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ORIGINAL RESEARCH

Athletic Training Educators' Knowledge, Comfort, and Perceived Importance of Evidence-Based Practice

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Context: Before new strategies and effective techniques for implementation of evidence-based practice (EBP) into athletic training curricula can occur, it is crucial to recognize the current knowledge and understanding of EBP concepts among athletic training educators.

Objective: To assess athletic training educators' current knowledge, comfort, and perceived importance of evidence-based concepts.

Design: Cross-sectional survey design.

Setting: Online survey instrument.

Patients or Other Participants: 141 respondents (28.3% response rate) from a convenience sample of 498 athletic training educators.

Main Outcome Measure(s): Demographic information and knowledge, comfort, and perceived importance of 11 EBP concepts (definition of EBP, steps of EBP, reliability, validity, intra-class correlation coefficient, kappa coefficient, specificity, sensitivity, likelihood ratio, positive predictive value, negative predictive value) were obtained.

Results: Participants' overall EBP knowledge score was 64.4%. Characteristics associated with higher knowledge scores were terminal degree (69.92% ± 10.36, $P < .001$), hours of research per week (66.96% ± 12.61, $P = .029$), and hours of teaching-related tasks conducted per week (67.47% ± 12.48, $P = .002$). Overall EBP comfort was 2.37/4.0 ("uncomfortable"). Characteristics associated with higher comfort scores were terminal degree (2.51 ± 0.67, $P = .017$), hours of research per week (2.52 ± 0.69, $P = .025$), and EBP workshops previously attended (2.56 ± 0.66, $P = .002$). Overall EBP perceived importance was 3.34/4.0 ("important"). The characteristic associated with higher importance scores was hours of research per week (3.44 ± 0.45, $P = .009$).

Conclusions: Athletic training educators' current knowledge of EBP concepts needs to be improved. This study indicates that athletic training educators are uncomfortable with evidence-based concepts, yet believe it is important for curricular implementation. The future development of workshops and teaching models should focus on the varying levels of EBP concepts. Distinguishing modes for curricula implementation might also be an effective way to increase knowledge, comfort, and perceived importance levels.

Key Words: Education, didactic curricula, survey research

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Evidence-based practice (EBP) evolved over the late twentieth and early twenty-first century to become accepted practice for health care professions. Several professional organizations, including the Institute of Medicine, have refocused their standards to include a greater emphasis on the importance of evidence-based fundamentals as a means for improving the level of health care offered to patients.[1] However, one of the greatest barriers for adoption of EBP by clinicians is the lack of knowledge regarding proper integration into patient care.[2-3]

Evidence-based practice is most accurately described as the integration of the best available research evidence, patient values, and clinician expertise to make clinical decisions.[4-6] EBP is conducted in a five-step process: (a) defining a clinical question; (b) conducting a search of the most current literature; (c) critically appraising the literature; (d) relating the research back to the initial clinical question; and finally (e) evaluating the effectiveness of the outcomes.[4] Although some research evidence may shift health care away from traditional practice, evidence-based practice does not ignore the importance of the clinician's individual knowledge and clinical experience.[7]

As evidence-based practice becomes more prevalent in health care, it is important for all health care professionals to accept and implement this process in both their clinical practice and didactic education. Medicine, dental medicine, and nursing pioneered the adoption and use of evidence-based practice in everyday patient care. Over the past decade, accrediting bodies, governing agencies, and health care payers have emphasized the push towards EBP.[1,8,9] Furthermore, research on evidence-based practice has flourished in nursing education and other professional publications, as well as in newly developed journals dedicated to evidence-based practice in nursing (eg, Evidence-Based Nursing, Journal of Research in Nursing). Other health care professions, such as physical therapy, occupational therapy, and athletic training have also gradually begun to adopt and incorporate evidence-based practice into daily clinical practices and education.[10]

Athletic training educators are an important influence on the professional development of athletic training students in the classroom. Along with teaching responsibilities, however, educators are also often expected to fulfill administrative, scholarly research, service, and clinical practice demands.[11] Strenuous workloads, therefore, can make it difficult for an educator to find time to learn evidence-based practice concepts, as well as incorporate them into their curricula. Individuals with a terminal degree, or those in a tenure-track position, are more likely to conduct research on a regular basis,[12] and may be more knowledgeable of and accustomed to the critical thinking and analysis components used in evidence-based practice. Educators who have previously attended "evidence-based"-related workshops may also be more familiar with such components, and therefore may have a better understanding of EBP.

