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Use of Patient-Reported Outcome Measures in Athletic Training: Common Measures, Selection Considerations, and Practical Barriers

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Context: Current evidence suggests that a low percentage of athletic trainers (ATs) routinely use patient-reported outcome measures (PROMs). An understanding of the perceptions of ATs who use (AT-USE) and who do not use (AT-NON) PROMs as well as any differences due to demographic characteristics (eg, use for patient care or research, job setting, highest education level) may help facilitate the use of PROMs in athletic training.

Objective: To describe commonly used PROMs by AT-USE, the criteria by which AT-USE select PROMs, and reasons for non-use by AT-NON.

Design: Cross-sectional study.

Setting: Online survey.

Patients or Other Participants: A convenience sample of 1784 ATs (response rate = 10.7% [1784/17972]; completion rate = 92.2% [1784/1935]) who worked in a variety of settings.

Main Outcome Measure(s): Participants completed an anonymous electronic online survey. Descriptive statistics were used to describe commonly used PROMs, PROM selection criteria, and reasons for PROM non-use.

Results: Participants were classified as AT-USE (n = 370, 20.7%) or AT-NON (n = 1414, 79.3%). For the AT-USE group, the most common type of PROMs used were specific (eg, region, joint; n = 328, 88.6%), followed by single-item (n = 258, 69.7%) and generic (n = 232, 62.7%). Overall, the PROMs most frequently endorsed by the AT-USE group were the Numeric Pain Rating Scale (n = 128, 34.6%); Lower Extremity Functional Scale (n = 108, 29.2%); Disability of the Arm, Shoulder and Hand (n = 96, 25.9%); Owestry Disability Index (n = 80, 21.6%); and Foot and Ankle Ability Measure (n = 78, 21.1%). The most important criteria reported by AT-USE for selecting PROMs were that the measure was valid and reliable, easy for patients to understand, and easy for clinicians to understand and interpret. Common reasons for non-use were that PROMs were too time consuming for the clinician, too time consuming for the patient, and more effort than they were worth.

Conclusions: The Numeric Pain Rating Scale; Lower Extremity Functional Scale; Disability of the Arm, Shoulder and Hand; Owestry Disability Index; and Foot and Ankle Ability Measure were the PROMs most commonly endorsed by AT-USE and should be considered for athletic training use. To further facilitate the use of PROMs in athletic training, future authors should identify strategies to address organizational and time-constraint obstacles. Interpretation of our study findings may require caution due to a relatively low response rate and because "routine use" was not operationalized.

Key Words: clinical outcomes assessment, health-related quality of life, disablement, whole-person health care

Key Points

- Athletic trainers who routinely used patient-reported outcome measures reported administering region-specific measures most often, followed by single-item and generic measures.
- The ease of interpretation for the patient, demonstrated reliability and validity, appropriateness, and completion time were important factors considered by athletic trainers when evaluating and selecting patient-reported outcome measures.
- The use of patient-reported outcome measures in athletic training remained relatively low, with level of education, work setting, and organizational infrastructure influencing their use.

Within the global health care system over the past decade, efforts have been directed at assessing patient outcomes as part of routine patient care and clinical research.[1–5] Organizations such as the Agency for Healthcare Research and Quality and the Patient-Centered Outcomes Research Institute have highlighted the need to understand the patient's perspective on wellness and care experiences and to establish patient-oriented evidence to better inform patient care decisions.[6] For example, through the routine and comprehensive assessment of clinical outcomes, including patient-reported outcomes, clinicians are able to identify effective treatments, treatment patterns, and areas for improvement.[1,4,5,7] Furthermore, since patient-reported outcomes are typically

assessed from the patient's perspective, these outcomes are essential to delivering patient-centered, whole-person health care; establishing patient-oriented evidence that matters; and identifying the effectiveness of treatment interventions.[1,4,5,7]

Patient-reported outcomes are useful for measuring what is important to patients and for evaluating patient outcomes.[7,8] The importance of assessing patient-reported outcomes in athletic training has been highlighted in the literature[8–10] and by the profession.[11,12] For example, the current editions of the "Athletic Training Education Competencies"[11] and the "Role Delineation/Practice Analysis"[12] emphasize the need to include patient-reported outcome measures (PROMs) as part of the entry-level competencies (effective in 2011) and continuing education efforts (effective in 2012), respectively. These PROMs are self-report surveys or questionnaires designed to capture patients' perspectives about their health status.[8,10] A variety of PROMs are available for patient care and clinical research. The 3 primary classifications of PROMs are generic, specific, and single-item measures. *Generic measures* are designed to be applicable to a range of health domains and to capture various dimensions of disablement and health-related quality of life.[13] *Specific measures* are designed with a particular injury, illness, or body region in mind.[13] Thus different types of measures are available, including measures specific to a body region, joint, disease, or condition. *Single-item measures* ask 1 question about a patient's health status and offer a quick and easy way to obtain information from the patient.[14] However, single-item measures are limited in the depth of the information provided about the patient's health status.[13]

