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ORIGINAL RESEARCH

Athletic Training Students' Perspectives and Performance When Learning Online

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Context: Technology continues to change throughout the world, and higher education is not absent from the adjustment. Athletic training educators should adapt to online learning opportunities that enhance the curriculum for their students.

Objective: To explore athletic training students' thoughts and knowledge when learning through a distance education platform.

Design: Cross-sectional, mixed-methods survey.

Setting: Six professional postbaccalaureate athletic training programs.

Patients or Other Participants: A total of 55 second-year athletic training students.

Intervention(s): One-week asynchronous eLearning module focused on the background and use of telemedicine in health care.

Main Outcome Measure(s): Participants completed the technology acceptance model tool before and after the module to gather their perspectives about online learning. During the eLearning module, knowledge acquisition was assessed with quizzes. Finally, a transactional distance theory tool including 2 open-ended response items was delivered at the end of the eLearning module.

Results: We identified that participants had a low acceptance for technology at the onset of the study that improved after the eLearning intervention for the constructs of self-efficacy ($P = .010$) and perceived ease of use ($P \leq .001$) of eLearning technologies. The transactional distance tool highlighted that the facilitator and readings were helpful, which was also indicative of the scores on the module quizzes. We also identified benefits to eLearning from the student perspective, which included previous experiences, learning on their own time, and feelings that the module was productive to their growth as students. Some participants stated that the eLearning module presented too much work and was missing interaction, whereas others were neutral relative to the comparison between traditional and online learning.

Conclusions: Overall, the results of this study identified that technology acceptance and transactional distance are important components of online learning. Athletic training educators should educate learners regarding the differences in online education requirements.

Key Words: Graduate medical education, transactional distance, technology acceptance

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Athletic Training Students' Perspectives and Performance When Learning Online

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KEY POINTS

- With exposure to online learning, athletic training students improved their self-efficacy and perceived ease of use relative to accepting technology in the "classroom."
- Those with previous online learning experiences reported a decrease in self-efficacy after engaging in an online learning environment that focused on learner-learner, learner-facilitator, and learner-content instruction. There is an important balance between educator responsibility and learner engagement that ensures high-quality education in an online environment.
- Athletic training students perceived that online learning had benefits and limitations and/or reported feelings of neutrality (or no change), in that previous online learning experiences influenced their perceptions.

INTRODUCTION

As athletic training education continues to adapt and change, educators must explore their instructional design including modes and methods of content delivery. One of the most common adaptations occurring throughout the United States is the move from residential campus environments to online learning environments. However, health care education has been slow to adopt distance education due to the hands-on time necessary for skill acquisition.[1,2] Although it may be challenging and uncommon, it is necessary that instructors separate their preconceived notions and thoughts about distance education from those about evidence-based teaching practice to meet the needs of the current college student. Previous research exploring educators in allied health care professions identified that most faculty were unaware of their potential abilities teaching online especially when it came to hands-on skills.[3] For beneficial online learning experiences, regardless of the specific method, the content must be coherent and comparable with the rigor associated with traditional face-to-face instruction.[4] Distance education uses the Internet, 1-way and 2-way transmissions, audio/visual conferencing, and DVDs and CD-ROMs to deliver content with regular and substantive interactions between the learner and facilitator.[5] Faculty must examine their resistance to educating online and using these means to engage their learners in meaningful experiences.

It is interesting that athletic training education has considered adopting eLearning into the curriculum since 2002 when the educational standards were expanded, leaving some educators concerned about how the new clinical education requirements would be fulfilled.[6] Athletic training education, and higher education in general, has progressed and adapted since the 2002 article on eLearning examples in athletic training, which highlighted the use of learning management systems, e-mail correspondence, and threaded discussion boards.[6] Overall, the literature is supportive of digital devices and technology as an educational strategy with learning outcomes similar to that of traditional lecture courses.[7–10] However, the traditional lecture or laboratory course may be challenging during immersive clinical experiences that are now required during clinical education for professional athletic training programs. The Commission on Accreditation of Athletic Training Education has stated that educational experiences offered outside of the immersive clinical experience must not detract from the totality of care and the day-to-day nature related to the role of an athletic trainer. The language from the Commission on Accreditation of Athletic Training Education does not directly mention online or distance education systems, but with the nature of immersive experiences creating full work days and potential travel concerns for athletic training students to come to campus, a natural evolution would be effective distance education modules.

Previous research in athletic training has cited that Web-based modules were successful in improving knowledge and perceived importance of a topic to the learner.[11,12] In a previous study, Welch, Van Lunen, and Hankemeier[11] developed a Web-based tutorial comprising 10 modules designed to take approximately 20 to 25 minutes each over a 4-week period to teach the practicing clinician about the steps of evidence-based practice. Learner knowledge and perceptions of importance were compared with a control group that did not receive any formal education on the topic.[13] Knowledge improved for the intervention group, and the researchers observed that participants continued to implement their knowledge gains into clinical practice 6 months after the Web-based module intervention.[11,12] However, the cited study explored the role of Web-based modules for continuing education versus professional education. Continuing education is vastly different from professional education, even if delivered at the postbaccalaureate level to adult learners, due to being self-guided using informal activities[14,15]; in theory, this improves the likelihood that someone will engage with content in a more positive manner because they have self-selected the online course. However, there is a lack of data supporting or refuting the use of online modules, such as the continuing education Web-based modules, in professional athletic training education. Given that the vast majority of athletic training programs are delivered face-to-face, the profession has focused on improving the learning experiences in the classroom. With the inclusion of immersive clinical experiences into the curriculum, timely exploration of distance and online learning is needed to best appreciate what athletic training needs and how it should operate in this format to be successful. Therefore, the purpose of this study was to explore athletic training students' thoughts and knowledge when learning through a distance education platform; this was accomplished using a mixed-methods approach.

