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Use of Evidence-Based Practice Among Athletic Training Educators, Clinicians, and Students, Part 1: Perceived Importance, Knowledge, and Confidence

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Context: Although evidence-based practice (EBP) has become more prevalent, athletic trainers' perceptions of importance and knowledge of these concepts and their confidence in EBP are largely unknown.

Objective: To assess perceived importance and knowledge of and confidence in EBP concepts in athletic trainers in various roles and with different degree levels.

Design: Cross-sectional study.

Setting: Online survey instrument.

Patients or Other Participants: The survey was sent to 6702 athletic training educators, clinicians, and postprofessional students. A total of 1209 completed the survey, for a response rate of 18.04%.

Main Outcome Measure(s): Demographic information and perceived importance and knowledge of and confidence in the steps of EBP were obtained. One-way analysis of variance, a Kruskal-Wallis test, and an independent-samples *t* test were used to determine differences in scores among the demographic variables.

Results: Athletic trainers demonstrated low knowledge scores (64.2% ± 1.29%) and mild to moderate confidence (2.71 ± 0.55 out of 4.0). They valued EBP as moderately to extremely important (3.49 ± 0.41 out of 4.0). Perceived importance scores differed among roles (clinicians unaffiliated with an education program scored lower than postprofessional educators, $P = .001$) and highest educational degree attained (athletic trainers with terminal degrees scored higher than those with bachelor's or master's degrees, $P < .001$). Postprofessional athletic training students demonstrated the highest total EBP knowledge scores (4.65 ± 0.91), whereas clinicians demonstrated the lowest scores (3.62 ± 1.35). Individuals with terminal degrees had higher ($P < .001$) total knowledge scores (4.31 ± 1.24) than those with bachelor's (3.78 ± 1.2) or master's degrees (3.76 ± 1.35). Postprofessional educators demonstrated greater confidence in knowledge scores (3.36 ± 0.40 out of 4.0) than did those in all other athletic training roles ($P < .001$).

Conclusions: Overall knowledge of the basic EBP steps remained low across the various athletic trainers' roles. The higher level of importance indicated that athletic trainers valued EBP, but this value was not reflected in the knowledge of EBP concepts. Individuals with a terminal degree possessed higher knowledge scores than those with other educational preparations; however, EBP knowledge needs to increase across all demographics of the profession.

Key Words: athletic training setting, educational preparation, clinical practice

Key Points

- Athletic trainers valued the concept of evidence-based practice and recognized its importance to the profession.
- However, their level of knowledge about evidence-based practice and their level of confidence in that knowledge were both low.
- Evidence-based practice should be taught not only in the educational curricula for athletic training students but also to practicing clinicians.

In 2003, the Institute of Medicine released a report entitled "Health Professions Education: A Bridge to Quality" that cited evidence-based practice (EBP) as 1 of 5 essential competencies all health care professionals should possess.[1,2] In addition to EBP, this report suggested competencies in providing patient-centered care, working in interdisciplinary teams, applying quality improvement, and using informatics.[2] Evidence-based practice is believed to be a method of professional practice that synthesizes the best research evidence, patient values, and clinicians' expertise.[3] This increased focus on EBP in the health care professions has led to the development of EBP in the profession of athletic training. The commitment of the National Athletic Trainers' Association (NATA) to promoting EBP has been evident through grant funding for evidence-based research, inclusion of strength-of-recom-

mendation grades in NATA position statements,[4–6] and a more focused emphasis on EBP in the fifth edition of the NATA *Educational Competencies*.[7]

This focus on EBP marks a shift in thinking among health care professionals from an emphasis on decisions based on tradition and opinion to actions based on data-driven, clinically relevant research. For clinicians and educators in athletic training to make this shift, they should be able to (1) formulate relevant clinical questions, (2) efficiently search for the best research evidence, (3) evaluate and assess the evidence, (4) apply the research evidence to their patient population, and (5) evaluate and understand how the patient's goals and values contribute to patient care.[8–10] However, one of the greatest barriers to EBP implementation in athletic training[11,12] and other health care professions[13–15] is clinicians' perceived lack of knowledge of how EBP can be properly and effectively implemented into patient care.

The focus on EBP in patient care is crucial to advancing athletic training.[16] Although more evidence-based publications and initiatives are available within athletic training than in the past, information to support current clinical practice is still limited.[7,9,17,18] If athletic trainers (ATs) are to be considered for third-party reimbursement, the profession will need to demonstrate effectiveness and scientific support for our treatments and improved patient outcomes.[7,19,20] Although athletic training educators can instill the need for EBP in current and future students, clinicians will also need to advance their EBP knowledge in order for the profession to progress. Limited research has been conducted to assess the current knowledge level of ATs as to EBP. Regardless of knowledge level, a clinician's comfort with EBP plays a large role in whether his or her behavior changes.[13,21] Understanding the present perceived importance, knowledge, and confidence of ATs in a variety of settings will help identify the current state of EBP in athletic training. This information will then provide a starting point for improving education and promoting changes in clinical practice.

Therefore, the purpose of our study was to determine the perceived importance and knowledge of and confidence in the basic EBP steps for athletic training clinicians, educators, and students. We developed several hypotheses: (1) ATs with terminal degrees and postprofessional educators would demonstrate greater perceived importance, knowledge, and confidence scores on the Evidence Based Concepts Assessment (EBCA); (2) clinicians not affiliated with an education program would demonstrate lower perceived importance of EBP concepts than ATs in all other roles; (3) ATs who had studied EBP in a workshop for clinical preceptors or as part of their educational training and those who had attended an EBP workshop or tutorial in the last year would demonstrate higher knowledge scores than who had not; (4) the relationships between perceived importance, composite confidence, and total knowledge score would be moderately to strongly positive; and (5) the relationships between years of athletic training experience and both total knowledge score and perceived importance would be moderately to strongly negative.