Although current efforts in entry-level[11] and continuing[12] education include patient outcomes assessments and the use of PROMs, research has suggested that a low percentage of athletic trainers (ATs) routinely use PROMs. Specifically, Valier et al[15] surveyed a small random sample of practicing ATs and found that only 26% routinely used PROMs as part of their usual patient care. In addition to lack of time, common reasons for non-use included the lack of education and insufficient understanding of PROMs to successfully implement these tools in routine care.[15] For instance, the intricate process of selecting the most appropriate PROMs for athletic health care can hinder their use in athletic training, particularly because the majority of available PROMs were developed for more general as opposed to athletic populations.[9,14,15] To our knowledge, no direct efforts have been made to identify the PROMs that are most commonly used by ATs who administer them. A better understanding of the PROMs used most often by ATs who have successfully implemented these tools in routine practice may help address the lack of education and the barriers related to PROM non-use, guide the PROM selection process, and facilitate the use of PROMs by ATs. Therefore, the primary aims of our study were to describe the PROMs commonly used by the ATs who administered them and the criteria for selecting them. Secondarily, we aimed to describe the reasons for non-use by ATs who did not use PROMs. This secondary aim allowed us to expand on previous findings[15] by surveying all ATs, regardless of job setting (eg, military/government, researchers), and provide the first insight into reasons for non-use after the release of the current editions of the "Athletic Training Education Competencies"[11] and "Role Delineation/Practice Analysis"[12] that went into effect for entry-level and continuing education efforts in 2011 and 2012, respectively.

METHODS

Participants

Participants were recruited from a convenience sample of certified ATs who worked in the high school, college/university, clinic/hospital, industrial, or military/government setting. They were included if they were certified ATs and members of the National Athletic Trainers' Association (NATA) and were identified in the 2014 end-of-year NATA membership e-mail list. Participants were grouped according to whether they did or did not use PROMs in clinical practice or research. The study was exempted from continued review by the local institutional review board because the study data were collected using an anonymous Web-based survey.

Procedures

An invitation to take part in the study was sent via e-mail to 17 972 ATs in the fall of 2015, and reminder e-mails about survey completion were sent 2 and 4 weeks later. The survey was closed approximately 5 weeks after the initial invitation was sent, providing participants with 35 days to complete the survey. Recruits were split into 2 groups based on their responses to the following questions: "Do you routinely use PRO instruments for clinical practice?" and "Do you routinely use PRO instruments for clinical research?" Those who replied *yes* to either or both questions were grouped as participants who used PROMs (AT-USE), and those who replied *no* to both questions were grouped as participants who did not use PROMs (AT-NON). Survey completion time was estimated to be between 10 and 15 minutes.

Instrumentation

Survey Development. We created a survey for the study that consisted of demographic questions, AT-USE questions, and AT-NON questions. The survey was developed in 3 phases: (1) item (question) generation, (2) survey validation, and (3) mechanical review. A panel of 3 experts was consulted for the item-generation phase of the survey. Each expert was a certified AT with an established line of research focused on assessing patient outcomes in physically active individuals and had previously given professional presentations on the use of PROMs to an athletic training audience. For item generation, the experts were asked to independently generate a list of PROMs relevant to athletic training, criteria used to select PROMs, and common barriers related to the use of PROMs. Then, they discussed the compiled items and reached a consensus on the content to be included in the survey. Because the survey was developed based on the experts' knowledge of the current literature, the final list of items was similar to the lists previously used by Valier et al[15] and Jette et al.[16] After item generation, survey validation was conducted. To evaluate face validity, we asked a small group of clinical ATs to review all survey questions for content, clarity, and relevance. Wording and formatting changes were made

based on their feedback. After survey validation, the final set of questions was used to create a Web-based survey (Qualtrics, LLC, Provo, UT). In the final phase of survey development, a second group of clinical ATs performed a mechanical review by completing the Web-based version of the survey to ensure that all embedded logic was functioning correctly.

Participant Demographic Questions. Demographic questions consisted of sex, years certified as an AT, professional (entry-level) athletic training degree, highest earned degree, additional certification(s), current job setting, classification of current job setting, and participant's NATA district. At the end of this section, participants were asked if they used PROMs for clinical practice or research.

The AT-USE Questions. The AT-USE question set consisted of 2 sections. The first section asked about the types of PROMs used by the AT (generic, specific, or single-item measures). Participants endorsed the PROMs they used from a drop-down list of PROMs compiled in the survey and were able to write in any other PROMs that were not included in the list. The second section asked participants to rate the importance of specific selection criteria when evaluating a PROM for use, including completion time, ease of interpretation, and established measurement properties. Each selection criterion was rated on a 5-point, Likert-like response scale (1 = *not important*, 5 = *very important*).

The AT-NON Questions. The AT-NON question set asked participants to rate their reasons for not using PROMs, including time for patients to complete, time for ATs to score, and effort-to-benefit perspective. Each component was rated on a 5-point Likert response scale (1 = *strongly disagree*, 5 = *strongly agree*).

Data Analysis

Based on a population size of 17 972 ATs, an estimated 1672 responses (9.3% response rate) were needed to obtain results that were accurate at a 99% confidence level with ±3% margin of error.[17] We used frequency counts and percentages to summarize patient demographics based on AT-USE and AT-NON groups.