METHODS

Program Recruitment

At the onset of the study, 60 athletic training programs (ATPs) that were active and in good standing with the

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Table 1. Demographics of the Participants

Variable	Frequency, n (%)	Mean ± SD	Range
Age, y		25 ± 3	22–38
Generations, age in 2018			
X, 39–53 y	0 (0)		
Y.1, 29–38 y	5 (9.1)		
Y.2, 24–28 y	31 (56.4)		
Z, 3–23 y	19 (34.5)		
Sex			
Male	21 (38.2)		
Female	34 (61.8)		

Commission on Accreditation of Athletic Training Education were contacted. These programs were delivering their professional ATP at the postbaccalaureate level, had graduated a minimum of 1 cohort of students, and had course offerings in the fall term of 2018. From the initial contact list, 6 ATPs (10% participation rate) responded to the interest e-mail and agreed to include the components of the study in their curriculum for their athletic training students. After securing cooperation letters from the 6 ATPs, which included ATP self-selection of the educator and course that would work with the primary investigator (PI) throughout the study duration, ethics approval from the Institutional Review Board at Indiana State University was obtained. The learners had to be in their second year, and the ATP had to ensure the learners possessed the foundational knowledge of orthopaedic evaluation specific to the lower extremity. After selecting the course, the ATP educator and the PI identified a 1-week time frame between August and early November to integrate the eLearning module. The ATP educator included telemedicine as the topic of delivery on the course syllabus, rather than this unit being additional work on top of concurrent content. The 6 ATPs were mostly public institutions (n = 5) affiliated with National Collegiate Athletics Association Division I athletics (n = 5). The ATPs ranged in enrollment size (small [1000–3000] = 1, medium [10 000–30 000] = 3, large [30 000 or more] = 2), and community type (rural = 2, suburb = 1, metropolitan = 2, city = 1). All ATPs were represented in the final data set, with between 41% and 100% of students in their cohorts agreeing to participate in the study.

The learners were recruited to participate in the study via e-mail before the eLearning module implementation. A link to the informed consent and preintervention survey (Qualtrics, Inc, Provo, UT) were included in the body of the recruitment e-mail. All students in the program were required to complete the informed consent. The informed consent stated that all athletic training students had to complete the eLearning module as part of their academic program, but they had the ability to opt out of study participation.

Participants

In total, 77 athletic training students were recruited to participate. After the exclusion of athletic training students who wished not to participate or did not complete all parts of the intervention or outcome measures, 55 participants were included in the data analysis (71.4% completion rate). Demographics of the participants are included in Table 1. A total of 90.9% (n = 50) of the participants stated they had previously taken an online course in either their baccalaureate or postbaccalaureate studies; however, only 41.8% (n = 23) stated that the online course was related to athletic training.

eLearning Module

It is important for instructors in health care education to stay up-to-date on emerging practices that include technology. Authors[16] of a previous systematic review regarding educational tools noted that there is a lack of empirical research regarding the experiences and curricular design associated with telemedicine instruction. *Telemedicine* is the broad concept of health care delivery from a distance using technology. Currently, the practice of telemedicine is not common in athletic training, with even fewer athletic training programs integrating the concept into the curriculum. If athletic training students do not engage with technology in the classroom or in the athletic training facility, we propose that it would be unlikely they would adopt and integrate technology-based options in their future practice. This concept is based on social and translational learning theories, in that educators showing and modeling how to leverage technology to communicate across distances allows for athletic training students to move these similar concepts to patient care. Therefore, the eLearning module for this study was focused on the background and use of telemedicine.

The PI had both curricular and instructional design experience with online modules, as well as athletic training experience as a certified telehealth facilitator from an accredited telemedicine program. Using background from both experiences, the PI curated an eLearning module with background reading, supplementary materials, and self-curated content. The PI also had 2 external educators without training in telemedicine review the modules for delivery and flow. The eLearning module contained 5 separate units within the larger module, each with a different focus and learning objective. After the information was gathered, the eLearning module on telemedicine was designed using SoftChalk and consistent for all involved ATPs. The eLearning platform (SoftChalk LLC, Richmond, VA) opened with an overview including an introduction to the facilitator, time expectations (5–7 days with 5–10 hours of work), the overall tasks including time necessary to complete each module, and the learning objectives. Before the onset of the participants engaging with the eLearning module, an athletic trainer with 5+ years of experience who held a clinical doctorate in athletic training was asked to peer review the module for feedback related to the content, flow, and question order. There were minor edits made to the module, including the removal of some articles that were deemed unnecessary by the individual and grammatical changes to the module quizzes. Table 2 provides a full breakdown of the 5 modules and associated learning outcomes.