METHODS

Participants

Census sampling of undergraduate professional athletic training education program directors, clinical preceptors, athletic training clinicians not associated with education programs, postprofessional athletic training educators, and postprofessional athletic training students was conducted for this study. The EBCA was sent to 6702 individuals, and 1209 individuals responded (18.04%). Participant demographic information is shown in Table 1. We received Old Dominion University Institutional Review Board approval for exempt research, and the participants' completion of the online survey served as their consent to participate.

Procedures

Participant recruitment took place during spring 2010 for each of the athletic training roles. Because multiple groups were targeted, the procedures for recruiting participants were slightly different for each group.

Undergraduate Athletic Training Education Program Directors and Clinical Preceptors

Contact information for each of the Commission on Accreditation of Athletic Training Education–accredited athletic training education program directors ($n = 348$) was obtained through the organization's Web page (http://www.caate.net). Each program director was contacted via telephone and asked to participate. The program director was informed of the purpose of the research investigation and asked if he or she would be willing to disseminate the survey to the remainder of the associated educational faculty and clinical preceptors affiliated with the institution. If we did not reach the program director within 4 phone calls made over the course of 1 week, we sent an e-mail. At the time of consent, the program director was asked to provide the number of additional faculty and clinical preceptors to whom the survey would be forwarded. A total of 213 program directors were reached via telephone or e-mail, and 209 agreed to participate; 132 actually did participate. Some program directors agreed to participate themselves but declined to send the information on to their faculty and clinical preceptors. Collectively, the program directors indicated they would send the EBCA to 2346 faculty and clinical preceptors. Only 266 individuals in this group (11.34%) responded.

Athletic Training Clinicians

A list of the names and e-mail addresses for all participants was obtained from the NATA national office through the NATA Survey List Request Form. Information for ATs from the 10 NATA districts in all work settings except college/university, secondary school, and business/sales/marketing was requested. Athletic trainers in the college/university and secondary school settings were excluded to reduce the potential for crossover with individuals who had affiliations with athletic training education programs. We purchased the e-mail addresses of the 3937 members produced by a search of the NATA database. E-mail addresses were used to request participa-

Table 1. Participant Demographics (N = 1209), No. (%)

Characteristic	Undergraduate Athletic Training Education Program Directors (n = 132)	Clinical Preceptors (n = 266)	Athletic Training Clinicians (n = 716)	Postprofessional Athletic Training Educators (n = 24)	Postprofessional Athletic Training Students (n = 71)
Age, y[a]					
20–29	5 (3.8)	122 (45.9)	218 (30.4)	0 (0)	67 (94.4)
30–39	50 (38.2)	96 (36.1)	227 (31.7)	15 (62.5)	1 (1.4)
40–49	50 (38.2)	33 (12.4)	158 (22.1)	6 (25.0)	2 (2.8)
50–59	23 (17.5)	14 (5.3)	98 (13.7)	1 (4.2)	1 (1.4)
60–69	3 (2.3)	0 (0)	15 (2.1)	2 (8.3)	0 (0)
70–79	0 (0)	1 (0.4)	0 (0)	0 (0)	0 (0)
Sex					
Male	68 (51.5)	138 (51.9)	400 (55.9)	12 (50.0)	24 (33.8)
Female	64 (48.5)	128 (48.1)	316 (44.1)	12 (50.0)	47 (66.2)
Ethnicity					
African American	3 (2.3)	3 (1.1)	11 (1.5)	0 (0)	2 (2.8)
Asian	0 (0)	2 (0.8)	10 (1.4)	1 (4.2)	1 (1.4)
Hispanic	1 (0.8)	3 (1.1)	29 (4.1)	1 (4.2)	3 (4.2)
Latin American	0 (0)	5 (1.9)	9 (1.3)	0 (0)	3 (4.2)
Native American	0 (0)	5 (1.9)	5 (0.7)	0 (0)	0 (0)
Pacific Islander	0 (0)		4 (0.6%)	0 (0)	0 (0)
White	126 (95.5)	246 (92.5)	648 (90.5)	22 (91.7)	62 (87.3)
Other	2 (1.5)	2 (0.8)	0 (0)	0 (0)	0 (0)
Athletic training experience, y[b]					
0–5	3 (2.3)	96 (36.1)	190 (26.5)	0 (0)	68 (95.7)
6–10	18 (13.6)	84 (31.6)	167 (23.3)	4 (16.7)	0 (0)
11–15	32 (24.2)	36 (13.5)	109 (15.2)	9 (37.5)	0 (0)
16–20	31 (23.5)	23 (8.6)	99 (13.8)	3 (12.5)	2 (2.8)
21–25	18 (13.6)	13 (4.9)	69 (9.6)	4 (16.7)	0 (0)
26–30	18 (13.6)	7 (2.6)	41 (5.7)	1 (4.2)	0 (0)
31–35	7 (5.3)	4 (1.5)	27 (3.8)	1 (4.2)	1 (1.4)
36–40	5 (3.8)	0 (0)	13 (1.8)	1 (4.2)	0 (0)
40+	0 (0)	0 (0)	1 (0.1)	1 (4.2)	0 (0)
Highest education level completed[c]					
Bachelor's	0 (0)	46 (17.3)	232 (32.4)	0 (0)	68 (95.7)
Master's	63 (47.7)	203 (76.3)	423 (59.1)	1 (4.2)	0 (0)
EdD	28 (21.2)	2 (0.8)	3 (0.4)	2 (8.3)	0 (0)
PhD	41 (31.1)	9 (3.4)	7 (1.0)	21 (87.5)	0 (0)
DPT	0 (0)	4 (1.5)	42 (5.9)	0 (0)	0 (0)
DO	0 (0)	1 (0.4)	0 (0)	0 (0)	0 (0)
DC	0 (0)	0 (0)	5 (0.7)	0 (0)	0 (0)
MD	0 (0)	0 (0)	3 (0.4)	0 (0)	0 (0)
PA	0 (0)	1 (0.4)	1 (0.1)	0 (0)	0 (0)

[a] One program director did not provide age.
[b] Three clinical preceptors did not provide years of experience.
[c] Three postprofessional students did not provide values for highest education level.

tion in completing the EBCA. A total of 3877 e-mails were successfully sent; 60 were returned as delivery failures due to unknown or expired e-mail addresses. Of the 3877 requests sent, 716 ATs (18.47%) responded by completing the survey.