We also compared the AT-USE and AT-NON groups to determine if they differed in participant demographics. We used χ^2 (Fisher exact) tests to compare the AT-USE and AT-NON groups by age, sex (male, female), years certified (<3 years, 3–5 years, 6–10 years, 11–20 years, >20 years), professional athletic training degree (bachelor's, master's), highest degree earned (bachelor's, entry-level master's, postprofessional master's, master's in a related field, clinical doctorate, doctoral, postdoctoral), and current job setting (high school, college/university, 2-year institution, clinic/outreach, clinic, hospital, industrial/occupational, military/government). For significant χ^2 test results, we conducted pairwise comparisons using z-scores with Bonferroni adjustments[18] to identify differences between groups. Bootstrapping was also used to provide a more conservative estimate of the population parameters.

We calculated frequency counts and percentages to summarize commonly used PROMs as reported by the AT-USE group. Survey responses related to the selection criteria of PROMs by the AT-USE group and reasons for non-use of PROMs by the AT-NON group were recorded as ordinal data. Thus, these responses were summarized using medians and interquartile ranges.[19,20] Within each group, we used χ^2 (Fisher exact) tests to compare ATs who classified their current positions as primarily patient care with those who classified their current positions as primarily research to identify any group differences for (1) PROM selection criteria in the AT-USE group and (2) reasons for non-use of PROMs in the AT-NON group. We used SPSS (version 23.0; IBM Corp, Armonk, NY) for data analysis.

RESULTS

Participant Demographics

Of the 1935 individuals who accessed the survey (response rate = 10.7%), 1732 completed the survey (completion rate = 89.5%) and were classified as either AT-USE (n = 370, 21.7%) or AT-NON (n = 1362, 78.3%). Demographics for each group are summarized in Table 1. In the AT-USE group, 67.6% (n = 250), 9.5% (n = 35), 9.7% (n = 36), and 13.2% (n = 49) classified their current position as patient care only, research only, patient care and research, or other, respectively. In the AT-NON group, 86.2% (n = 1179), 1.5% (n = 20), 1.6% (n = 22), and 10.7% (n = 146) classified their current position as patient care only, research only, patient care and research, or other, respectively.

The χ^2 test results were significant for professional athletic training degree ($\chi^2 = 4.10$, $P = .04$), highest degree earned ($\chi^2 = 108.3$, $P < .001$), and current job setting ($\chi^2 = 101.5$, $P < .001$), with those holding doctoral degrees (clinical doctorate, doctorate, postdoctorate), those holding professional athletic training degrees at the bachelor's level, and those working in the clinic, hospital, and military/government settings reporting the use of PROMs more frequently than other groups within the same variable, respectively. The χ^2 findings were not significant for sex ($\chi^2 = 1.29$, $P = .26$) or years certified ($\chi^2 = 3.50$, $P = .48$).

The AT-USE Results

For the AT-USE group, 51.6% (n = 191) reported using PROMs for clinical practice only, 24.6% (n = 91) for research purposes only, and 23.8% (n = 88) for both clinical practice and research purposes. Athletic trainers reported that they most frequently used specific PROMs (n = 328, 88.6%) followed by single-item (n = 258, 69.7%) and generic (n = 232, 62.7%) PROMs. Summaries of responses for specific, single-item, and generic PROMs are reported in Tables 2, 3, and 4, respectively. Of the ATs who used specific PROMs (n = 328), the knee (n = 236, 72.0%), foot and ankle (n = 212, 64.6%), and shoulder and elbow (n = 204, 62.2%) were the most commonly reported body regions (Table 2). The least common body regions for which ATs reported using PROMs were the head (n = 118, 36.0%), neck (n = 100, 30.5%), and wrist and hand (n = 99, 30.2%). The most commonly endorsed specific PROMs by ATs who used specific PROMs (n = 328) were the Lower Extremity Functional Scale (LEFS; n = 108, 32.9%); Disabilities of the Arm, Shoulder and Hand (DASH; n = 96, 29.2%); Oswestry or Modified Oswestry Disability Index (n = 80, 24.4%); and Foot and Ankle Ability Measure (n = 78,