Evidence-based practice is crucial for the future advancement of the athletic training profession. Compared to a majority of other health care professions, athletic training lacks evidence-based publications identifying specific research to support its clinical practices.[6] Having scientific evidence may not only support the effectiveness of athletic training clinical methods, but may also provide a rationale for third-party financial reimbursement.[13] From an academic standpoint, it is important for educators in athletic training programs to continually prepare students with the proper skills that serve as the foundation for evidence-based practice.[14]

Creating a culture of evidence-based practice must start with didactic education. For EBP education to progress, faculty must be well versed in its fundamentals. However, athletic training educators' overall understanding of EBP principles has not been assessed. Recognition of athletic trainers' current knowledge, comfort, and perceived importance of EBP will help formulate new strategies and effective techniques to implement it into athletic training education curricula. Therefore, the purpose of this study was to determine athletic training educators' knowledge, comfort, and perceived importance of evidence-based practice concepts. We hypothesized that athletic training educators who held a terminal degree (eg, PhD, EdD), conducted more than five hours of research per week, or had previously attended "evidence-based"-related workshops would have greater knowledge, comfort, and perceived importance scores on the Evidence-Based Concepts for Clinical Practice Assessment (EBCPA). We also hypothesized that there would be no differences in knowledge, comfort, or importance scores based on weekly teaching-related tasks or patient care responsibilities.

METHODS

Participants

All registrants of the 2009 Athletic Training Educators' Conference (N=498) were solicited for participation in this study. One hundred and forty-one individuals responded to the pre-conference Evidence-Based Concepts for Clinical Practice Assessment and demographics questionnaire for a response rate of 28.3%. Subjects consisted of 62 male (age = 41.32 ± 8.92) and 79 female (age = 36.08 ± 7.91) athletic training educators. Subjects had an average of 9.81 ± 7.19 years of athletic training teaching experience. Demographics for the sample group are presented in Table 1. The Institutional Human Investigation Committee of Old Dominion University approved this study and consent was implied upon voluntary submission of the completed survey.

Table 1. Demographic Information (n = 141)

Demographic	n	%
Sex		
Males	62	44.0
Females	79	56.0
Terminal Degree		
Have	66	46.8
Do Not Have	75	53.2
Hours of Research Per Week		
More Than Five	68	48.2
Fewer Than Five	73	51.8
"Evidence-Based" - Related Workshop		
Have Attended	64	45.4
Have Not Attended	77	54.6
Hours of Academic Coursework Per Week		
More Than Forty	81	57.4
Fewer Than Forty	60	42.6
Patient Care on a Weekly Basis		
Conduct Patient Care	69	48.9
Do Not Conduct Patient Care	72	51.1

Instrumentation

Currently there are two survey instruments that have been used for the assessment of clinicians' evidence-based practice knowledge levels. The Berlin Questionnaire and the Fresno Test of Evidence-Based Medicine have both been found to be reliable and valid.[15,16] However, the Berlin Questionnaire contains scenario-based application questions to assess EBP knowledge among postgraduate medical physicians while the Fresno Test of Evidence-Based Medicine contains open-ended scenario-based questions to assess EBP knowledge among family practice residents and requires participants to use electronic databases to complete the survey. Therefore, due to the population being assessed as well as the manner of questions and level of knowledge required to successfully complete these surveys, they were deemed unsuitable for use in this research study. Thus the research team created an online survey utilizing Inquisite 8.0 Corporate Survey Builder (Catapult System Corporation, Austin, TX) to assess evidence-based practice knowledge levels among athletic training educators. Along with a knowledge section, The Evidence-Based Concepts for Clinical Practice Assessment included two calibration sections: comfort level and perceived importance. These variables were assessed to gain a more accurate perspective of athletic training educators' attitudes and beliefs towards the incorporation of evidence-based practice concepts within didactic curricula. Knowledge levels may not solely indicate whether or not these educators feel the subject matter is important or how comfortable they were with their responses (ie, low knowledge scores do not necessarily equate to low importance or comfort scores), therefore we incorporated a calibration component to the survey.