Procedures

After the eLearning module was provided via URL link to all the athletic training students, the ATP educator and PI agreed to switch roles for the course for the duration of the study. The switch required the ATP educator to replace traditional class time with the online module time frame to complete and address objectives, schedule, and activities. The switch also required the ATP educator to refer all learner inquiries related

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Table 2. Learning Objectives and Content for the eLearning Modules

Module	Learning Objectives	Content
1–Introduction	To define telemedicine and appreciate the components necessary for telemedicine encounters	• 2 peer-reviewed articles • 2 YouTube (Google LLC, San Bruno, CA) videos
2–Benefits of Telemedicine in Healthcare	To distinguish between the types of telemedicine available in health care	• 2 peer-reviewed articles • 1 non–peer-reviewed article • 1 YouTube video • 1 infographic
3–Ethical and Legal Practice	To consider the use of telemedicine in future clinical practice through the lens of ethical, legal, and regulatory practice	• 2 peer-reviewed articles • 2 non–peer-reviewed articles • 2 YouTube videos • 1 infographic
4–Telemedicine in Athletic Training	To explain how telemedicine may be incorporated in athletic training with respect to opportunities and challenges	• 3 peer-reviewed articles • 1 non–peer-reviewed article • 2 YouTube videos
5–Facilitating a Telemedicine Encounter	To identify the best practices in facilitating telemedicine encounters	• 2 peer-reviewed articles • 3 non–peer-reviewed articles • 2 authored video lectures • 2 YouTube videos • Question-and-answer session (Padlet, San Francisco, CA)

to the telemedicine module to the PI. This activity fell under the ATP educator's academic freedom, much like that of asking a guest lecturer to teach a series of classes face-to-face.

The PI provided contact information to answer any questions before and during the study and provided individual pseudonyms unique to each learner. The pseudonyms were used for all module quiz submissions to track the variables of interest throughout all parts of the study while maintaining the confidentiality of the participants' names. For those who wished to volunteer for this study, their surveys auto-generated the preintervention tool; regardless of study participation, all learners in the ATP received an e-mail on Sunday to initiate the 1-week eLearning module. The athletic training students completed information in the eLearning module at a self-directed pace with an expected deadline of Saturday to end the 7-day period provided for the module. The learners completed all module quizzes and assignment submissions through Qualtrics survey links embedded in the eLearning module. One week after the end of the eLearning module, the learners received the postintervention tool, via e-mail, which included the transactional distance theory tool with the open-ended responses.

Main Outcome Measures and Instruments

To answer the objectives of the study, data were collected from the participants before, during, and after the eLearning module. Participants completed the technology acceptance model (TAM) tool before and after the module to gather their perspectives on online learning. During the eLearning module, knowledge acquisition was assessed with quizzes delivered electronically. Finally, a transactional distance theory tool including 2 open-ended response items was delivered at the end of the eLearning experience.

Technology Acceptance Model. This study used the TAM tool derived from previous research as a means to collect preintervention and postintervention data.[17,18] The tool focused on eLearning and contained 17 items. The eLearning TAM tool sought to measure the constructs of (1) perceived ease of use (3 items), (2) perceived usefulness (3 items), (3) attitude (3 items), (4) behavioral intention (2 items), (5) self-efficacy (2 items), (6) subjective norms (3 items), and (7) system accessibility (1 item) using a 7-point Likert-type scale with anchors from *strongly agree* to *strongly disagree,* in which stronger agreements were indicated by a lower mean value. The TAM eLearning portion has been used in previous studies with acceptable measures of convergent (>0.70) and divergent (<0.85) validity for the factors and constructs of the tool, making it a viable tool for information system analysis.[18–20] The theoretical framework for technology use in health care is based on the blended theory of technology in health care, which was derived from the theory of planned behavior and the TAM.[18,21] This blended theory states that an individual will be likely to use and integrate technology into clinical practice if the platform is easy to use and exchange of information is present.[22] The TAM was originally designed to assess whether and how a user may interact with an information systems[23]; however, many iterations of the TAM have been developed for specific technology interfaces.

Transactional Distance Theory. To assess the transactional distance of the learning experience in this study, the authors modified a tool to fit the components of the telemedicine module and the delivery system. The tool, which was first used[24] in 2005 and subsequently edited,[25] provided the items relevant to the constructs of transactional distance respective to a module or specific lesson. Although the tool lacked published psychometric properties, the data provided reference values from previous research in postsecondary education and were supported by empirical research regarding the necessary components of transactional distance for research.[26,27] The transactional distance theory tool contained 17 items that sought to answer the interactions between the learner-learner, learner-technology, learner-instructor, and the learner-content, as related to the module. The items included a mix of Likert-scale, sliding-scale, and open-ended

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response items. The open-ended response items were coded using a qualitative approach for the athletic training students' perceptions of eLearning. The tool was included in the postintervention survey. The transactional distance theory, first explained by Moore,[28] states that when the level of interaction between the educator and learner decreases, the autonomy of the learner must increase. Previous research on different tools to measure transactional distance has elicited components necessary, yet educational research still lacks a best practice tool for this theory.[29–31] Most of the tools and surveys relative to transactional distance theory are respective to an entire course rather than a unit or module.

eLearning Module Quiz Scores. During the asynchronous eLearning module, the athletic training students completed a quiz or activity related to each module. The PI developed the quizzes, which were evidence-based from the content respective to each of the learning objectives for the 4 units in the eLearning module. For the data analysis, quiz scores from 4 of the modules were analyzed. The fifth module activity was excluded. It was a question-and-answer discussion board, meaning the learners could have a format for open virtual communication. As such, participation could be recorded, but it did lack the assessment portion necessary for knowledge scores because there were no correct/incorrect answers or responses for the module activity. The module quizzes ranged from 3 to 9 questions each. In addition to the correct/incorrect multiple-choice questions, Modules 1 and 2 contained open-ended response items that were not scored as correct or incorrect responses and were not included in the data.