Table 1. Participant Demographics

Demographic Characteristic	Group, No. (%)			
	AT-USE			
	Clinical Use Only	Research Use Only	Both Clinical and Research Use	AT-NON
Sex				
Male	86 (44.8)	34 (37.8)	40 (45.5)	630 (46.1)
Female	105 (55.2)	57 (62.2)	48 (54.5)	732 (53.5)
Years certified				
<3	31 (16.2)	14 (15.4)	6 (6.8)	170 (12.5)
3–5	36 (18.8)	15 (16.5)	22 (25.0)	301 (22.1)
6–10	42 (22.0)	13 (14.3)	19 (21.6)	287 (21.1)
11–20	39 (20.4)	27 (29.7)	23 (26.1)	347 (25.5)
>20	43 (22.5)	22 (24.2)	18 (20.5)	257 (18.8)
Professional athletic training degree				
Bachelor's	156 (81.7)	82 (90.1)	74 (84.1)	1088 (79.6)
Master's	35 (18.3)	9 (9.9)	14 (14.9)	274 (20.0)
Highest degree earned				
Bachelor's	53 (27.7)	15 (16.5)	9 (10.2)	323 (23.6)
Entry-level master's	14 (7.3)	2 (2.2)	2 (2.3)	90 (6.6)
Postprofessional master's	21 (11.0)	9 (9.9)	12 (13.6)	177 (12.9)
Master's in related field	87 (45.5)	29 (31.9)	37 (42.0)	698 (51.1)
Clinical doctorate (eg, DAT, DPT, DHSc)	10 (5.2)	2 (2.2)	13 (14.8)	12 (0.9)
Doctoral (eg, PhD, EdD, ScD)	6 (3.1)	29 (31.9)	14 (15.9)	61 (4.5)
Postdoctoral	0 (0.0)	5 (5.5)	1 (1.1)	1 (0.1)
Current job setting				
High school	41 (21.5)	11 (12.1)	8 (9.1)	481 (35.3)
College/university	59 (30.9)	62 (68.1)	36 (40.9)	535 (39.3)
Two-year institution (college)	2 (1.0)	0 (0.0)	2 (2.3)	44 (3.2)
Clinic/outreach	31 (16.2)	9 (9.9)	6 (6.8)	158 (11.6)
Clinic	35 (18.3)	2 (2.2)	24 (27.3)	65 (4.8)
Hospital	10 (5.2)	3 (3.3)	7 (8.0)	42 (3.2)
Industrial/occupational	7 (3.7)	1 (1.1)	1 (1.1)	23 (1.7)
Military/government	2 (1.0)	2 (2.2)	3 (3.4)	12 (0.9)
Position classification (select all that apply)				
Patient care	174 (91.1)	49 (53.8)	63 (71.6)	1201 (87.9)
Education	52 (27.2)	46 (50.5)	39 (44.3)	417 (30.5)
Administrative	49 (25.7)	27 (29.7)	29 (33.0)	347 (25.4)
Research	10 (5.2)	34 (37.4)	27 (30.7)	42 (3.1)
National Athletic Trainers' Association district				
1	17 (8.9)	5 (5.5)	7 (8.0)	121 (8.9)
2	25 (13.1)	9 (9.9)	8 (9.1)	191 (14.0)
3	22 (11.5)	13 (14.3)	8 (9.1)	162 (11.9)
4	44 (23.0)	26 (28.6)	17 (19.3)	272 (20.0)
5	10 (5.2)	7 (7.7)	9 (10.2)	144 (10.6)
6	6 (3.1)	5 (5.5)	4 (4.5)	82 (6.0)
7	20 (10.5)	6 (6.6)	8 (9.1)	87 (6.4)
8	12 (6.3)	10 (11.0)	9 (10.2)	86 (6.3)
9	28 (14.7)	9 (9.9)	10 (11.4)	151 (11.1)
10	7 (3.7)	1 (1.1)	8 (9.1)	65 (4.8)

Abbreviations: AT-NON, athletic trainers who did not use patient-reported outcome measures; AT-USE, athletic trainers who used patient-reported outcome measures; DAT, doctor of athletic training; DHSc, doctor of health science; DPT, doctor of physical therapy.

23.8%). Athletic trainers who reported using single-item PROMs most often cited the Numeric Pain Rating Scale (n = 128, 49.6%), the Global Rating of Change Scale (n = 59, 22.9%), and the Patient Specific Functional Scale (n = 44, 17.1%; Table 3). The most frequently endorsed generic PROMs were the Short Form-12 (SF-12) or Short Form-36 (SF-36; n = 57, 36.5%) and the Disablement in the Physically Active (DPA) scale (n = 39, 25.0%; Table 4). Many PROMs received few endorsements or no endorsement at all, indicating low usage in athletic training practice (Tables 2 through 4).

In terms of PROM selection (Table 5), the most commonly endorsed criteria were being easy for patients to understand, shown to be valid and reliable, being easy for clinicians to understand and interpret the meaning of scores and changes in scores, and being most appropriate for the types of conditions seen in the AT's practice setting. The least often endorsed selection criteria were being useful for

Table 2. Commonly Used Specific Patient-Reported Outcomes Measures by Body Region (n = 328)