Knowledge

The knowledge section consisted of 20 multiple-choice questions evaluating 11 different evidence-based practice concepts: definition of EBP, steps of EBP, reliability, validity, intra-class correlation coefficient, kappa coefficient, specificity, sensitivity, likelihood ratio, positive predictive value, and negative predictive value. These questions were developed from information and recommendations available in the current literature as well as survey instruments used in other health care professions.[15,16] With permission, some of the knowledge questions were adopted from the Berlin Questionnaire and modified to apply to athletic training. Each question had one correct response and each participant's composite score in this section was calculated by awarding one point for the correct response and zero points for an incorrect response. Therefore, a higher knowledge composite score indicated a higher level of knowledge pertaining to the 11 evidence-based concepts.

Multiple-choice questions in the knowledge section were divided into two subsections consisting of nine foundational questions and 11 framing questions. Foundational questions included information pertaining to the introductory elements of the evidence-based practice process, literature searching, and critical appraisal, whereas framing questions evaluated components of EBP that require statistical application and understanding. Sample foundational survey questions for the knowledge section are provided in Table 2, and sample framing survey questions are presented in Table 3. Based on opinions from a panel of five experts, the 20 multiple-choice questions were additionally grouped into five smaller groups of 3-5 questions each. Each of these groups included 2-3 related evidence-based practice concepts. The evidence-based practice concepts group [EBPC] focused on the general evidence-based practice concepts including knowledge pertaining to the steps of EBP, levels of evidence, and gold standards for research study designs. The reliability and validity group [RV] included questions about interpreting reliability and validity, while the reliability coefficients group [RC] involved reliability coefficients such as intra-class correlation coefficients and kappa coefficients. The sensitivity, specificity, and likelihood ratio group [SSL] concentrated on sensitivity, specificity, and the interpretation of likelihood ratios. Finally, the predictive values group [PV] entailed questions pertaining to positive and negative predictive values. A visual representation of the instrument breakdown is provided in Figure 1. Total group and subgroup scores, as well as the composite knowledge score, were further normalized to percentages.

Table 2. Sample Foundational Survey Instrument Questions

4. Which of the following is considered the "gold standard" of experimental research design? (Choose one)
[ ] Case report [ ] Clinical observation
[ ] Prospective cohort [ ] Randomized controlled trial
8. Which statistical concept assesses a diagnostic test to determine its reproducibility? (Choose one)
[ ] Reliability [ ] Validity
[ ] Sensitivity [ ] Specificity

Table 3. Sample Framing Survey Instrument Questions

16. At the ABC University athletic training clinic, the prevalence of post-surgical ganglion cyst reccurrence is 30%. One hundred consecutive patients have been included in a study for a new non-invasive diagnostic test for detection of ganglion cysts. Of these 100 patients, 63 are recognized as truly negative (ie, truly free of a ganglion cyst). The number of false positive and false negative patients is identical. Which one of the 4 tables best describes this information?

A	**Gold Standard Positive**	**Gold Standard Negative**	
Test Positive	23	7	30
Test Negative	7	63	70
	30	70	100 Patients

B	**Gold Standard Positive**	**Gold Standard Negative**	
Test Positive	30	0	30
Test Negative	0	70	70
	30	70	100 Patients

C	**Gold Standard Positive**	**Gold Standard Negative**	
Test Positive	27	10	37
Test Negative	3	60	63
	30	70	100 Patients

D	**Gold Standard Positive**	**Gold Standard Negative**	
Test Positive	30	7	37
Test Negative	7	56	63
	37	63	100 Patients

Choose one:

[ ] Table A [ ] Table B

[ ] Table C [ ] Table D

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17. Which of the following terms combines sensitivity and specificity to indicate a shift in probability? (Choose one)