Data Analysis

Quantitative Analysis. The TAM data collected at preintervention and postintervention were analyzed using descriptive statistics and paired sample *t* tests with follow-up analysis based on sex and previous online learning. Descriptive statistics included mean and standard deviation for each of the constructs on the basis of the normative value of negative ($\geq$3.0) and positive thoughts ($\leq$3.0) about technology. A 1-way analysis of variance was performed to analyze the TAM results on the basis of generational groups. The transactional distance tool data were analyzed using descriptive statistics including means, standard deviations, and frequencies on the data collected postintervention. Finally, the eLearning module quiz scores were auto-scored via Qualtrics using a score of 1 for a correct answer and a score of 0 for an incorrect answer. Combined data were entered into a custom spreadsheet program (Microsoft Excel 2016, Microsoft Corp, Redmond, WA) and analyzed in commercially available statistical software (SPSS Statistics for Windows, version 25.0; IBM Corp, Armonk, NY) with the *P* value set at .05, with follow-up analysis at the .01 level when appropriate for the TAM data.

Qualitative Analysis. To explore the student perceptions of distance learning held during and after the study, open-ended response items from the postintervention transactional distance tool survey were downloaded and analyzed using the consensual qualitative research (CQR) tradition. This method of qualitative analysis allows for the findings to be peer reviewed and checked by the members of the coding team to ensure trustworthiness of the data.[32] On the postintervention survey, the participants had 2 open-ended questions: "How do you feel that the distance-learning platform changed your ability to complete assignments?" (n = 55 responses) and a response box that allowed the participant to provide "other comments" (n = 18 responses) related to anything they experienced during the study period. The responses were coded for domains and categories that emerged regarding eLearning. The CQR analysis theory occurred in 4 progressive stages: (1) identifying initial core ideas, (2) extracting each domain from the core ideas, (3) triangulating the coded responses, including development of categories, of multiple analysts, and (4) establishing the frequency of data presented in the determined categories using a 3-member code team.[32] The code team independently reviewed the open-ended responses for both questions in their entirety. After reviewing the responses, the analysis team met and discussed initial core ideas. Once the core ideas were agreed upon, the code team derived the domains and categories.[32] Two members of the code team analyzed the first question in its entirety for all responses and assigned the data to a domain. After the coding of the first question, the code team reconvened to discuss coding until consensus was reached. A consensus version of the domains was used to recode the initial question and subsequent open-ended responses. The initial 2 members of the code team then coded all responses from both questions before moving to the next phase of the analysis. The coded responses were sent to the third member of the code team for review. The third member then coded, with discrepancies settled using a two-thirds vote of the code team to conclude the process. Finally, an external auditor performed the final check for trustworthiness. The external audit was performed by a qualified researcher and educator (qualifications included online instructor certification, telemedicine experience, and previous qualitative coding experience) assisting the analysis team.[32] The external auditor reviewed the coded data set to verify the domains and themes.

Table 3. Technology Acceptance Model Data

eLearning Constructs	Preintervention	Postintervention
System accessibility	2.91 ± 1.19	2.71 ± 1.21
Perceived ease of use*	3.33 ± 1.18	2.53 ± 1.12
Perceived usefulness	3.49 ± 1.32	3.26 ± 1.34
Attitude	3.39 ± 1.20	3.28 ± 1.37
Behavioral intention	3.51 ± 1.38	3.62 ± 1.57
Self-efficacy*	3.07 ± 1.17	2.67 ± 1.05
Subjective norms	3.44 ± 1.15	3.19 ± 1.31

* Denotes significant difference at $P \leq .05$.

RESULTS

Technology Acceptance Model

Table 3 provides the means and standard deviations for all participants measured at preintervention and postintervention. On the preintervention TAM tool, participants indicated negative acceptance for 5 of the 6 constructs about eLearning. At postintervention, the eLearning TAM tool construct score demonstrated more positive acceptance for system accessibility, perceived ease of use, and self-efficacy, but it still displayed negative acceptance scores for perceived usefulness, attitude, behavioral intention, and subjective norms. We identified significant differences between the preinterventions

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Table 4. Transactional Distance Theory

Variable	Frequency, n (%)
Time engaged with module	
Less than 3 h	14 (25.6)
3–5 h	20 (36.4)
6–10 h	18 (32.7)
11–15 h	2 (3.6)
16–20 h	0 (0)
Over 20 h	1 (1.8)
Helpfulness of the facilitator	
Very helpful	18 (32.7)
Helpful	24 (43.6)
No questions to ask	13 (23.6)
Not helpful at all	0 (0)
Question-and-answer session	
I posted	45 (81.8)
I did not post	10 (18.2)
Interaction in question-and-answer session	
I replied to a classmate	9 (16.4)
I did not reply to a classmate	43 (78.2)
There was nothing to reply to	3 (5.5)
Helpfuless of the question-and-answer session	
Very helpful/helpful	42 (76.4)
Not very helpful	8 (14.5)
Not at all helpful	3 (5.5)
Helpfulness of the background readings	
Very helpful	5 (9.1)
Helpful	41 (74.5)
Not very helpful	1 (1.8)
Not at all helpful	2 (3.6)

and postinterventions for the eLearning constructs of self-efficacy ($t_{54} = 2.689$, $P = .010$) and perceived ease of use ($t_{54} = 5.245$, $P \leq .001$), with the perceived ease-of-use construct being the only item that was significant at the 99% confidence interval.