Body Part	No. (%)
Foot and ankle (n = 212)	
Foot and Ankle Ability Measure	78 (36.8)
Foot and Ankle Disability Index	64 (30.2)
AAOS Foot and Ankle Core Score	28 (13.2)
Lower Extremity Functional Scale	11 (5.2)
Sports Ankle Rating Quality of Life Measure	11 (5.2)
Foot Function Index	7 (3.3)
Foot Health Status Questionnaire	4 (1.9)
Knee (n = 236)	
Lower Extremity Functional Scale	108 (45.8)
Knee Osteoarthritis Outcome Score	56 (23.7)
International Knee Documentation Committee	55 (23.3)
Cincinnati Knee Scale	20 (8.5)
Lysholm Knee Functioning Scoring Scale	19 (8.1)
Tegner Activity Level Rating Scale	18 (7.6)
Western Ontario and McMaster Universities Osteoarthritis Index	16 (6.8)
Kujala Patellofemoral Score/Anterior Knee Pain Score	15 (6.4)
Western Ontario Meniscal Evaluation Tool	5 (2.1)
Oxford Knee Score	3 (1.3)
Hip (n = 128)	
Lower Extremity Functional Scale	54 (42.2)
Hip Disability and Osteoarthritis Outcome Score	17 (13.3)
Hip Outcome Score	16 (12.5)
American Academy of Orthopaedic Surgeons Hip and Knee Score	9 (7.0)
Harris Hip Score	9 (7.0)
Western Ontario and McMaster Universities Osteoarthritis Index	4 (3.1)
Nonarthritic Hip Score	3 (2.3)
Back (n = 153)	
Oswestry or Modified Oswestry Disability Index	80 (52.3)
Low Back Outcome Score	17 (11.1)
Roland Morris Disability Questionnaire	14 (9.2)
Waddell Disability Index	6 (3.9)
North American Spine Society Lumbar Spine Assessment Instrument	3 (2.0)
Quebec Back Pain and Disability Scale	3 (2.0)
Shoulder and elbow (n = 204)	
Disabilities of the Arm Shoulder and Hand (DASH)	96 (47.1)
QuickDASH	46 (22.5)
Upper Extremity Functional Scale	21 (10.3)
Functional Arm Scale for Throwers	18 (8.8)
Shoulder Pain and Disability Index	17 (8.3)
Kerlan-Jobe Orthopaedic Clinic Questionnaire	15 (7.4)
American Shoulder and Elbow Surgeons Self-Report Form	8 (3.9)
Pennsylvania Shoulder Score	5 (2.5)
Shoulder Rating Questionnaire	4 (2.0)
Shoulder Disability Questionnaire	2 (1.0)
Simple Shoulder Test	2 (1.0)
Western Ontario Shoulder Instability Index	2 (1.0)
Flexilevel Scale for Shoulder Function	1 (0.5)
Oxford Shoulder Score	1 (0.5)
Upper Limb Functional Limitation Scale	1 (0.5)
Constant Murley Shoulder Score	0 (0.0)
University of California, Los Angeles, Shoulder Rating Score	0 (0.0)
Wrist and hand (n = 99)	
DASH	40 (40.4)
QuickDASH	19 (19.2)
Upper Extremity Functional Scale	10 (10.1)
Michigan Hand Outcomes Questionnaire	2 (2.0)
Patient-Rated Wrist Evaluation Questionnaire	2 (2.0)
Brigham and Women's Carpal Tunnel Questionnaire	0 (0.0)
Gartland and Werley Score	0 (0.0)
Neck (n = 100)	
Neck Disability Index	52 (52.0)
Copenhagen Neck Functional Disability Scale	3 (3.0)
Northwick Park Therapy Dependency Assessment	0 (0.0)
Head (n = 118)	
Headache Impact Test (HIT-6)	31 (26.3)
Profiles of Mood States	13 (11.0)
Dizziness Handicap Inventory	13 (11.0)
Multidimensional Fatigue Scale	7 (5.9)
Patient-Rated Outcomes Measurement Information System	7 (5.9)
Beck Depression Inventory	6 (5.1)
Traumatic Brain Injury Quality of Life	5 (4.2)
Satisfaction with Life Scale	4 (3.4)
Quality of Life After Brain Injury	3 (2.5)
NeuroQOL (Quality of Life in Neurological Disorders)	2 (1.7)

a variety of purposes, such as research, quality assurance, and patient evaluation; suitability for electronic analysis; and seeming to be the most frequent ones used in athletic training practice. When we compared responses based on classification of current job setting, ATs who were primarily responsible for patient care rated the following criteria to be of less importance than those who were primarily responsible for research: shown to be valid and reliable ($P = .03$), useful for a variety of purposes ($P = .02$), and can be analyzed electronically ($P = .03$). No group differences were reported for the remaining selection criteria (P values = .07–.99).

The AT-NON Results

Of the ATs who did not use PROMs, the most commonly endorsed reasons for non-use (Table 6) were that they *require a support structure that I do not have (eg, technology, staff),* take too long for clinicians to analyze/calculate/score, and take too much time for patients to complete. The least frequently endorsed reasons for non-use were that they require too high a reading level for many patients; are not sensitive to the cultural/ethnic concerns of many of the ATs' patients; and *are in English, a language*

Table 3. Commonly Used Single-Item Patient-Reported Outcome Measures (n = 258)

Instrument	No. (%)
Numeric Pain Rating Scale	128 (49.6)
Global Rating of Change Scale	59 (22.9)
Patient-Specific Functional Scale[a]	44 (17.1)
Global Rating of Function	24 (9.3)
Patient Rating of Satisfaction With Care	16 (6.2)
Global Rating of Disability	11 (4.3)
Single Assessment Numeric Evaluation	10 (3.9)
Patient Rating of Satisfaction With Injured Body Part	7 (2.7)
Patient Acceptable Symptom State	1 (0.4)

[a] The Patient-Specific Functional Scale is formally a 3- to 5-item measure. However, because it is neither a specific nor generic measure, we classified it as a single-item measure.