[ ] Likelihood ratio [ ] Positive predictive value

[ ] Negative predictive value [ ] Intra-class correlation coefficient

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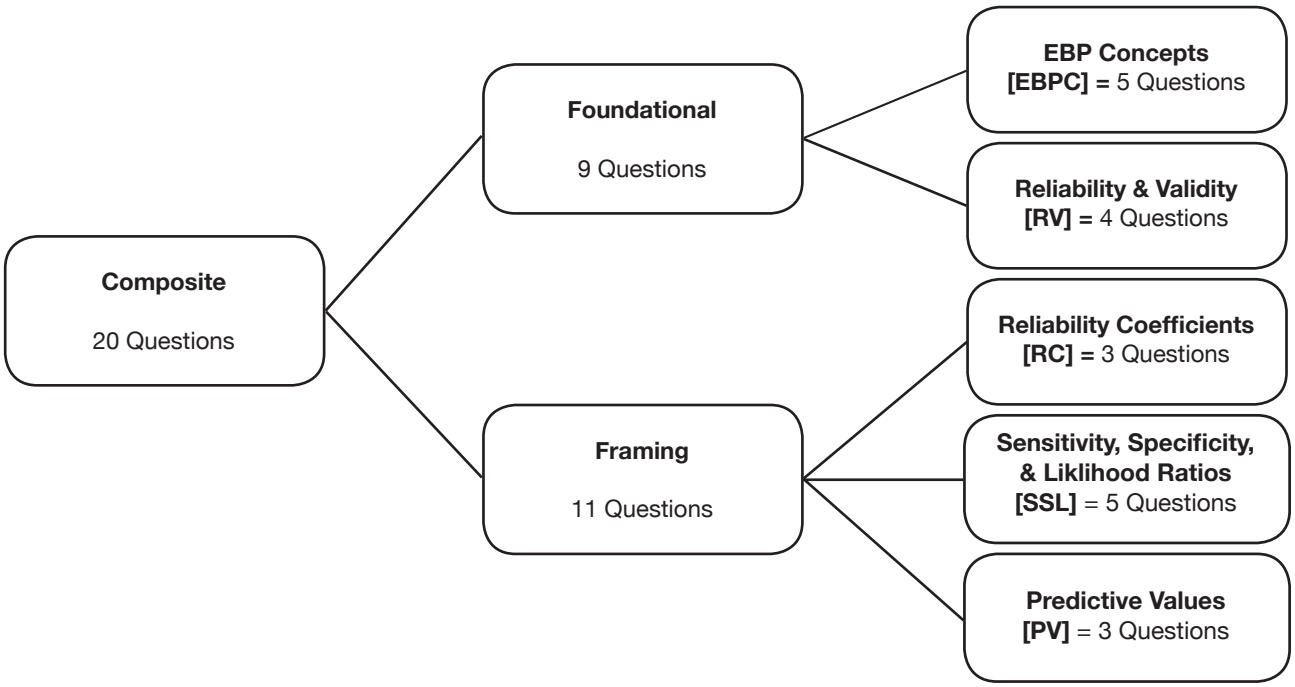

Figure 1. Survey Instrument Breakdown

Comfort

The comfort section consisted of 11 four-point Likert scale questions concerning the 11 evidence-based practice concepts. The comfort level questions asked if the participant was comfortable with their ability to implement each of the 11 concepts within didactic curricula. The participant had four ordered choices where a score of "1" indicated the participant was "very comfortable" while a score of "4" indicated the participant was "very uncomfortable." During the statistical analysis, the researcher reversed the scale and therefore converted each response so that a score of "1" indicated the participant was "very uncomfortable" and a score of "4" indicated the participant was "very comfortable." This reverse coding allowed the researcher to display that a higher comfort composite score indicated a higher level of comfort pertaining to the eleven evidence-based practice concepts. To coincide with the knowledge section, the comfort level questions were broken down into the same foundational versus framing groups as well as the five smaller subgroups. The evidence-based practice concepts in each of the comfort groups were matched to those included in the knowledge groups. Total group and subgroup scores in each comfort group and the composite comfort score were averaged and normalized to the comfort Likert scale where a 4 is the maximum score achievable.

Perceived Importance

The perceived importance section also included 11 Likert scale questions concerning evidence-based practice concepts. The perceived importance level questions asked if the respondent believed each of the 11 evidence-based practice concepts was important to implement within didactic curricula. To match the comfort Likert scale, the participant again had four ordered choices where a score of "1" indicated the participant believed the concept was "very important" and a score of "4" indicated the participant believed it was "very unimportant." This scale was also reversed during statistical analysis and each response was converted to match the comfort scores. Furthermore, the perceived importance level questions were also broken down into the foundational versus framing subsections, as well as the five smaller groups, and were matched by the evidence-based practice concepts as previously described. Total group and subgroup scores in each perceived importance group and the composite perceived importance score were averaged and normalized to the importance Likert scale for a maximum achievable score of 4.

Along with the EBCPA, participants were also asked to complete a demographics questionnaire. This questionnaire included 34 questions requesting information related to gender, age, ethnicity, academic work, clinical practice, and research as well as information pertaining to their associated athletic training education program (Table 1).