We did not identify any significant differences ($P > .05$) by sex or generational groups when comparing preintervention and postintervention construct scores on the TAM tool. Finally, there was a significant difference for the self-efficacy construct at postintervention for those with (mean = 2.77 ± 1.05) and without (mean = 1.70 ± 0.45) previous online experiences ($t_{53} = 2.252$, $P = .029$). The data indicated that participants who had taken online courses before the study had lower self-efficacy at the end of the study than did new online learners who had stronger agreements in this construct regarding eLearning.

Transactional Distance

Overall, the participants stated they spent 10 ± 11 hours with the online learning module in its entirety, which is comparable to the 6 to 10 hours of planned work that was provided to the learners. Most participants (n = 40; 72.7%) stated they had enough time for the online learning module and did not need to talk to a live person face-to-face to complete it. Although there was a requirement from the parent course that all module assignments be completed as part of the relationship with the ATP, there were no consequences if the learner failed to complete the readings in the online modules. The lack of oversight resulted in 10.9% of the participants (n = 6) stating that they did not complete the readings. Most participants (n = 41; 74.5%) indicated that they did not search the Web for supplementary material. The participants felt the material in the online modules was neither difficult nor easy (n = 35; 63.6%), with a small number indicating it was easy (n = 15; 27.3%) or very easy (n = 1; 1.18%). Only 4 participants stated the material was difficult (n = 4; 7.3%), and no participants stated it was very difficult. Table 4 provides a full breakdown of the transactional distance reflections of the participants relative to time engaged, helpfulness of the facilitator, question-and-answer session, and background readings.

Student Perceptions

The codebook had 3 domains: benefits, limitations, and neutrality. The benefits domain included 3 categories: previous experiences, learning on their own time, and feelings that the module was productive to their growth as students. The previous-experience category alluded to a prior online or asynchronous encounter. The learning-on-their-own-time category highlighted time management and choosing to engage with the content as they wished. Finally, the productive category included concepts such as the content being helpful and interesting, and the platform was easy to use. The limitations domain of eLearning included workload and missing interaction or content. The workload category involved too much content or not enough time to complete the tasks. The missing interaction or content category focused on a limitation of eLearning regarding not having interaction among learners and/or the facilitator or a lack of information in the modules. The neutrality domain focused on a perception that no change resulted from the eLearning module. Selected important quotes from each category with frequency counts of each category from all responses (throughout the 4 open-ended items) are presented in Table 5.

Module Quiz Scores

The knowledge acquisition of the participants was derived from the 4 module quiz scores. The first module quiz focused on the background of telemedicine with a high mean performance score of 4.00 ± 1.16 out of 5. The module 2 quiz focused on the benefits of telemedicine with a mean performance score of 3.76 ± 1.26 out of 5. The module 3 quiz was the longest of the 4 quizzes, with a focus on ethical and legal practices, and had the lowest performance with a mean score of 6.33 ± 1.96 out of 9. Finally, the module 4 quiz was the shortest quiz and included an unscored open-ended response item and a virtual practice session. The content of module 4 focused on the performance of telemedicine and yielded a mean score of 2.13 ± 0.82 out of 3. Module 5 did not contain a quiz but provided a question-and-answer discussion board that was neither scored nor evaluated. The module quizzes, including the questions, correct answers, and frequency counts of correct answers are provided in Table 6.

DISCUSSION

The major findings of this study provide evidence that with exposure to online learning, athletic training students improved their self-efficacy and perceived ease of use relative to accepting technology in the "classroom." Moreover, those

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Table 5. Domains and Categories Relative to the Impact of eLearning

Domains and Categories	Supporting Quotes	Important Statements, No. (%)
Benefits–previous experiences	• "It was different, not like the distance learning classes I've taken previously. I am sure I would have been more interested if it were a class required for graduation." • "I don't feel like the distance posed a problem for me. It was very similar as an online course in which you have to rely on technology to communicate."	6 (10.9)
Benefits–learning on their own time	• "It made it easier to complete assignments by being able to do it from any location than having to be in person." • "It was beneficial because it was self-paced."	5 (9.1)
Benefits–productive	• "At the beginning of this, I had not even heard about telemedicine and was indifferent about its use. Now that I have gained familiarity with it, I can see myself using aspects of telemedicine in the future. The eLearning module was very helpful in increasing my knowledge about telemedicine." • "I really enjoy the distance-learning module. Being a visual learner I was able to understand the positives to the actual program telemedicine could help more patients than just athletes. It gives more insight on the program and reasoning on why some could benefit." • "The learning modules were helpful as they taught me what the graders would be looking for with my interaction. They also taught me how to properly perform a telemedicine encounter."	24 (43.6)
Limitations–workload	• "I feel distance eLearning can be time-consuming." • "Honestly, to do everything in a week, the modules were too much content for me. Despite being already busy with class assignment, etc, the module became a further burden to me. Telemedicine should definitely be the mainstream of medical care in the near future and it was a medical technology that I was really interested in, so I wanted to take more time to learn about it carefully." • "I just found the number of modules to be a bit excessive. The readings were repetitive. I learned the most from your videos."	11 (20.0)
Limitations–missing interaction or content	• "I personally need that face-to-face contact in a classroom, so having an online learning course was difficult for me to find time in such a busy schedule that is always changing." • "I feel like I didn't really know or understand how to work the system that well."	5 (9.1)
Neutrality	• "It didn't change my ability." • "I do not think my ability to complete the module was affected." • "It didn't really change my ability to complete my assignment, I was able to access the modules but maybe having to figure out how to move the robot was a little tough but other than that it wasn't too bad."	10 (18.2)