Postprofessional Educators

Postprofessional educators' names were obtained from the NATA Post-Professional Athletic Training Education Program Evaluation Annual Report for the 2008–2009 academic year. Each educator on the list (n = 47 from 15 postprofessional education programs) was sent an e-mail request to fill out the EBCA. One postprofessional education program was eliminated from participating because it was the home institution of the researchers. Twenty-four postprofessional educators (51.06%) responded to the request for participation.

Postprofessional Education Athletic Training Students

We found e-mail addresses for students currently enrolled in 15 postprofessional athletic training programs on the associated institution's Web site or a survey link; a request for participation was forwarded to the student by the graduate program director. One program director declined to send the survey to students, so that program was eliminated from the participant pool. A total of 223 students were initially sent an e-mail asking for participation; 71 (31.84%) completed the survey.

Survey Distribution

Once the e-mail addresses were received for all the groups listed earlier, an e-mail was sent containing the following items: (1) the purpose and importance of the research study, (2) a request for participation, (3) the

Table 2. Content of Evidence Based Concepts Assessment Survey Category Items

Survey Category	Content	Question Format
Importance of EBP concepts	Developing a clinical question, appraising literature, basing clinical decisions on evidence, using evidence to influence patient outcomes, searching the literature to support clinical practice, allowing your personal experience to influence clinical decision making	Likert scale (1 = *not important*, 4 = *very important*)
Attitudes and beliefs about EBP	Importance to credibility of athletic training, effects on my daily practice, improves quality of patient care, "cookbook" approach to clinical practice, lack of strong evidence	Likert scale (1 = *strongly disagree*, 4 = *strongly agree*)
Accessibility to EBP resources	Direct access to and frequency of use of systematic reviews, peer-reviewed journals, clinical prediction rules, professional literature, online search databases, NATA think tanks and position statements, textbooks, Web sites	Checklist of frequency (1 = *more than once a week*, 2 = *once a week*, 3 = *biweekly*, 4 = *once a month*, 5 = *less than once a month*, 6 = *never*)
Knowledge of EBP	Steps of EBP, types of research designs, developing a clinical question, assessing treatments, searching the literature, role of personal expertise	Multiple choice questions (4 choices)
Confidence in knowledge	Assessing confidence in answer to corresponding knowledge question	Likert scale (1 = *not at all confident*, 4 = *extremely confident*)
Barriers to EBP implementation	Accessibility of resources, administrative support, ability to perform EBP steps, personal interest, personal confidence, understanding of EBP process, time, support from colleagues	Likert scale (1 = *strongly disagree*, 4 = *strongly agree*)

Abbreviations: EBP, evidence-based practice; NATA, National Athletic Trainers' Association.

estimated time to complete the survey, (4) the hyperlink to the survey Web page, (5) the date by which the survey should be completed, and (6) contact information for the researcher. Participants were given 4 weeks from the date of recruitment to complete the survey. Biweekly follow-up e-mail reminders were sent; they contained the same information as the initial e-mail, as well as an additional statement thanking those participants who had already completed the survey. If a participant contacted the primary researcher to confirm completion of the survey, that individual's e-mail address was removed from the list and he or she no longer received reminders.

Instrumentation

Questionnaire Development. In the fall of 2009, we conducted a literature review to locate instruments that assess EBP components and to evaluate the current state of EBP within the athletic training profession. The literature review helped to guide the conceptual formulation of the survey instrument. We were unable to find any surveys assessing EBP among ATs, but we did find several surveys for other health care professions. We patterned our instrument after the Evidence-Based Practice Questionnaire developed by Jette et al,[13] which was used to assess physical therapists' beliefs, attitudes, knowledge, and behaviors, and a study by Kitto et al[22] investigating attitudes in surgeons. In addition, we consulted the Evidence-Based Concepts: Knowledge, Attitudes and Use instrument developed by Manspeaker et al,[23] which is used to assess professional athletic training students.

The EBCA was originally designed to include 42 Likert-response items, 6 multiple choice questions, and 2 multipart questions, for a total of 50 items. These questions addressed (1) perceived importance of EBP concepts (6 Likert-scale items), (2) attitudes and beliefs towards EBP (14 Likert-scale items), (3) accessibility to EBP resources (2 multipart questions), (4) knowledge of EBP (6 multiple choice questions), (5) confidence in knowledge (6 Likert-scale items), and (6) barriers to EBP implementation (16 Likert-scale items). Once the EBCA was developed, we sent it to a panel of 5 experts to evaluate content validity, comprehensibility, comprehensiveness, and completion time. The panel comprised a physical therapist with EBP and survey construction knowledge, 2 athletic training clinicians, and 2 athletic training educators with survey research experience. Panelists were asked to rate each item of the EBCA on a scale of 1 to 3: 3 indicated that the *item was acceptable to remain in the survey as written*, 2 meant that the *item would be acceptable once revised*, and 1 meant that the *item was poor and should be removed*. Survey items that were rated as 1 by more than 1 panelist were removed from the survey instrument, whereas items rated as 2 were revised and amended as necessary. The panel of experts recommended rewording and adding several items throughout this process. The final EBCA consisted of 51 items (Table 2).

