Methods: Nine participants with shoulder impingement syndrome were recruited from Catalyst Physical Therapy and Wellness clinics in San Diego through convenience and snowball sampling. Participants performed low intensity exercise with a BFR cuff applied to the proximal portion of the upper extremity. Measurements of pain and discomfort were collected using the Shoulder Pain and Disability Index and Numeric Pain Rating Scale. Scores were compared before and after the exercise protocol, as well as 24 hours after completion.

Results: Significant improvements of shoulder function were seen immediately after exercise, while improvements in pain symptoms lasted up to 24 hours post-intervention ($p < .05$).

Conclusion: BFR is a significant treatment method for those suffering from shoulder impingement syndrome, to improve both shoulder pain and function. BFR intervention is most clinically applicable for contraindicated individuals who are unable to traditionally strengthen the affected muscles.

Keywords: Blood Flow Restriction, occlusion training, shoulder impingement syndrome, rotator cuff, shoulder pain and function.

We've Made it Easy for People to Hate Sports and Exercise: A Reflective Thematic Analysis of Motivational Posters

Elmer Hernandez Gomez (California Polytechnic State University, San Luis Obispo)

Faculty Mentor: Dr. Jafra D. Thomas

Introduction: Amateurism is loving an activity more than its outcomes. Also a communal activity, sport and exercise amateurs intrinsically love opportunities to socialize, recreate, and experience joyful movement.

Purpose: Given that amateurism in sport and exercise cultures may go unappreciated, and is undermined by prevailing cultural values, this presentation makes a case for why kinesiology students should be taught about, and how to apply, specific philosophies in amateurism.

Methods: Presentation materials come from an assignment done in an undergraduate course on Perspectives in Physical Activity. After learning about an ancient philosophy akin to amateurism, Bhagavad Gita philosophy, students used that philosophy to construct motivational posters promoting

an amateur mindset toward sport and exercise. The student presenter showcases several posters and how they contrast with prevailing cultural values within typical sport and exercise motivational posters.

Results: Project poster message themes were invalidating perfectionism and embracing the present, whereas the typical posters' themes were dull advice and guilt tripping, according to the student's reflective thematic analysis performed with the faculty mentor through independent study.

Conclusion: Having learned specific tenets of an amateurism philosophy, the student gained deeper understanding of amateurism and the ability to culturally promote an amateur ethos within sport and exercise settings. These are significant learning outcomes all kinesiology students should achieve, given amateurism is a powerful source of fulfillment and enduring motivation in sport and exercise.

The Impact of Physical Activity Enjoyment of Korean Office Workers Participating in Leisure Activities on Their Social Network and Prosocial Behavior: Focusing on the Mediated Effect of Positive Psychological Capital

Eun-Ju Kim (Chung-Ang University)

Faculty Mentors: Young-Jae Kim and Jeong-Hyung Cho

Introduction: In Korean society, women used to be in charge of housework in the past, but recently they are under a lot of stress as they work and do housework. In this situation, physical activity is very helpful in relieving women's stress and improving quality of life. In particular, physical activity was found to have a positive effect on social relations by creating a positive mental state.

Purpose: This study analyzes the impact of Korean women's physical activity on social relations and positive behavior and proposes policies to improve women's quality of life based on this.

Methods: The study surveyed 300 Korean female office workers aged 20 to 39. The survey included women who participated in leisure activities such as sports activities.

Results: Enjoyment of physical activity had a positive effect on both social networks and prosocial behavior. Positive psychological capital showed a partial mediating effect in the relationship between physical activity enjoyment and social network, and a full mediating effect in the relationship between physical activity enjoyment and prosocial behavior.

Conclusion: Koreans prioritize relationships and foster strong social ties through shared activities. Studies have found that physical activities enhance social networks and promote positive behaviors. This research suggests ways to make physical activities more enjoyable, ultimately contributing to a healthier society.

Keywords: Leisure sports, female office workers, enjoyment of physical activity, social network, prosocial behavior.

Mental Health Resource Materials in English and Spanish: A Suitability Analysis

Giselle Martinez (California Polytechnic State University, San Luis Obispo)

Co-Authors: Jessica Perez

Faculty Mentors: Dr. Jafra D. Thomas and Suzanne Phelan

Introduction: Physical activity and health promotion researchers seem to rarely study the suitability of mental health resource materials, despite a clear inverse relationship between negative mental health outcomes and physical activity. A potential barrier to kinesiology research analyzing resource materials' suitability is a lack of training at the undergraduate level.

Purpose: The purpose of this presentation is to model a training process used to prepare undergraduate students to reliably rate the quality of Cal Poly Mobile Health Unit's patient resource materials written in English and Spanish, using the suitability assessment of materials protocol.

Methods: Two native Spanish and English-speaking undergraduate students trained with the suitability assessment protocol, then tested their interrater reliability with public resource materials from the National Institutes of Health covering four mental health topics written in English and Spanish (N = 8).

Results: Substantial interrater reliability was achieved. Coder differences were resolved. Undergraduates achieved competency in reliably utilizing the suitability assessment rating form to judge the quality of patient and public resource materials in English and Spanish. Test sample materials' suitability scores and issues were equivalent across language categories, contrasting previous research. Like previous studies, reading grade level and summaries were not suitable, with overall material suitability adequate.

Conclusion: The undergraduate student research assistants achieved competency in reliably utilizing the suitability assessment form with a sample of real patient education materials in English and Spanish comparable to those used in Cal Poly's Mobile Health Unit. Implications for kinesiology and wellness college and university degree programs will be discussed, with an emphasis on undergraduate student career preparation.