learners with previous online learning experiences reported a decrease in self-efficacy after engaging in an online learning environment that focused on learner-learner, learner-facilitator, and learner-content instruction. There is an important balance between educator responsibility and learner engagement that ensures high-quality education in an online environment. Athletic training students perceived that online learning had benefits, limitations, and/or reported feelings of neutrality (or no change), in that previous online learning experiences influenced their perceptions. Finally, knowledge acquisition did occur during the quizzes, demonstrating that the eLearning platform did result in educational gains respective to the topic.

Technology Acceptance Model

The participants in the study noted negative thoughts at preintervention for eLearning use, including system accessibility, perceived ease of use, perceived usefulness, attitude, behavioral intention, self-efficacy, and subjective norms.

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Table 6. Module Quiz Performance Scores

Module[a]	Questions and Correct Answer	No. Correct (55 Respondents), n (%)
1	• Match the type of telemedicine with the definition. Each choice will only be used once. *Remote Monitoring Telemedicine*	33 (60.0)
	• Match the type of telemedicine with the definition. Each choice will only be used once. *Synchronous Telemedicine*	46 (83.6)
	• Match the type of telemedicine with the definition. Each choice will only be used once. *Asynchronous Telemedicine*	43 (78.2)
	• According to the readings, telemedicine can reduce transportation time and cost for patients in rural areas. Approximately, how much of the United States population resides in rural areas? *20%*	47 (85.5)
	• How has telemedicine been beneficial for the United States Department of Veterans Affairs? *It reduces transportation needs*	51 (92.7)
2	• What does the "originating site" refer to in telemedicine? *The physical location of the patient, which may be the office of a practitioner, a hospital, a clinic, or even the patient's home*	47 (85.5)
	• Which of the following is not considered a benefit of telemedicine? *Decrease in compliance with treatment plan*	52 (94.5)
	• From the systematic review of patient satisfaction of telehealth, what was the most frequent factor from the compiled affinity matrix? *Improved outcomes*	43 (78.2)
	• One drawback from the literature regarding telemedicine implementation is the breakdown in the relationship between health professional and the patient. What factor is most likely the reason for this breakdown in the relationship? *Lack of formal training in using telemedical equipment*	28 (50.9)
	• Of the 6 "telemedicine barriers" noted in the (US) Western Governors' Association Telemedicine Action Report in 1994, which factor was believed to have been raised/worsened when the report was updated in 1998? *Problems with licensure and credentials because of conflicting interests regarding ensuring quality of care, regulating professional activities and implementing health policies*	37 (67.3)
3	• What is a state parity law in relationship to telemedicine? *A requirement for a private payer in that state to reimburse the same way they would for an in-person medical treatment*	44 (80.0)
	• Which of the following states has a requirement that telemedicine services must originate in hospitals or physician's office for Medicaid reimbursement? *Florida*	41 (74.5)
	• As of 2016, how many states require written, verbal, or an unspecified method of informed consent before a telemedicine encounter can be performed? *27*	46 (83.6)
	• Which of the following statements is true for the state of Texas regarding coverage and reimbursement? *A patient must have an in-person evaluation at least once within 12 months to continue telemedicine*	39 (70.9)
	• What do the states of Idaho, Missouri, North Carolina, and South Carolina prohibit to facilitate a telemedicine encounter? *Prohibit the use of "cell phone video" or "video phone"*	40 (72.7)
	• Which of the following is true of coverage and reimbursement in Pennsylvania? *Covers telemedicine in the home when provided by a caregiver*	41 (74.5)
	• According to the readings, which federal agency is most suited for regulating the telemedicine industry? *Federal Trade Commission*	33 (60.0)
	• What ethical principal is challenged when the traditional, face-to-face provider-patient interaction is replaced with virtual consultations in order to reduce costs? *Beneficence*	32 (58.2)
	• A health care provider in Indiana has been meeting with Matthew for postoperative follow-up care for his ACL [anterior cruciate ligament] surgery. Matthew is traveling for family vacation to Illinois when he notices some redness, swelling, and warmth at the incision site. What is the first concern that the health care provider should consider when choosing to meet with Matthew regarding his concerns? *State licensure to practice in Illinois*	32 (58.2)
4	• In the readings, what should a telemedicine facilitator or clinician do if the video "freezes" or the connection is lost? *Have a telephone nearby to call the patient to explain what is happening*	44 (80.0)
	• Which of the following statements is true for teleconcussion? *The standardized assessment of concussion tool was in 100% agreement between face-to-face encounters and telemedicine visits*	41 (74.5)
	• Which of the following conditions may an athletic trainer benefit from choosing to do a telemedicine encounter with a specialist for collaborative care decisions? *Impetigo*	32 (58.2)

[a] Module 1, Introduction to Telemedicine; Module 2, Benefits of Telemedicine in Healthcare; Module 3, Ethical and Legal Practice; Module 4, Telemedicine in Athletic Training.