Table 4. Commonly Used Generic Patient-Reported Outcome Measures (n = 156)

Instrument	No. (%)
Short Form-12 or Short Form-36	57 (36.5)
Disablement in the Physically Active	39 (25.0)
Short Musculoskeletal Functional Assessment	21 (13.5)
Pediatric Quality of Life Inventory	19 (12.2)
Musculoskeletal Functional Assessment	17 (10.9)
Pediatric Outcomes Data Collection Instrument	2 (1.3)
Sickness Impact Profile	1 (0.6)

in which many of my patients are not fluent. When comparing responses based on classification of current job setting, ATs who were primarily responsible for patient care rated the following criteria to be of less importance than those who were primarily responsible for research: they require too high a reading level for many patients ($P = .03$) and *are in English, a language in which many of my patients are not fluent* ($P = .03$). No group differences were reported for the remaining reasons for non-use (P values = .06–.99).

DISCUSSION

The primary purpose of our study was to identify PROMs commonly used by ATs who administer PROMs in order to facilitate the implementation of PROMs in athletic health care for patient care and research. To our knowledge, we are the first to explicitly identify the most commonly used PROMs among ATs. Our results suggest that ATs most often reported using region-specific PROMs, followed by single-item and generic PROMs. The ATs' preference for region-specific measures was not surprising. Because specific measures were designed for a particular injury, disease, or illness, they were structured to capture small and important changes over time more easily than generic measures.[10,21] Another reason that region-specific PROMs may be used more often than other types of PROMs is that they typically focus on function, which is a major concern of athletic patients. A review of the current literature suggested that the DASH[22–24] and LEFS[25–29] were commonly used in the sports medicine community to assess self-reports of function. In our study, the DASH and LEFS were also frequently endorsed specific PROMs by ATs who used PROMs. Although these tools provide a glimpse of the patient's perspective, which should enhance patient care, their emphasis on function limits the ability to obtain a whole-person perspective on how the health condition affects the patient. Comprehensive, whole-person care requires attention to all levels of disablement, including body structure and function, activity, and participation.[7,10] Because specific PROMs tend to emphasize activity level, a generic measure should be included to complement the information identified with specific measures.[8,10,30]

In our study, almost 70% of ATs who used PROMs also reported using single-item measures. Single-item measures ask only 1 question about the patient's health or perception of his or her health status, making them quick and easy instruments to administer, score, and complete.[15,16] When used in combination, multiple single-item measures can potentially capture several levels of disablement, yet they do so in less depth than multi-item measures. For example, the Numeric Pain Rating Scale, Global Rating of Function, and Global Rating of Disability capture levels of body structure and function, activity, and participation. Based on our findings, it appears that, although ATs used the Numeric Pain Rating Scale, they rarely used the Global Rating of Function or the Global Rating of Disability. Future efforts to better educate clinicians on the use of single-item outcome measures and their benefits for quick and easy outcomes assessment are needed, particularly when time is a major barrier to their use.[15,16]

Our results also suggest that more than 60% of ATs who used PROMs administered generic measures. In contrast to specific measures, generic measures typically target a wide range of health domains, often assessing health-related quality of life and how the condition affects the patient from a whole-person perspective.[10,31] Thus, generic measures can often provide information beyond a person's self-report of function. In addition, because generic measures are not designed with a particular injury or illness in mind, they can be used among different patient populations and patients with different injuries.[8,10,30] This, in turn, allows clinicians and researchers to make broad comparisons across groups with various demographic characteristics.[10,32] Though generic measures offer several benefits to patient care, they may also have limitations. For example, generic measures are not developed with a patient population in

Table 5. Athletic Trainers' Ratings of Importance of Specific Selection Criteria When Choosing Patient-Reported Outcome Measures

Criterion	Response, No. (%)					Median (Interquartile Range)
	Not Important	Slightly Important	Moderately Important	Important	Very Important	
Easy for patients to understand	1 (0.3)	1 (0.3)	9 (3.1)	78 (27.0)	200 (69.3)	5 (4,5)
Shown to be valid and reliable	0 (0.0)	1 (0.3)	16 (5.5)	96 (33.2)	176 (60.9)	5 (4,5)
Easy for clinicians to understand/interpret meaning of scores and change in scores	1 (0.3)	3 (1.0)	34 (11.8)	109 (37.7)	142 (49.2)	4 (3,5)
Most appropriate for the types of conditions seen in my practice setting	3 (1.0)	5 (1.7)	28 (9.7)	121 (41.9)	132 (45.7)	4 (3,5)
Can be completed quickly	2 (0.7)	4 (1.4)	43 (14.9)	115 (39.9)	124 (43.1)	4 (3,5)
Useful for a variety of purposes (eg, research, quality assurance, patient evaluation)	12 (4.2)	30 (10.4)	46 (16.0)	128 (44.4)	72 (25.0)	4 (2,5)
Can be analyzed electronically (eg, scanner, computer)	35 (12.1)	36 (12.5)	59 (20.4)	88 (30.4)	71 (24.6)	4 (3,5)
Seem to be the most common ones used in athletic training practice	43 (14.9)	54 (18.8)	84 (29.2)	75 (26.0)	32 (11.1)	3 (1,5)

Table 6. Athletic Trainers' Reasons for Non-Use of Patient-Reported Outcome Measures