Survey Analysis

Once the EBCPA survey was fully developed, a panel of five experts assessed the instrument for content validity. The survey tool was regarded to be a valid instrument including a representative sample of questions to appropriately assess EBP knowledge, comfort, and perceived importance levels; therefore, the research team proceeded to conduct a test-retest reliability assessment. Reliability percent agreement of the 20 knowledge questions was determined via pilot testing with a group of six athletic training educators not attending the 2009 Athletic Training Educators' Conference. Each participant of the pilot sample completed the knowledge questions twice; the retest assessment was completed three weeks following the initial assessment. The percent agreement for all questions included on the final instrument was found to be substantial with an average of 76.67% and a range from 50% to 100%. Three out of the twenty knowledge questions had a percent agreement of 50% ("moderate agreement"). Percent agreement focuses on identifying the strength of agreement from one session to the next; however, it does not account for correct answers or responses due to chance.[17] Individuals who chose incorrect responses often chose a different incorrect response during the second assessment, therefore affecting the percent agreement rate. Due to the substantial percent agreement of the knowledge section, no modifications were made after the reliability analysis was conducted.

Procedures

A list of the names and contact information of all the registrants for the 2009 Athletic Training Educators' Conference was obtained from the administrative staff associated with the Educators' Conference. Conference registrants were sent a letter via email requesting participation in the research investigation. The letter contained a description of the overall purpose and importance of the research study, the estimated time to complete the survey, the URL hyperlink directing them to the survey webpage, and a request for their participation. The email also provided contact information of the researcher for comments or questions that concerned either the research study or the survey instrument.

Once the participant completed the survey (indicated by clicking "submit"), the information was automatically sent to the Old Dominion University database system. Participants' responses were generated in Statistical Package for Social Sciences (version 16.0, SPSS Inc. Chicago, IL) and then matched with a file coding system to maintain participant confidentiality. Data collection occurred over a three-week period beginning in late January 2009 and ended prior to the Educators' Conference at the end of February 2009. Follow-up emails were sent to the participants once every week to thank those who had completed the survey instrument while simultaneously reminding those who had not yet responded.

Data Analysis

Statistical Package for Social Sciences for Macintosh (version 16.0, SPSS Inc. Chicago, IL) was used to calculate the statistical components. Descriptive statistics were used to calculate the means, standard deviations, and frequencies. One-way analysis of variances (ANOVA) and repeated measures ANOVAs were used to detect knowledge differences between groups for the data associated with terminal degree, hours of research, "evidence-based"-related workshops, hours of teaching-related tasks, and hours of patient care. Mann-Whitney U tests were used to

detect comfort and importance differences for the ordinal data associated with these variables. The significance level was set at $P \leq 0.05$.

RESULTS

We had a response rate of 28.3% (141 out of 498 survey recipients responded). Overall, athletic training educators attained composite knowledge scores of 64.90% ± 13.29. Educators denoted they were generally "uncomfortable" with the specified evidence-based concepts (2.38/4.0 ± 0.65), yet indicated that the EBP concepts were "important" for curricular implementation (3.34/4.0 ± 0.48). Descriptive statistics (mean ± SD) for all independent variables are presented in Table 4.

Educators with a terminal degree achieved higher composite knowledge scores than those without a terminal degree ($F_{1,139} = 23.96$, $P < .001$). Terminally degreed educators also felt more comfortable with the evidence-based concepts than individuals without a terminal degree ($z = -2.381$, $P = 0.017$). More specifically, these individuals felt more comfortable with the framing questions included in the RC ($z = -3.113$, $P = .002$) and SSL ($z = -1.982$, $P = .047$) groups. No differences were demonstrated for curricular implementation importance with regard to terminal degree.

Educators conducted varying hours of research, teaching-related tasks, and patient care per week. Educators who conducted more than five hours of research per week achieved higher composite knowledge, comfort, and importance scores than educators who did not. These individuals reported higher comfort levels in both the foundational ($z = -2.012$, $P = .044$) and framing ($z = -2.597$, $P = .009$) subsections; specifically in the EBPC ($z = -1.987$, $P = .047$) and RC ($z = -4.585$, $P < .001$) groups. Furthermore, educators who conducted more than five hours of research per week achieved significantly higher importance scores in the RC ($z = -2.974$, $P = .003$) and SSL ($z = -2.322$, $P = .020$) groups. Educators who conducted more than 40 hours of teaching-related tasks per week achieved higher composite knowledge scores, but had no significant differences from educators who conducted fewer than 40 hours per week in regard to composite comfort and importance scores. Finally, there were no significant differences for knowledge, comfort, and perceived importance among athletic training educators who conducted or did not conduct patient care on a weekly basis.