Survey Reliability. Reliability of the EBCA was assessed through the use of principal component analysis to determine the consistency of each Likert subscale and with the Cronbach α to determine the internal consistency. Principal component was used as an analysis to identify the sets of variables that correlated with each other.[24] Eigenvalues of ≥ 1 and factor loading scores ≥ 0.4 were used to select those factors that explained the most total variance.[23–27] Factor loading scores greater than 0.4 demonstrate a strong relationship within the factor. The Kaiser-Meyer-Olkin measure was used to determine if the sample was adequate for factor analysis. Reliability for each of the scales and subscales was as follows: 5 Likert items for perceived importance ($\alpha = .69$), 15 Likert item for attitudes and beliefs ($\alpha = .76$), 6 Likert items for confidence in knowledge ($\alpha = .76$), and 16 Likert items for barriers ($\alpha = .87$).

Percentage of agreement was used to determine the reliability for the knowledge questions. A small representative group of ATs (n = 32) was asked to complete the

Table 3. Percentage Agreement for Knowledge Questions

Question	Percentage Agreement
1. What is the first step in the EBP process?	0.963
2. Which type of research design is considered to have the highest quality of evidence?	0.778
3. When defining a clinical question using the PICO technique, which factor should you consider first?	0.704
4. When assessing the outcome of a treatment you used, what factor would most likely lead you to use it again?	0.741
5. When conducting a literature search, which of the following online sources holds the highest-quality content?	0.852
6. In what way should your personal experience with a particular treatment contribute to your clinical practice?	0.630

Abbreviations: EBP, evidence-based practice; PICO, patient intervention comparison outcomes.

questionnaire twice, separated by 3 weeks, so that we could determine the test-retest reliability of the knowledge section. Responses from these individuals were used only for reliability purposes and were not included in the larger analysis. A total of 27 participants (84%) completed the EBCA on both occasions, with a mean of 22 days between tests. The reliability of the 6 knowledge questions ranged from 63% to 96% agreement. Therefore, the questions were fair to extremely reliable in that an individual would answer similarly during 2 administrations of the survey.[24] Percentage-of-agreement results by question are found in Table 3.

Participants completed all aspects of the survey. However, because of the enormity of the data set, only the perceived importance and knowledge of and confidence in knowledge are addressed in this manuscript. In part 2 of this series,[28] we will discuss the attitudes and beliefs, accessibility to EBP resources, and perceived barriers to EBP of athletic training educators, clinicians, and students.

Perceived Importance

The perceived importance section consisted of 6 Likert-scale items that asked the participant to rate the importance of concepts related to the steps of EBP. The participant had 4 choices; 1 indicated that the *concept was not at all important*, and 4 indicated that the *concept was very important*. Principal component analysis showed that the sixth perceived importance item did not fit well with the rest of the scale items. Thus, the perceived importance composite score included only the 5 items related to the steps of EBP; the sixth item was still included in the EBCA for descriptive purposes. The composite score was calculated by adding up the responses to each of the 5 importance statements. This score was then averaged by the number of response items to normalize the perceived importance composite score to the Likert scale, such that 4 was the maximum possible score.

Knowledge

The knowledge section consisted of 6 multiple choice questions that centered on the steps of EBP. The questions were developed from both information in the current literature and instruments used in other health care professions.[13,23] Every question was awarded 1 point for a correct response and 0 points for an incorrect response. The score for each question was added for the total knowledge score; 6 was the maximum possible score. A higher total knowledge score indicated a higher level of knowledge. Sample survey questions from the knowledge section are found in Table 4.

Table 4. Sample Evidence-Based Concepts Assessment Knowledge Questions

2. Which type of research design is considered to have the highest quality of evidence? (Choose one)

[ ] Randomized controlled trial [ ] Independent laboratory investigation
[ ] Case study [ ] Single-subject design

5. When conducting a literature search, which of the following online sources holds the highest-quality content? (Choose one)

[ ] Google Scholar [ ] MEDLINE
[ ] Cochrane Database [ ] WebMD

Confidence in Knowledge

The confidence in knowledge section consisted of 6 Likert-scale items. The participants were asked to rate their confidence in their ability to correctly answer each of the 6 multiple choice knowledge questions. They had 4 choices: 1 indicated that they were *not at all confident* and 4 indicated that they were *extremely confident* in their answer. The composite confidence in knowledge score was calculated by averaging all the responses to normalize the score to a scale. A score closer to 4 meant that the participant had more confidence in his or her responses to the knowledge questions.

Data Analysis

The EBCA is a Web-based survey that resided on the institution's server. Once the participant completed the survey (indicated by clicking "submit" on the final screen), the information was automatically sent to the university database system. Participant responses were generated in PASW Statistics (version 18.0; SPSS Inc, Chicago, IL). Independent variables used to analyze the data were athletic training role (undergraduate athletic training education program director, clinical preceptor, athletic training clinician, postprofessional educator, or postprofessional student), highest degree attained (bachelor's, master's, or terminal), and history of EBP education as part of clinical preceptor workshops, educational preparation, or other workshops within the past year. A *terminal degree* was defined as an EdD, PhD, or clinical or medical doctorate. Dependent variables assessed were the perceived importance composite score, total knowledge score, and composite confidence in knowledge score.

Descriptive statistics were used to calculate means, standard deviations, and frequencies. The α level was set at $P \leq .05$. A 1-way analysis of variance was conducted to determine the difference in knowledge scores by the athletic training roles of the participant and the highest degree achieved. The Tukey honestly significant difference test was used for post hoc analysis. A Kruskal-Wallis H test was calculated to determine the differences for the nonparametric data of perceived importance composite

Table 5. Descriptive Statistics for Each Athletic Training Role (Mean ± SD)

Concept	Undergraduate Athletic Training Education Program Directors	Clinical Preceptors	Athletic Training Clinicians	Postprofessional Athletic Training Educators	Postprofessional Athletic Training Students
Perceived importance composite score (maximum = 4)	3.52 ± 0.44	3.44 ± 0.41	3.49 ± 0.41	3.71 ± 0.35[a]	3.60 ± 0.37
Total knowledge score (maximum = 6)	4.18 ± 1.18	4.03 ± 1.13	3.62 ± 1.35[b]	4.54 ± 0.88	4.65 ± 0.91
Composite confidence in knowledge score (maximum = 4)	2.86 ± 0.58	2.64 ± 0.53	2.67 ± 0.55	3.36 ± 0.40[c]	2.99 ± 0.46