Reason	Response, No. (%)					Median (Interquartile Range)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Require a support structure that I do not have (eg, technology, staff)	46 (4.0)	163 (14.3)	402 (35.3)	373 (32.7)	158 (13.9)	3 (2,4)
Take too much of clinician's time to analyze/calculate/score	33 (2.9)	155 (13.6)	449 (39.3)	381 (33.3)	125 (10.9)	3 (2,4)
Take too much time for patients to complete	45 (3.9)	163 (14.3)	451 (39.5)	369 (32.3)	114 (10.0)	3 (2,4)
Often not completed at discharge so are not useful for determining patient response to treatment	41 (3.6)	165 (14.4)	647 (56.6)	245 (21.5)	45 (3.9)	3 (2,4)
Require more effort than they are worth	59 (5.2)	236 (20.6)	562 (49.1)	234 (20.4)	54 (4.7)	3 (1,5)
Are difficult to interpret	53 (4.6)	238 (20.8)	573 (50.2)	251 (22.0)	27 (2.4)	3 (2,4)
Do not contain items or questions that are relevant for the types of patients I see	55 (4.8)	224 (19.6)	597 (52.2)	219 (19.2)	48 (4.2)	3 (3,3)
Require training that I do not have	131 (11.4)	274 (23.9)	502 (43.8)	190 (16.6)	48 (4.3)	3 (2,4)
Are really only used for research purposes	101 (8.9)	303 (26.6)	574 (50.2)	143 (12.5)	20 (1.8)	3 (2,4)
Provide information that is too subjective to be useful	66 (5.8)	325 (28.5)	599 (52.4)	132 (11.5)	21 (1.8)	3 (2,4)
Do not contain information that helps direct the plan of care	72 (6.3)	363 (31.7)	557 (48.6)	134 (11.7)	19 (1.7)	3 (2,4)
Are difficult for patients to complete independently	103 (9.0)	356 (31.1)	539 (47.0)	144 (12.6)	4 (0.3)	3 (2,4)
Make patients anxious	137 (12.0)	307 (26.8)	571 (49.9)	124 (10.8)	6 (0.5)	3 (2,4)
Cost too much	148 (13.0)	263 (23.2)	607 (53.4)	101 (8.9)	17 (1.5)	3 (2,4)
Are confusing for patients	113 (9.9)	348 (30.4)	625 (54.4)	57 (5.0)	5 (0.3)	3 (2,4)
Are not relevant	148 (12.9)	347 (30.3)	550 (48.0)	69 (6.1)	31 (2.7)	3 (2,4)
Require too high a reading level for many patients	214 (18.7)	397 (34.7)	478 (41.7)	51 (4.5)	5 (0.4)	2 (1,3)
Are not sensitive to the cultural/ethnic concerns of many of my patients	266 (23.3)	322 (28.1)	511 (44.7)	42 (3.6)	3 (0.3)	2 (1,3)
Are in English, a language in which many of my patients are not fluent	384 (33.5)	305 (26.6)	415 (36.2)	37 (3.3)	5 (0.4)	2 (1,4)

mind, so they may not be as efficient in or sensitive to capturing small and important changes as specific measures are. Also, generic measures are designed to be used for a broad range of patients; therefore, some of the items may be perceived as lacking relevance to high-functioning patient populations, such as athletes.[8,10] Due to these limitations, an often recommended best practice[8–10] is to use both generic and specific PROMs to ensure that the clinician evaluates the patient from a whole-person perspective and can measure small and important changes over the course of care.

Given the potential limitations of generic measures in athletic health care, it was surprising that the DPA[33] was not more frequently endorsed in our study (n = 39, 25.0%). The DPA is a generic PROM designed specifically for highly functional patients. Lack of endorsement of the DPA may have been because it is a relatively new instrument and potentially less familiar to clinicians than the SF-12 or SF-36. Although the measure is new, recent investigators who used the DPA found it to be feasible[34] and reliable[35] in high-functioning patients. Furthermore, physical and mental composite scores have been established that may help ATs gain more insight into the patient's perspective.[34] As ATs continue to integrate PROMs into daily practice and clinical research, the DPA may be a useful generic PROM to consider.

A second aim of our study was to gain a better understanding of how ATs who used PROMs identified and selected them for patient care and research. Our findings suggest that criteria such as ease of understanding for the patient, demonstrated reliability and validity, appropriateness, and completion time were important factors when evaluating and selecting a PROM. The current literature on instrument selection supports these findings. For example, Kyte et al[36] recommended that factors to consider when selecting a PROM include its measurement properties (ie, reliability, validity, and responsiveness) and appropriateness for the patient population. *Appropriateness* applies to the wording in the questions and the patient burden when completing the instrument.[36] The criterion of time was not surprising because ATs are typically expected to provide fast-paced, high-volume patient care under time limitations. When considering the ATs' current job classification, the selection criteria for ATs who used PROMs primarily for patient care did not generally differ from those who used PROMs for research purposes. Interestingly, ATs who were primarily responsible for patient care rated the importance of a PROM being valid and reliable lower than their peers who were primarily responsible for research. This may suggest that future educational efforts should emphasize the importance of using PROMs that are valid and reliable to support global professional efforts. For example, it would be challenging to demonstrate the value of ATs and identify effective treatments and services provided by ATs without the use of valid and reliable measures.[8–10]