Educators who had previously attended "evidence-based"-related workshops did not have significant differences in composite knowledge and perceived importance scores when compared to educators who had not; however, they were significantly more comfortable with the 11 evidence-based concepts. More specifically, individuals who had previously attended "evidence-based"-related workshops reported they felt more comfortable with concepts included in the EBPC ($z = -2.466$, $P = .014$), SSL ($z = -2.484$, $P = .013$), and PV ($z = -2.019$, $P = .044$) groups.

DISCUSSION

Athletic training educators' knowledge of evidence-based practice concepts vary from a basic understanding to more advanced comprehension. As assessed on the Evidence-Based Concepts for Clinical Practice Assessment, athletic training educators' composite knowledge scores averaged 64.4%. Educators performed better on the foundational (EBPC & RV) questions than on the framing (RC, SSL, PV) questions; therefore, the more complex the evidence-based concepts became, the lower the scores were on the EBCPA. In a similar study, Fritsche et al[15] examined baseline EBP knowledge scores among a group of health professionals and found mean knowledge scores via the Berlin Questionnaire to be 6.3 out of 15 (42%). Additionally, Nicholson et al[16] evaluated a sample of health care clinical educators and found their baseline knowledge scores via the Fresno Test to be 57.9%.

After a baseline assessment was obtained via the Berlin Questionnaire, health professionals completed a 3-day evidence-based course and improved their EBP knowledge scores by 57% ($P < 0.001$).[15] Furthermore, following the baseline knowledge assessment via the Fresno Test, clinical educators completed nine evidence-based workshops over a one-year period; post-workshop analyses reported knowledge scores to be 78.4%, indicating a 20.5% increase ($P < 0.001$).[18] Therefore, although the baseline knowledge scores of athletic training educators may look similar to these other studies, it is important to point out that the data collected from the other health professions have since then been followed with workshops, short-courses, and programs, along with post-intervention analyses. Additionally the questionnaires utilized in these studies are more complex in content (ie, open-ended, scenario-based application questions) than what was used within our research.[15,16] Therefore, athletic training educators' current EBP knowledge scores are falling behind other health care professionals and must be improved.

As the fifth edition of the *NATA Educational Competencies* incorporates evidence-based practice concepts,[19] athletic training students will be required to understand these concepts and feel confident in implementing them within clinical practice. However, before students can be expected to comprehend evidence-based concepts, it is important to determine educators' comfort levels with their ability to implement such concepts into their didactic curriculum. Composite comfort scores assessed within this study averaged 2.4 out of 4, indicating that the majority of athletic training educators felt "uncomfortable" with their content knowledge of the 11 evidence-based concepts. Educators felt slightly more comfortable with the foundational questions such as reliability and validity. However, comfort levels decreased with more complex concepts, particularly with reliability coefficients and predictive values. Similar baseline comfort scores (2.8 out of 5) were found in health care clinical educators who were asked to assess their confidence levels of online skills for access to medical knowledge and support of EBP teaching.[18] However, the baseline comfort assessment for these clinical educators was followed with numerous EBP workshops; post-intervention comfort scores were reported to be 3.3 out of 5 ($P < 0.001$).[18]

Along with knowledge and comfort, it is also important to appraise athletic training educators' beliefs towards the importance of implementing particular evidence-based concepts within athletic training coursework. Educators reported that the 11 evidence-

Table 4. Composite Knowledge, Comfort, and Importance Scores

Variable	Knowledge (Mean ± SD)	*P* Value	Comfort (Mean ± SD)	*P* Value	Importance (Mean ± SD)	*P* Value
Terminal Degree		0.001		0.017		0.370
Have	69.92 ± 10.36		2.51 ± 0.67		3.39 ± 0.46	
Do Not Have	59.60 ± 14.11		2.27 ± 0.53		3.29 ± 0.50	
Hrs of Research/Week		0.029		0.025		0.009
More Than Five	67.06 ± 12.67		2.52 ± 0.69		3.44 ± 0.45	
Fewer Than Five	61.99 ± 13.84		2.25 ± 0.58		3.24 ± 0.49	
"Evidence-Based" Workshop		0.087		0.002		0.752
Have Attended	66.56 ± 13.62		2.56 ± 0.66		3.36 ± 0.41	
Have Not Attended	62.66 ± 13.19		2.33 ± 0.59		3.32 ± 0.53	
Hrs of Teaching Tasks/Week		0.002		0.504		0.901
More Than Forty	67.47 ± 12.48		2.43 ± 0.69		3.34 ± 0.48	
Fewer Than Forty	60.33 ± 13.80		2.31 ± 0.59		3.33 ± 0.48	
Patient Care on a Weekly Basis		0.211		0.496		0.139
Conduct Patient Care	62.97 ± 14.07		2.41 ± 0.62		3.28 ± 0.46	
Do Not Conduct Patient Care	2.35 ± 0.68		2.35 ± 0.68		3.40 ± 0.50	