Disparities in Sexually Transmitted Infection Rates Among Young Hispanic and Black People in the United States: An Op-ed Term Project for Undergraduate Instruction in Kinesiology & Wellness

Emily Rodriguez (California Polytechnic State University, San Luis Obispo)

Faculty Mentors: Dr. Jafra D. Thomas and Dr. Marilyn E. Tseng

Introduction: Young people ages 15 to 24 with socially marginalized identities face increased risk of contracting sexually transmitted infections. Health inequities underpinning sexually transmitted infections also underpin inequities in areas traditionally studied in kinesiology and wellness.

Purpose: As part of an undergraduate course, the student developed an opinion-editorial presenting evidence of sexual health disparities in Black and Hispanic populations in the United States and unequal access to quality middle and high school sexual health education, then recommended theoretically informed, interdisciplinary, community-level strategies to address the health inequities underpinning high risk of STIs among Black and Hispanic young people.

Methods: Development of the op-ed entailed adhering to op-ed writing guidelines, completing scaffolding activities in partnership with a classmate learning community, and addressing peer comments to preliminary drafts.

Results: The primary outcome was an evidence-based op-ed with hyperlinked references, two identified solutions, and refutation of counterarguments such as the claim that medically accurate sexual health education increases sexual behavior.

Conclusion: Implications of an interdisciplinary op-ed assignment for kinesiology and wellness undergraduate courses will be discussed.

Seminaturalistic Driving Study of Breast Size and Seat Belt Fit

Anna Scheider (Westmont College)

Co-Authors: Ciboney Hellenbrand and Daniel Rafeedie

Faculty Mentor: Dr. Adam Goodworth

Introduction: Research has shown that body shape can negatively impact seat belt fit. Although proper seat belt fit is crucial for automotive safety, no prior research has been performed to study the effects that breast size has on belt fit.

Purpose: The purpose of this study was to identify the effect of breast size on belt fit in seminaturalistic driving conditions. The authors hypothesized that a larger breast size will worsen belt fit in a naturalistic setting.

Methods: Anthropometric data was collected from 11 college students. Participants then followed a driving course making three distinct stops along the way and performing various reaching tasks at each stop. The course was driven three times, each time under a different condition: control, small breast size, or large breast size. Breast size was controlled with artificial breasts. Video software was used to evaluate belt fit throughout the tests.

Results: A majority of participants experienced poor belt fit during reaching tasks, but once they assumed normal driving posture afterwards, their belt returned to proper position during the breast conditions. Participants with shorter stature were observed to have more issues with proper belt fit during the testing conditions.

Conclusion: Researchers found that a combination of bodily characteristics, D-ring position, seat angle, and position of the seat buckle may contribute to poor belt fit in some individuals.

Enhancing ACL Tear Diagnosis Workflow by Integrating Classification, Image Segmentation, and Text Report Using Gen AI Models

Bowen Xia (The Harker School)

Faculty Mentor: Dr. Li Jin

Introduction: Knee joint injuries are prevalent in sports, with anterior cruciate ligament injuries being among the most common in athletes. Magnetic resonance imaging is a standard approach for visualizing and diagnosing ACL injuries. However, the complexity and volume of MRI data pose significant challenges for radiologists in identifying injuries. The advancement of artificial intelligence offers promising solutions to enhance ACL tear diagnosis.

Purpose: This research integrated AI to streamline and enhance ACL injury detection.

Methods: Utilizing the MRI knee injury dataset from Kaggle, the study combined three approaches: 1) a convolutional neural network to predict ACL tear, 2) Medical Segment Anything Model to segment MRI knee images and highlight potential areas of interest, and 3) GPT models optimized by integrating retrieval-augmented generation using both original and segmented images and related knowledge to improve the accuracy and relevance of the MRI report.

Results: Combining CNN results, MedSAM-segmented images, and GPT-generated reports provides doctors with richer information for informed decision-making.

Conclusion: The use of segmentation models can be more accurate in defining the extent and nature of knee injury. Future research should incorporate additional MRI sequences, such as coronal and axial views, to enhance the detail and accuracy of injury diagnosis.

Advancing Running-Related Injury Prediction with Transformer-Generated Synthetic Tabular Time-Series Data

Robinson Xiang (The Harker School)

Student Co-Authors: Bowen Xia

Faculty Mentor: Dr. Li Jin

Introduction: Running often leads to common injuries that present significant challenges for both professional athletes and recreational runners, compromising performance and health. Identifying the relationship between training intensity and running-related injury risk involves the development of predictive statistical models. Traditional machine learning algorithms have been employed for injury risk prediction, but these models encounter limitations such as scarcity and imbalance of high-quality time-series data, resulting in inconsistent predictive performance.

Purpose: To bridge this gap, the authors propose an innovative method that utilizes transformer architectures to generate synthetic tabular time-series data, enhancing real data for improved injury prediction.

Methods: Specifically, the study utilized Nvidia Megatron, a PyTorch-based framework for training large language models, to generate new rows representing time-series data to augment a panel dataset. Using a DCAE-DNN model for training, the authors compared prediction results for the same un-augmented test set with those using non-augmented data and Synthetic Minority Oversampling Technique.

Results: The result achieved 97.4% accuracy with a 0.814 AUC score, both surpassing those of the other two approaches.

Conclusion: This research is one of the first attempts to use large language models to generate data in kinesiology research. The innovative approach using transformer architectures to generate synthetic tabular time-series data significantly improved injury prediction accuracy, and future research should refine this method and apply it to other sports injuries.