[a] The mean for postprofessional educators was higher than for athletic training clinicians.
[b] The mean for athletic training clinicians was lower than for all other roles.
[c] The mean for postprofessional educators was higher than all other roles.

score and the composite confidence in knowledge score by athletic training role and highest degree. A Mann-Whitney U test statistic with Bonferroni adjustment was used to address inflation in the type I error rate, which is common with multiple comparisons. An independent-samples t test was performed to determine the difference in total knowledge scores of participants who had studied EBP in their clinical preceptor training, educational preparation, or another workshop within the past year and those with no such exposure. Spearman rank correlations (ρ) assessed the relationship between years of athletic training experience and perceived importance and composite confidence in knowledge scores and between the total knowledge score and the perceived importance and composite confidence scores. A Pearson product moment correlation (r) identified the relationship between total knowledge score and years of athletic training experience.

RESULTS

The response rate of all participants was 18.04% (1209 of 6702 recipients responded). Overall, ATs demonstrated low total knowledge scores (64.2% ± 1.29%) and indicated that they were mildly to moderately confident (2.71 ± 0.55 out of 4.0) but thought that EBP concepts were moderately to extremely important for inclusion (3.49 ± 0.41 out of 4.0). Descriptive statistics (mean ± SD) for each of the athletic training roles are presented in Table 5, and descriptive information by highest degree attained is presented in Table 6. Frequencies for each of the importance scale items are shown in Figure 1. Frequency counts for the correct response to each knowledge question and the corresponding level of confidence for all participants are seen in Figure 2.

Perceived Importance

Perceived importance composite scores were different by athletic training roles ($H = 18.77$, $P = .001$) and highest educational degree attained ($H = 19.34$, $P < .001$). Clinicians not associated with an education program demonstrated lower perceived importance composite scores than did postprofessional educators ($U = 5778.5$, $Z = –2.77$, $P = .006$), but their scores were not different from those of undergraduate athletic training education program directors, clinical preceptors, or postprofessional athletic training students. Those ATs with a terminal degree demonstrated higher perceived importance composite scores than those with a bachelor's degree ($U = 24\,568.0$, $Z = –2.89$, $P = .004$) or those with a master's degree ($U = 45\,991.0$, $Z = –4.26$, $P < .001$). A very weak positive relationship was seen between perceived importance and total knowledge score ($\rho = .114$, $P < .001$). No relationship was noted between years of athletic training experience and perceived importance composite score ($P = .20$).

Knowledge

The total knowledge scores differed among the athletic training roles ($F_{4,1208} = 19.0$, $P < .001$). Postprofessional educators' total knowledge scores were higher than those of clinicians ($P = .004$) but not different from those of undergraduate program directors ($P = .70$), clinical preceptors ($P = .32$), or postprofessional students ($P = .99$). In addition, clinicians not associated with education programs had lower total knowledge scores than did undergraduate program directors ($P < .001$), clinical preceptors ($P < .001$) and postprofessional students ($P < .001$). Total knowledge scores by highest degree attained were also different ($F_{2,1203} = 12.68$, $P < .001$): ATs with terminal degrees had higher total knowledge scores than those with a bachelor's degree or master's degree (both $P < .001$). Years of athletic training experience and total knowledge score had a very weak negative relationship ($r = –0.098$, $P = .001$).

The knowledge scores of clinical preceptors who had EBP as part of their clinical preceptor training or workshops and those who have had no exposure were not different ($P = .059$). Similarly, the total knowledge scores did not differ between undergraduate athletic training

Table 6. Descriptive Statistics for Highest Degree Attained (Mean ± SD)

Variable	Bachelor's Degree	Master's Degree	Terminal Degree
Perceived importance composite score (maximum = 4)	3.51 ± 0.37	3.45 ± 0.43	3.59 ± 0.42[a]
Total knowledge score (maximum = 6)	3.76 ± 1.35	3.78 ± 1.25	4.31 ± 1.24[a]
Composite confidence in knowledge score (maximum = 4)	2.60 ± 0.57	2.69 ± 0.53	3.06 ± 0.49[a]

[a] The mean for athletic trainers with terminal degrees was higher than for all other athletic trainers.