based concepts evaluated were "important" for implementation; composite perceived importance scores averaged at 3.3 out of 4. Interestingly, educators believed the more framing evidence-based concepts were just as important for implementation as the basic foundation concepts. In a similar assessment of physical therapists' attitudes and beliefs towards EBP, it was found that 90% of the respondents believed evidence-based practice concepts were important and necessary.[3] It is evident that athletic training educators, along with other health care professionals, believe EBP is a necessary component for the enhancement of health care.

Enhanced Knowledge and Appreciation for Statistics

We hypothesized that athletic training educators with a terminal degree would have higher knowledge, comfort, and perceived importance scores on the Evidence-Based Concepts for Clinical Practice Assessment than athletic training educators without a terminal degree. We found that educators with a terminal degree achieved significantly higher composite knowledge scores and composite comfort scores; however, no difference in importance scores between the two groups was found. More specifically, educators with a terminal degree felt more comfortable with the framing evidence-based concepts, particularly the reliability coefficients, sensitivity, specificity, and likelihood ratios.

We also hypothesized that those athletic training educators who spend more than five hours per week on research would achieve higher scores on the knowledge, comfort, and importance sections of the survey. We found that educators who conducted more than five hours of research per week scored significantly higher composite scores on the knowledge section as well as higher composite scores on the two calibration sections. These educators felt more comfortable with both the foundational and framing subsections, particularly the evidence-based practice concepts and reliability coefficient sections. They also regarded the reliability coefficients, sensitivity, specificity, and likelihood ratios to be of greater importance for implementation than individuals who did not conduct more than five hours of research per week.

Generally, earning a terminal degree includes substantial coursework in statistical analyses, and often requires a doctoral student to conduct research on a regular basis.[12] Doctoral education programs typically include more courses in statistical concepts than CAATE-accredited professional or NATA-accredited post-professional programs, therefore giving the individual greater skill practice in data synthesis, breakdown, and critical appraisal. Furthermore, individuals with a terminal degree may often be in a position that requires continual research publications for promotion and tenure.[10,12,20] Due to the increased focus on statistical processes, individuals with a terminal degree and/or those who conduct research on a weekly basis are more likely to have a better understanding of the fundamental evidence-based concepts, and therefore perform better on the Evidence-Based Concepts for Clinical Practice Assessment. Similarly, we would expect to find that these individuals believe the incorporation of EBP concepts into the curriculum is more important.

"Evidence-Based" Related Workshops

In regard to "evidence-based" related workshops, we hypothesized that athletic training educators who had previously attended "evidence-based"-related workshops would demonstrate higher knowledge, comfort, and importance scores. In regard to overall knowledge scores, there were no significant differences found between the two groups. However, athletic training educators who had previously attended EBP workshops had significantly higher composite comfort scores. Furthermore, these individuals reported significantly higher comfort scores for the evidence-based practice concepts group, as well as the framing groups of sensitivity, specificity, likelihood ratios, and predictive values.

Finally, although no significant differences were found for composite importance scores, athletic training educators who had previously attended EBP workshops indicated significantly higher importance scores for the fundamental evidence-based concepts.

Several "evidence-based"-related workshops have been made available to athletic trainers at both the district and national levels over the past several years.[21] However, the majority of these workshops are introductory and solely focus on what evidence-based practice is and how it is needed in athletic training to help promote and further enhance the profession. While advanced-level workshops detailing higher-level statistical concepts are available, very few suggest ways to carry this knowledge over into the classroom. Although workshops typically do not change a clinician's daily practices,[22] they have been found to change attitudes and perceptions.[23]

Workload Hours Per Week

It was hypothesized that there would be no significant differences in knowledge, comfort, and perceived importance between athletic training educators who conduct more than 40 hours of teaching-related tasks per week and those who conduct fewer than forty. Contrary to our initial hypothesis, educators who conduct more than 40 hours of teaching-related tasks per week had significantly higher composite knowledge scores. However, there were no significant differences revealed in either comfort or importance sections of the instrument, which supports our initial hypothesis. In addition, we also hypothesized that there would be no significant differences in knowledge, comfort, and importance scores between athletic training educators who performed patient care on a weekly basis and those who did not. The findings support our initial hypotheses in that there were in fact no significant differences revealed in any of three survey sections assessed.