Although gaining an understanding of the PROMs often used by ATs is important, it should be noted that the use of PROMs in athletic training was relatively minimal. Specifically, only 1 in 5 ATs used PROMs on a routine basis. This is similar to previous findings in athletic training,[15] suggesting that the recommendations of the "Athletic Training Education Competencies"[11] and the "Role Delineation/Practice Analysis"[12] may have had little effect in encouraging the use of PROMs in athletic training practice thus far. Although the percentage was low, it is in

line with results from other health care professions, such as physical therapy, occupational therapy, and speech and language therapy.[37] When considering whether certain demographic factors influenced the use or non-use of PROMs in athletic training, it appears that education and work setting may have affected the use of PROMs. Our findings suggest that individuals who had doctoral training were more likely to report using PROMs. This may speak to the notion that additional education may influence whether an AT will use PROMs. This is reasonable considering that one of the major reasons for non-use was lack of training as reported by ATs[15] and physical therapists.[14] In addition, it appears that the work setting can affect the use of PROMs; individuals working in clinic, hospital, and military/government settings were more likely to use them.

Beyond potential differences based on demographic factors, an understanding of barriers related to the non-use of PROMs is essential in guiding future efforts for increasing the use of these instruments. As in most health care settings, the lack of time to complete, score, and interpret PROMs is a major barrier.[37–40] Technology may help to alleviate these time constraints.[39] For example, resources such as Web sites[41] and electronic medical records[42] can facilitate the completion and scoring of PROMs, thus reducing the time burden. Also, efforts have been focused on using computer-adaptive testing methods for PROMs,[43,44] reducing the overall number of items patients complete, and further limiting the time needed to administer the instrument and calculate and interpret scores. Future educational efforts should focus on identifying and developing ways to use technology to encourage more routine use of PROMs. Additionally, researchers in athletic training should consider using computer-adaptive testing methods.

Our findings also suggest that the lack of organizational infrastructure is a major barrier to the routine use of PROMs. Previous investigators in a variety of health care professions,[39] including rehabilitation health sciences (eg, physical therapy, occupational therapy, and speech and language therapy)[37] and palliative care,[38] have highlighted the importance of a supportive organizational infrastructure in encouraging PROM use. Essential components of organizational support for PROM use include policies to guide PROM use,[40] clear guidelines for implementing PROMs,[39] managerial involvement and support (eg, managerial appreciation for the extra effort, involvement in the implementation process),[38,40] adequate resources (eg, training, technical support, statistical support, data interpretation),[37,39] and additional administrative support (eg, a PROM coordinator).[38] In our study, we found that ATs practicing in clinics, hospitals, and military/government settings, which likely have more robust and defined organizational infrastructures, were more likely to use PROMs than ATs working in more traditional settings, such as secondary schools, that may have limited resources. Because most ATs do not work in traditional medical settings or under the medical model, professional efforts are needed to identify ways of providing clinicians with more support for PROM use. For example, professional organizations, such as the NATA, may consider providing resources such as training, technical support, statistical support, and data interpretation to assist ATs in the use of PROMs. In addition, efforts by professional organizations to develop best practices for PROM use may offer support similar to that supplied by more formal organizational policies. Future efforts by the athletic training profession should aim to identify strategies that help ATs optimize organizational infrastructure and support to encourage the use of PROMs in patient care.

One limitation of our study was the relatively low response rate (10.7%). However, similar response rates have been reported in other athletic training studies.[45–47] To our knowledge, our results reflect the highest response rate of ATs concerning their practice patterns and the use of PROMs in athletic health care. Also, the publicly available demographic information of NATA members (eg, sex, job setting, highest level of education, district)[48,49] was similar to the percentages observed in our sample, supporting the representativeness of our sample and the generalizability of our findings. Lastly, the final response size of 1784 exceeded the threshold needed to provide results that were accurate at a 99% confidence level and ±3% margin of error. Thus, our results likely provide a better estimate of the population value than those of Valier et al,[15] who reported a 31% response rate, though their study was powered for a 40% response rate, 95% confidence level, and 64% margin of error. For these reasons, we believe our results add meaningful information to the current literature and provide beneficial insights into the use and non-use of PROMs in athletic training. Another possible limitation is that although we made efforts to be inclusive and comprehensive in our list of PROMs, some available measures were not included as options in our survey. Even though respondents were able to cite PROMs not included in our study by typing in entries, some instruments may have been missed. Lastly, we did not operationalize the term *routinely* when asking the participants whether or not they routinely used PROMs for clinical practice or clinical research, which they may have interpreted differently. Despite these limitations, we believe the findings from our study provide important information on the current use of PROMs among ATs.

CONCLUSIONS

We aimed to describe PROMs commonly used by ATs who administered PROMs, the criteria by which ATs selected PROMs, and the reasons for non-use by ATs who did not administer PROMs. Although the overall use of PROMs in athletic training remained low, those who did use PROMs reported administering a variety of different types. Generally, specific PROMs, such as the Foot and Ankle Ability Measure, LEFS, and DASH, were the most commonly reported PROMs used by ATs, but more than half also indicated using single-item and generic measures. When selecting a PROM, ATs often consider the time burden for the patient and the clinician and the measurement properties of the PROM. To encourage greater use of PROMs in the athletic training profession, efforts are needed to address common barriers, such as lack of time, and to identify effective strategies (eg, use of multiple single-item measures, leveraging available technology) to help ATs implement PROMs more routinely into patient care and research.

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