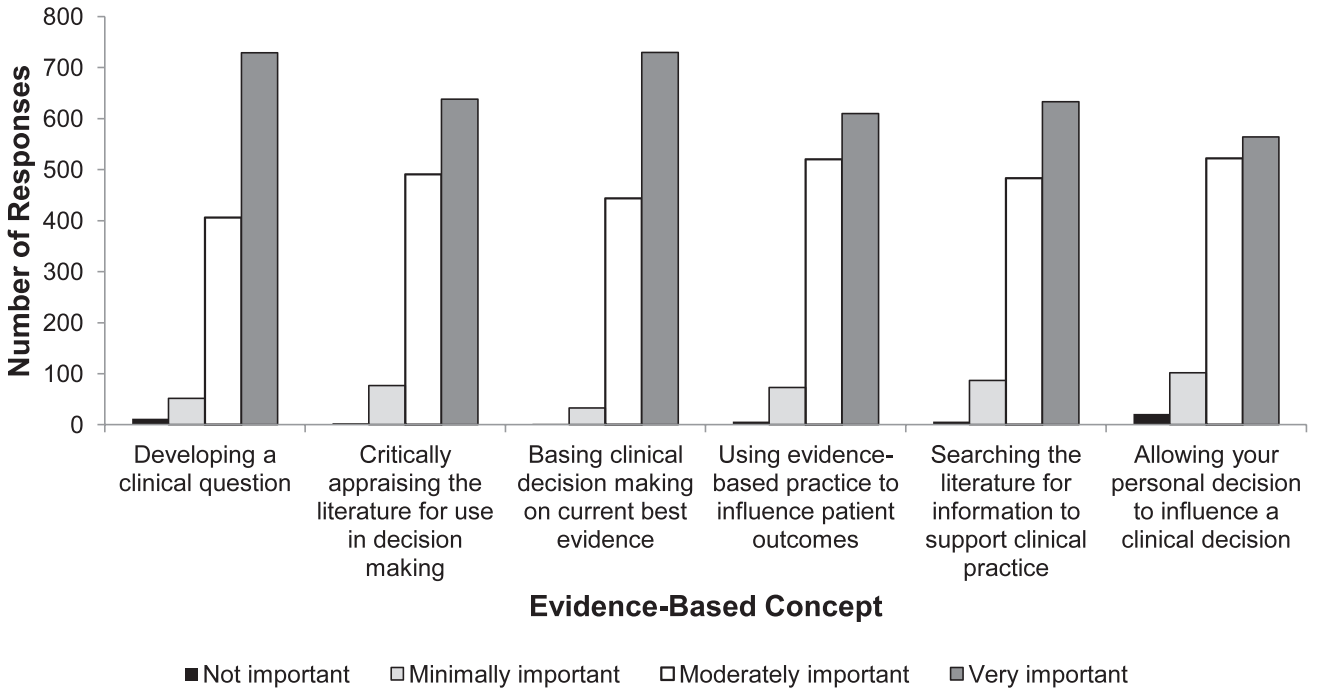

Figure 1. Perceived importance of evidence-based concepts to all participants.

education program directors and clinical preceptors who had EBP as part of their educational preparation or who had attended an EBP workshop in the past year when compared with those who did not have these previous exposures ($P = .848$ and $P = .057$, respectively).

Confidence in Knowledge

The composite confidence in knowledge scores were different by athletic training role ($H = 67.16$, $P < .001$) and by highest degree attained ($H = 76.19$, $P < .001$). Postprofessional educators demonstrated higher confidence

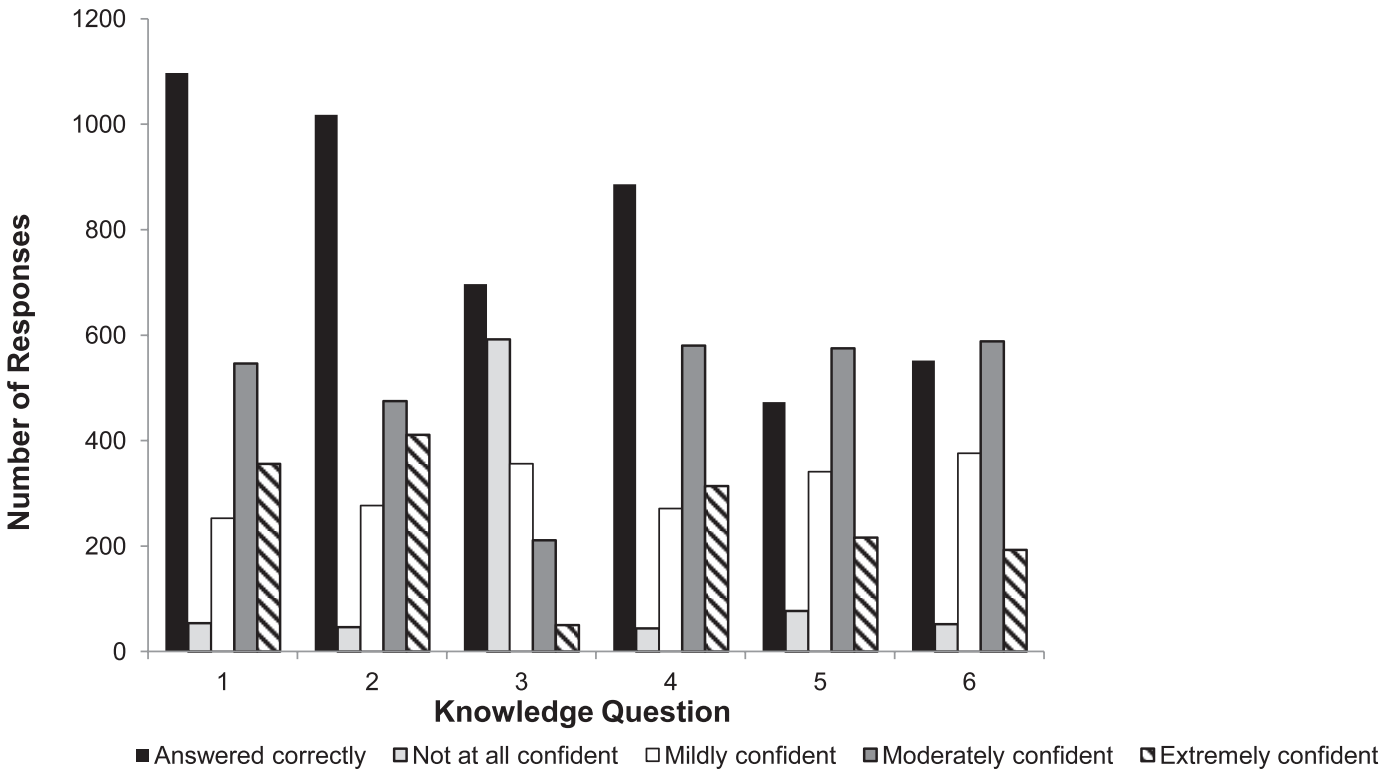

Figure 2. Athletic trainers' confidence in knowledge.

in knowledge than did undergraduate program directors ($U = 749.5$, $Z = -4.12$, $P < .001$), clinical preceptors ($U = 907.0$, $Z = -5.832$, $P < .001$), clinicians not associated with an education program ($U = 2675.5$, $Z = -5.77$, $P < .001$), and postprofessional students ($U = 455.5$, $Z = -3.42$, $P = .001$). Those ATs with a terminal degree had more confidence in knowledge than did those with a bachelor's degree ($U = 16\,066.5$, $Z = -8.26$, $P < .001$) or a master's degree ($U = 35\,699$, $Z = -7.80$, $P < .001$). Years of athletic training experience and the composite confidence in knowledge score had a very weak positive relationship ($\rho = .070$, $P = .015$). Additionally, total knowledge score and the composite confidence in knowledge score had a weak positive relationship ($\rho = .226$, $P < .001$).