Athletic training educators are often required to balance their workload between scholarship, service, clinical responsibilities ,and teaching-related tasks (eg, mentoring and advising students, curriculum preparation, in-class instruction) as well as other administrative responsibilities.[11,24,25] Although further research needs to be conducted to specify how these educators classify teaching-related tasks, individuals who spend more than 40 hours per week may typically be more likely to examine research more frequently in order to fulfill their expected tasks. Individuals who spend fewer than 40 hours per week on teaching-related tasks generally have other responsibilities occupying their time, such as duties in the clinical setting. Previous literature indicates that barriers to learning and implementing EBP concepts in the clinical setting include lack of time, limited access to resources, and self-confidence.[3,26] Thus, athletic training educators, as well as clinicians, may carry extremely full workloads that prevent them from taking the time to learn evidence-based practice concepts as well as discover ways to implement them into their already demanding schedules.

EBP Implementation

While the assessment of the effects of the independent variables on evidence-based practice knowledge, comfort, and perceived importance scores within this study are important, the larger focus must remain on the global issues of EBP implementation within the athletic training profession. Overall, the main goal of this health care profession is to improve patient care.[27] However, such improvements require that treatment plans and clinical decisions are based on evidence and proven to be effective, timely, and cost efficient for the patient and clinician. To do so, we must produce clinicians who will routinely use evidence-based concepts during their search and appraisal of research literature for the optimal treatment methods and interventions for each patient or problem. Unfortunately, without consistent implementation of EBP into didactic and clinical athletic training education, such clinicians may never be available.

Interestingly, many athletic training educators are already implementing the tools necessary for evidence-based practice without realizing it. Problem-based learning, a teaching strategy that has been incorporated into many athletic training education programs, allows students to enhance their critical thinking and problem solving skills—two tasks essential for the evidence-based clinician.[28] With problem-based learning and various other active-learning strategies embedded into the curriculum, transformations to incorporate evidence-based concepts should be relatively easy. To further add to the simple transition, many athletic training education programs have already begun to implement research methods courses into the curriculum. Such classes also augment a student's critical thinking ability, as well as provide a basic understanding of some of the important statistical concepts within EBP. Critical thinking and analysis concepts, therefore, are crucial for the fundamental growth and development of an evidence-based clinician, and are imperative for inclusion within the classroom. Educators should not only ensure evidence-based practice concepts are included into the curriculum, but also shift critical thinking and analysis skills to the early professional program level, so that students will have more time to digest and incorporate statistical concepts and critical thinking skills into their developing practices.

Limitations

Certain limitations within this study may have affected the results. To begin, the participants in this study were not a random sample of the population. Athletic training educators registered for the 2009 Athletic Training Educators' Conference were assessed; therefore the participant group was a sample of convenience. Additionally, the length of the EBPCA may have inhibited a conference registrant's voluntary completion of the survey. The instrument consisted of 20 multiple-choice questions, 22 Likert scale questions, and 34 demographic questions. Estimated time for completion was approximately 30 minutes. The demanding schedules of athletic training educators may not have precluded completion of the EBPCA prior to the conference.

CONCLUSIONS

The purpose of this study was to determine the knowledge, comfort, and perceived importance levels of evidence-based concepts by athletic training educators. The key information presented by this study provides a baseline of athletic training educators' current knowledge, comfort, and perceived importance of evidence-based practice. This baseline is particularly important to identify the direction of and need for further research. Considering the results of this study, there is a definite need to educate athletic training educators in regards to evidence-based practice concepts, with specific focus placed on distinguishing strategies for implementation into didactic curricula.

Athletic training educators and clinicians believe evidence-based practice is a necessary component to incorporate into the profession.[13,29] Currently, focus is slowly shifting away from the basics of what evidence-based practice entails towards ways to facilitate the implementation of EBP into education.[18] However, the knowledge, comfort, and perceived importance levels for EBP implementation must steadily increase before athletic training can be considered an evidence-based profession. Future research should examine a larger population of athletic training didactic and clinical educators and athletic trainers who are not affiliated with accredited professional or post-professional athletic training education programs. Additionally, evidence-based practice teaching modules should be developed for implementation into athletic training coursework.

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