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Although 90% of the participants had taken an online course at some point in their higher education careers, a smaller sample (n = 23) had taken a distance class related to athletic training. The previous lived experiences of the participants may have skewed their interpretations of eLearning, resulting in the negative planned behaviors at postintervention. This means that a student who had taken an online course and had an expectation for what this experience would be like had negative attitudes related to the technology.

At postintervention, the participants had higher acceptance for system accessibility, perceived ease of use, and self-efficacy, with behavioral intention as the lowest rated construct. *Behavioral intention* relates to the student's likelihood to engage in eLearning. The TAM for eLearning had previously determined that behavioral intention is highly influenced by self-efficacy and social norms.[33] *Self-efficacy* is considered a factor for adoption and use, specifically with computer literacy.[34] The instructor can play a role in the students' self-efficacy by providing directions, explanations, and promoting academic motivation to engage with the content.[35] On a follow-up analysis, a significant difference for the self-efficacy construct at postintervention for those with previous and no previous online experiences indicated learners with no previous online experience had stronger agreement regarding eLearning after exposure to the system. We suggest that online learning be thoughtfully integrated into a traditional (face-to-face) course or program before transitioning to online as the sole method of delivery because low self-efficacy toward previous online experiences may skew the learners to believe the course or program will be like that of their past experiences.

Potential athletic training students have a choice in selecting a program and university that matches their self-perceived learning styles, and educators have the academic freedom to deliver the content in the way they feel is the best fit for the course. This lends to the evolution of social norms of online and distance learning in athletic training.[4] Social norms have been identified as a strong predictor of future use, including perceived ease of use for eLearning.[21] The social norms of generations have been expressed and created a theoretical concept of the current college learner.

The role of instructors and learners in health care must adapt to the changing times of Generation Z learners (individuals born between 1995 and 2010).[36–38] Whereas much of the current research is on Millennials,[39] the current climate of postsecondary education at both the graduate and undergraduate level must be preparing for, rather than catching up to, Generation Z learners. Generation Z learners are decisive, connected, and global due to the use of social media platforms to connect individuals across the world.[36] Both Millennial (Generation Y.1 and Y.2) and Generation Z learners expect immediate feedback, most likely due to the instantaneous response capabilities of the Web.[37–41] They prefer to explore on their own yet lack the critical and independent skills for success in health care professions.[37–41] The use of technology by the general population has increased at an exponential rate in the last decade, neither society nor athletic training educators should falsely presume the term "digital native" applies to this whole group as a social normative behavior. *Digital Native* is a coined term for Millennials and Generation Z learners who grew up alongside technology and therefore imagine they have competence in this area. Generation Z learners are considered digital natives with extensive knowledge in Internet and digital literacy.[42] Our data support that there is no difference between the generations of learners, and we must assume that, regardless of age, all learners must be introduced to new topics and technology integration at the same level. This may also be true when exploring technology use for daily living versus for school because the translation of their comfort and competence in this area may fall short. However, we will have learners who have not been exposed to technology at all and will feel uncomfortable with the experience. Our role as educators is to influence the learner to adopt and ascertain the platforms necessary for the 21st-century individual.[42] This is far wider than health care and should include aspects of information technology and security in the learner's personal life. Although important to the ability to function in society, the learner as a health care student must be able to navigate the world of software and hardware, with the logical first step being exposed to distance education during their educational preparation. We strongly encourage educators to begin integrating online and eLearning experiences to improve the digital literacy of students. Future research should consider exploring how exposure to online experiences can improve digital literacy and whether it has an effect on other aspects of the future clinical skills such as health informatics technology and electronic health record use.

Transactional Distance and Student Perceptions

The methods deployed in the present study involved an asynchronous module, which may have limited learner-facilitator interaction. The learners in this study had more of a learner-content eLearning experience, but it was complemented with learner-learner and learner-facilitator interactions. During module 4, the learners had to interact with other learners (or nonlearners) in that they had to practice explaining a therapeutic exercise for one of their activities. During module 5, the learners had to watch a curated lecture with video streaming from the facilitator and to engage in a virtual question-and-answer session with the facilitator. Outside of these instances, the eLearning module was heavily rooted in learner-content interactions. The literature[13] states that adult learners prefer the online learning environment because it permits school-life balance while they gain a quality learning experience. With the shift of professional education from the undergraduate to the postbaccalaureate level in athletic training, program directors of ATPs should expect to enroll students who are 22+ years old rather than 18 to 22 years old. With adult learners, ATPs can expect a higher level of maturity and emotional intelligence that would allow for success in either a traditional or online learning environment.[43,44] However, distance education allows institutional autonomy and program-driven decision-making that meets the needs of the current learners.[45]

Previous research regarding online education has identified no difference in learning satisfaction and student performance between face-to-face and distance courses, meaning that online education is a viable option for content delivery.[46] The lack of a difference in learning outcomes for educational delivery methods seems to be true for clinical skills related to nursing and telemedicine.[7,47] The tenets of transactional distance theory, specifically the interactions among learner-

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content, learner-learner, and learner-facilitator, are the areas where educators can traverse the greatest gap in online delivery.[48] The transactional distance tool identified that the majority of students engaged with the learning module for either 3 to 5 hours or 6 to 10 hours, with most of these students feeling they had enough time to complete the module. Overall, the participants stated they spent about 10 hours on the experience in its entirety, which is comparable to the time expectation of planned work provided to the learners.