DISCUSSION

Knowledge

The knowledge assessed via the EBCA was foundational in nature; the questions addressed components related to the 5 steps of EBP. Even so, all ATs demonstrated limited knowledge of these concepts, with an average of 64.2%. Similar scores were demonstrated by athletic training educators (64.9%) on the Evidence-Based Concepts for Clinical Practice Assessment, which included 20 foundational and framing questions.[16] Fritsche et al[29] examined the knowledge of EBP concepts via the Berlin Questionnaire and found that health care professionals demonstrated a mean of 42%. Similarly, Ramos et al[30] and Nicholson et al[31] evaluated health care clinical educators' knowledge of EBP concepts via the Fresno Test and found their baseline knowledge score was 57.9%. Although ATs had higher average scores than did health care professionals on the Berlin Questionnaire and Fresno Test, these results should be interpreted cautiously. Both instruments provided initial knowledge assessments several years ago. Since the baseline assessment via the Berlin Questionnaire, health professionals improved their EBP knowledge scores by 57% ($P < .001$) after completing a 3-day EBP course.[29] In addition, clinical educators assessed via the Fresno Test completed 9 EBP workshops over a 1-year period of time and increased their EBP knowledge scores by 20.5% ($P < .0001$).[31] It is also important to note that the content of these assessments was much more in depth and included open-ended and scenario-based applications, rather than just the 5 steps of EBP, indicating again that the ATs' knowledge lagged behind that of other health care professionals.[16]

Although we hypothesized that postprofessional educators would demonstrate higher knowledge scores than ATs in all other roles, their scores surpassed only those of athletic training clinicians. We believed that the research emphasis of postprofessional programs would lead postprofessional educators to achieve higher scores than ATs who were not engaged in statistical analyses and critical appraisal on a regular basis. Additionally, postprofessional students demonstrated higher knowledge scores than did both clinical preceptors and athletic training clinicians. This finding does not support our initial hypothesis, but it makes sense that students currently involved in an advanced educational program focusing on appraisal skills, scholarship, and improving patient care would perform better in knowledge related to these areas. Contrary to what we hypothesized, clinicians demonstrated lower knowledge scores than all other groups. We believe this could be because the knowledge questions focused specifically on the basic steps of EBP. The basic steps of EBP may not be well executed or fully understood in the athletic training profession, yet EBP implementation into professional athletic training education programs is being emphasized.[7,17]

In an assessment of physical therapists, Jette et al[13] found that individuals who had advanced degrees were more likely to be more knowledgeable. The ATs in this study who had earned terminal degrees also attained higher knowledge scores. To earn their degrees, they pursued education that focused on research design, statistical concepts, and critical appraisal; furthermore, for promotion and tenure, they are often required to continue their scholarly research and publish.[32,33] Conducting research and maintaining a record of scholarly activity would naturally lead to more familiarity with the foundational EBP concepts we assessed in the EBCA.[16] The presence of EBP in some postprofessional curriculums and in select professional athletic training education programs could explain the weak negative relationship between knowledge score and years of athletic training experience. This indicates that younger ATs and those with less experience have more knowledge than those who have been in the profession for some time. Younger clinicians who have had EBP as part of their educational preparation are likely to know more than about the topic than clinicians who have been practicing longer.[13]

The difficulty in comparing our results with those of other athletic training assessments or other health care professions is that few survey instruments assess knowledge through multiple choice questions. Except for the Berlin Questionnaire, Fresno Test, and Evidence-Based Concepts for Clinical Practice Assessment, we did not find other instruments for comparison. Several assessments of clinicians' knowledge ask participants to rank their level of knowledge of specific terms or concepts such as *odds ratio* or *systematic review*.[13–15,34] Each term was ranked on a Likert scale and then the scores were summed for a knowledge score. Although this method demonstrates a clinician's perceived knowledge, it reflects more of a self-reported level of comfort with a term than a true measure of the understanding of the term. Even though our knowledge assessment consisted of only 6 questions, we were still able to determine the clinicians' ability to correctly understand the foundational concepts of the EBP steps.

Confidence in Knowledge

In addition to a low knowledge level, all ATs demonstrated a mild to moderate level of confidence in their knowledge level. Postprofessional educators and ATs with terminal degrees displayed significantly more confidence in their knowledge. As with the increased knowledge level, postprofessional educators often have terminal degrees and are more likely to feel comfortable with the concepts associated with EBP. Even though these groups had higher composite confidence scores, they still were on the lower end, and total knowledge score and confidence were only weakly positively correlated. One would expect that as knowledge increased, an individual's confidence

level would increase proportionally. This weak correlation signifies a lack of confidence in the ability to correctly understand EBP concepts. The weak positive correlation between years of experience and confidence was supported by the findings of Jette et al,[13] who noted that younger physical therapists reported more confidence in their EBP skills than older (age = 50+ years) clinicians.

The lack of knowledge and confidence demonstrated by participants in this study has also been expressed in qualitative interviews with athletic training educators[11] and clinical preceptors.[35] Both groups indicated that their own lack of knowledge was a barrier to implementing EBP with students. Ultimately, the goal of EBP is to help improve patient care through combined best evidence, clinician expertise, and the patient's goals and values.[3,7] In order to achieve this goal, the profession must continue to support and promote the knowledge level of ATs.