By way of contrast, the qualitative findings (Table 5) identified that previous experience with a distance course was noted as a benefit to completing the tasks from this study. Negative aspects of eLearning were the workload and missing information. The workload critique highlighted the number of articles and videos that they were tasked with reading and watching in 1 week. The best practices in online education design use a formula to convert the face-to-face class time to the expected equivalent hours for an online class. For each credit hour of the course, a student should expect 2 to 3 hours per week studying outside of class. If a student is enrolled in a 3-credit course, they should expect to study 6 to 9 hours per week, for a total of 9 to 12 hours of course content per week in the online environment when you replace 3 credit hours of face-to-face class time. The State of New York stated that regardless of credit-hour delivery, 1 college credit hour requires 15 hours of instruction and 30 hours of supplementary assignments during the term.[49] For a 3-credit course, this would equate to 135 hours in total per semester or split at 9 hours per week in a traditional 15-week term. We encourage educators to provide a time expectation, much like we did in this study, for each task (eg, readings, activities) to assist the learners in the planning, preparation, and completion of the module.

We believe we can identify that online learning and workload from a distance module may be perceived differently by the athletic training student. The workload discrepancy could be a construct of content delivery per parent course or the previous experiences of the student that influenced this perception of a lack of time and excessive workload of the study. It is key that learners and educators involved with online courses appreciate that distance education is neither easier than nor should it be delivered in the same format as a traditional face-to-face class. Andragogy and self-directed adult learning continue to highlight how students in postbaccalaureate programs can achieve their desired outcomes in online environments.[50] Unfortunately, most self-directed learners need facilitation and continued reinforcement, suggesting that considerations for the transactional distance theory are necessary for transformative learning to occur.[51] The data from our study specifically highlighted that a question-and-answer session, more commonly referred to a *discussion board*, may not be the most helpful avenue to encourage engagement with the learners, content, and facilitator. We must begin the transformative learning process of delivering instruction with technology including innovative models for interaction outside of discussion boards because students have expressed, they prefer to discuss in a live environment.[52]

Limitations

Although technology has created itself a place in the role of education, there are pitfalls that must be addressed. The ability to problem solve, troubleshoot, and quickly develop secondary material are all necessary qualities of an educator wishing to implement technology in the classroom. There is also the time requirement from the perspective of the educator to create the materials needed because evidence supports that it is more intensive than face-to-face instructional planning.[53] Educators must exhibit compassion and have a clear policy in the course syllabus if and when a student experiences technology issues. For example, if a student's computer crashes or the application fails, troubleshooting hotlines and tips should be easily accessible on learning management systems. If choosing to integrate this technology within a course or the entire curriculum, the duty falls on the ATP and educator to create a network of resources to solve potential problems. This is also true of a limitation in the present study with all the programs being delivered as traditional, face-to-face programs: The likelihood of specific exposure to SoftChalk, the online platform used for the modules, is low. The newness of these platforms may increase the uncertainty related to navigation leading to anxiety and time "wasted" to complete the assigned tasks. Finally, the pitfall of hiding behind technology has the same potential in face-to-face as well as distance education. The role of the student in digital civility when sharing information, posting, and critiquing online material, as well as when engaging with fellow learners, is critical.

Future Directions

Future research should explore the role of distance learning including full-semester online courses in athletic training. There is a lack of literature to support its use or drive instructional design specific to athletic training. Other peer programs, such as physician assistant studies and postprofessional athletic training programs, offer both hybrid and fully online accredited degrees while engaging simultaneously in clinical education. Efforts should be made to explore interested students' expectations for a professional ATP, including online education while simultaneously exploring educators' perceptions for creating online learning environments. The student and educator perceptions about online and distance learning will drive the market. This is timely as professional athletic training programs begin to implement immersive clinical experiences and may explore the role of online learning during these periods of clinical education. Finally, the purpose of this study focused on attitudes and cognitive learning. Future research should explore the ability for an athletic training student to acquire psychomotor skills that are necessary to accompany to the cognitive knowledge gains identified with our study.

CONCLUSIONS

The results of this study identified that athletic training students enrolled in professional, postbaccalaureate programs had low acceptance for technology that improved after the intervention for the constructs of self-efficacy and perceived ease of use related to eLearning. The transactional distance between the learner, content, and facilitator was not identified as a problem for engagement and success, with most participants expressing benefits to eLearning rather than limitations or neutrality in their open-ended responses, but it did identify that the workload of distance education platforms may be perceived differently from that of traditional face-to-face coursework. Educators should be mindful of course

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equivalence and social norms of athletic training coursework when introducing eLearning modules into their course and curriculum.

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