Perceived Importance

The perceived importance composite score of 3.49 out of 4.0 indicates that all ATs believed that EBP concepts related to the steps of EBP were moderately to extremely important. Thus, the ATs valued EBP but lacked the knowledge and ability to successfully implement the concepts. We hypothesized that clinicians not associated with an athletic training education program would demonstrate lower perceived importance composite scores than all other groups. Contrary to our hypothesis, clinicians only had lower importance composite scores than postprofessional educators. Because EBP is a pressing topic in many athletic training education settings, we thought that clinicians who were not consistently involved in the discussion to implement EBP into educational standards might not value EBP as highly or have as much exposure as the other groups. The fact that there was little difference between clinicians and all of the other roles could lend support to the idea that the NATA has done a good job of promoting the need for EBP through research and editorials emphasizing the use of EBP in our patient care.[7,9,18–20] This possibility was also supported by the lack of a relationship between years of athletic training experience and perceived importance. Implementing EBP starts with creating a culture that embraces the concepts of EBP.[7] Based on our results, the athletic training profession seems to value EBP, but enhancing knowledge of these concepts needs to be emphasized.

In contrast to the athletic training role, individuals with a terminal degree did have higher perceived importance scores than those with either a bachelor's or master's degree. Obtaining a terminal degree often involves significant coursework in statistical analysis and completion of a research project or dissertation, which may lead to a greater appreciation for EBP.[6,16,33,36] Our results supported our hypothesis that individuals with terminal degrees would perceive EBP concepts as more important.

Previous EBP Training and Workshops

We also hypothesized that undergraduate program directors and clinical preceptors who had had EBP as part of their clinical preceptor training, had had educational preparation in EBP, or had participated in EBP workshops or courses in the past year would have higher knowledge scores. However, no differences were found in the knowledge scores of these groups. These results are similar to those from athletic training educators who had attended an EBP workshop in the last year: they demonstrated no difference in knowledge scores but did have higher composite confidence scores.[16] Most athletic training workshops on EBP have focused on introductory concepts; these types of workshops are more likely to change attitudes in favor of EBP than to fully educate an AT to be an evidence-based clinician.[37,38] Educational interventions can produce small improvements in professional practice, EBP behaviors, and patient outcomes, but educational meetings have been less effective in changing more complex skill behaviors.[39,40] Educational meetings that are interactive in nature or offer a mixed didactic and hands-on format tend to be more effective in changing outcomes.[40]

As the profession aims to include EBP in the educational preparation of athletic training students, future investigators should examine the best methods to improve knowledge. Foundational concepts such as developing clinical questions, searching for literature, and identifying appraised resources should be covered early within educational preparation.[38] By addressing these concepts early within an educational process, students will then be able to build upon this foundational knowledge to understand advanced critical appraisal and statistical concepts. Although these recommendations are specifically for educational programs, the same procedure should be followed when educating the rest of the athletic training profession. As our results indicate, ATs believe the concepts of EBP to be important, but they lack the knowledge to apply them correctly. If the profession is committed to becoming a profession that values EBP, then a systematic method must be put in place to advance EBP knowledge among all parties. The Web-based course "Evidence-Based Practice in Athletic Training," which is available to NATA members, is one of the first steps in advancing EBP knowledge across the profession.[41] Athletic trainers can use this course to not only increase their EBP knowledge but also pursue continuing education.[41] Including EBP as a requirement for continuing education in order to maintain certification could be an avenue to increase the profession's overall EBP knowledge.

Limitations

Certain limitations in this study could have affected the results. The sampling procedures used for identification and dissemination of the survey instruments were varied in order to reach all of the intended participants. Although the same procedures in terms of requests for participation were followed across all groups, the identification of participants varied greatly. We believed that the different methods were necessary to appropriately reach the intended populations, but they did result in limitations. In particular, calling on undergraduate athletic training education program directors to identify and disseminate the survey instrument to clinical preceptors within their program led to a low response rate, but it was the only way to reach this critical population of athletic training educators. Program directors were asked to provide the number of people to whom they would forward the request for participation, but these numbers were not

confirmed. Unfortunately, the follow-up with these individuals also had to go through the program directors. The low response rate (11%) is not ideal, but without going through the program director, we would have been unable to reach this group at all. Another limitation is that clinicians who worked in the collegiate and high school settings were eliminated from participation in order to reduce the potential for crossover with participants who were affiliated with education programs. The athletic training clinicians in those settings were not included, thus limiting our ability to generalize the results of this study to all ATs in those settings. Of the 266 clinical preceptors who completed the survey, 244 indicated that they provided patient care in the clinical, collegiate, high school, and hospital settings, which indicates that individuals in these settings were represented in the results of the clinical preceptors.

Validity of the EBCA could come into question. A panel of experts reviewed the instrument for content validity, but the lack of a gold standard within athletic training made establishing its validity difficult. Finally, the concepts included in the EBCA were specific to the foundational concepts of the EBP steps and did not include more advanced concepts. The small number of knowledge questions limits the ability of the EBCA to fully demonstrate knowledge across a range of basic and advanced concepts. The concepts in this knowledge assessment were basic in nature, yet we felt it necessary to start at this basic level because of the lack of EBP assessments in athletic training.

CONCLUSIONS AND IMPLICATIONS

Athletic trainers valued the concept of EBP and believed that the process of EBP was important to the profession, but they demonstrated a low level of knowledge and confidence in that knowledge. Although postprofessional educators and ATs with terminal degrees had more knowledge, clinicians who were not associated with education programs lagged in EBP knowledge. The focus on incorporating EBP in the educational curriculum of athletic training students has increased[7]; however, we must also work to improve the knowledge level of all clinicians who have completed their education. The "Evidence-Based Practice in Athletic Training" online course was created to help increase the knowledge base of the athletic training profession in both foundational and more advanced EBP concepts. Future researchers should investigate the best methods to use in promoting knowledge in ATs who are no longer in educational programs. In addition, we should also study the effectiveness of workshops, online modules, and educational programming geared at promoting EBP.

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