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Patient-Reported Outcome Measures in Sports Medicine: A Concise Resource for Clinicians and Researchers

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Background: Despite the importance of assessing patient outcomes during patient care, current evidence suggests relatively limited use of patient-reported outcome measures (PROMs) by athletic trainers (ATs). Major barriers to PROM use include lack of knowledge, navigating the intricate process of assessing a wide variety of PROMs, and selecting the most appropriate PROM to use for care. A concise resource for ATs to consult when selecting and implementing PROMs may help facilitate the use of PROMs in athletic health care.

Objective: To review the instrument essentials and clinical utility of PROMs used by ATs.

Methods: We studied 11 lower extremity region–specific, 10 upper extremity region–specific, 6 generic, and 3 single-item PROMs based on the endorsement of at least 10% of ATs who use PROMs, as reported in a recent investigation of PROM use in athletic training. A literature search was conducted for each included PROM that focused on identifying and extracting components of the instrument essentials (ie, instrument development, reliability, validity, responsiveness and interpretability, and precision) and clinical utility (ie, acceptability, feasibility, and appropriateness). Through independent review and group consensus, we also classified each PROM question by International Classification of Functioning, Disability and Health domain and health-related quality-of-life dimensions.

Key Findings: The PROMs contained in this report generally possessed appropriate instrument essentials and clinical utility. Moreover, the PROMs generally emphasized body structure and function as well as the physical functioning of the patient. Athletic trainers aiming to assess patients via a whole-person approach may benefit from combining different PROMs for use in patient care to ensure broader attention to disablement health domains and health-related quality-of-life dimensions.

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

In aligning itself with global health care initiatives,[1–5] the athletic training profession has made focused efforts to foster the assessment of clinical outcomes, particularly patient-reported outcomes, during routine patient care.[6–8] For example, the athletic training profession has highlighted the need to assess patient-reported outcomes in the current editions of the *Athletic Training Education Competencies*[9] and the *Role Delineation Study*,[10] as well as the *2020 Standards for Accreditation of Professional Athletic Training Programs*.[11] Furthermore, the National Athletic Trainers' Association has recently adopted the use of the World Health Organization's International Classification of Functioning, Disability and Health (ICF) framework, highlighting the need for athletic trainers (ATs) to view patients from a whole-person perspective.[12] These foundational documents in athletic training emphasize not only the need for clinical outcomes assessment during patient care but also the important role patient-reported outcome measures (PROMs) play in capturing the patient's perspective, informing patient care decisions, and evaluating the effectiveness of treatment approaches from a whole-person perspective.[4–6,13]

Although the importance of assessing patient outcomes and the use of PROMs is clear, current evidence suggests only 15% to 26% of ATs routinely use PROMs during patient care.[14–16] When asked to identify barriers to the routine use of PROMs during patient care, ATs who did not use PROMs reported that the lack of education about and understanding of PROMs impeded their ability to successfully implement PROMs in their clinical practice.[14–16] Recent findings[17] indicated that the vast majority of ATs (68%–98%) were unfamiliar with PROMs that were frequently reported in the athletic training literature, including the Foot and Ankle Ability Measure (FAAM; 82.1% of the sample was unfamiliar), the Medical Outcomes Study 36-Item Short Form Health Survey (86.2% were unfamiliar), and the Patient-Specific Functional Scale (PSFS; 82.1% were unfamiliar), further underscoring this lack of knowledge. Although a general lack of knowledge of and inexperience with PROMs are not unique to the athletic training profession,[18] these barriers can negatively affect the comprehensive implementation of PROMs during patient care, particularly during the intricate process of selecting the most appropriate instrument among the numerous available PROMs.

To help ATs evaluate the available PROMs and identify the most appropriate instruments for use in patient care, Snyder Valier and Lam[19] provided a detailed summary of the major considerations related to PROM selection. In short, ATs should consider both the instrument essentials (ie, instrument development, reliability, validity, responsiveness and interpretability, and precision) and the clinical utility (ie, acceptability, feasibility, and appropriateness) of the instrument.[19] Furthermore, when assessing the appropriateness of a PROM, ATs were advised[19] to consider the health domains represented in disablement models[20] and dimensions of health-related quality of life (HRQOL)[21,22] captured by the instrument to ensure that the PROM can support patient-centered care. Because of busy athletic training clinicians' lack of time and resources,[14,15,18] gathering and evaluating all the information related to the instrument essentials and clinical utility for numerous PROMs is challenging. Although previous authors have reviewed the use of PROMs in the sports medicine community, these commentaries have generally reviewed PROMs from the perspectives of orthopaedic surgeons, whose patient population may not necessarily reflect the young and highly functional patient population for whom ATs usually provide care[23–25] or may not have reviewed a comprehensive list of PROMs reported by ATs who routinely use them.[26] In addition, these researchers did not critically review instruments based on the health domains represented in disablement models or dimension of HRQOL, which are important components to patient-centered, whole-person care. Therefore, the purpose of our report was to critically review the instrument essentials and clinical utility of the PROMs reported by ATs who used PROMs to (1) provide a helpful and concise guide for ATs to refer to during the PROM selection process and (2) facilitate the use of PROMs in athletic training clinical practice.

METHODS

Identification of PROMs

To provide ATs with a concise guide to PROMs, we reviewed the instruments reported by ATs who used PROMs in routine practice. In a survey study by Lam et al,[15] ATs who used PROMs on a routine basis were asked to identify the PROMs they used for patient care and research purposes. Based on the responses of 370 ATs who routinely used PROMs in care, 78 unique PROMs were endorsed and identified. We included PROMs in this report if at least 10% of the ATs endorsed their use in the study by Lam et al.[15]

Literature Search

Using the list of PROMs, we conducted a 2-phase literature search. First, we searched the literature with a focus on instrument development and establishment of the psychometric properties of each PROM. We completed 4 searches for each PROM using its name and the following key words: *development, validity, reliability, responsiveness*. For example, we performed these searches for the FAAM: (1) *Foot and Ankle Ability Measure AND development*, (2) *Foot and Ankle Ability Measure AND validity*, (3) *Foot and Ankle Ability Measure AND reliability*, and (4) *Foot and Ankle Ability Measure AND responsiveness*. For the second phase, we searched the literature for the use of the PROM specifically among athletes. For this phase, we used the PROM name in combination with 1 of 2 key words (*athlet**, *sport*) in separate searches: for instance, (1) *Foot and Ankle Ability Measure*" *AND athlet** and (2) *Foot and Ankle Ability Measure AND sport*. This process was repeated for each PROM.

Data Extraction

We extracted data from the available literature to summarize the instrument essentials (ie, instrument development, reliability, validity, responsiveness and interpretability, and precision) and clinical utility (ie, acceptability [number of items, time to complete, readability, comfort-level concerns], feasibility [ease of use, role of clinician, time to score, costs associated with use], and appropriateness [intended patient populations, demonstrated use for other patient populations, global purpose of use]) of each PROM included in this report.

For instrument acceptability, we also assessed the readability of each PROM. Readability is important for all patients but particularly for patients who are minors, such as secondary school and youth athletes, or nonnative English speakers.[27,28] For this review, readability was represented by the Flesch-Kincaid reading grade level. To calculate the Flesch-Kincaid reading grade level, we used Word for Mac (version 16.15; Microsoft Corp, Redmond, WA). In short, each PROM was imported into Microsoft Word and its unformatted text was analyzed with the embedded formula to provide a reading grade level for the measure.

For instrument appropriateness, we also summarized the ICF health domains and HRQOL dimensions captured by each PROM using a consensus process described in a previous study.[29] In brief, the consensus process required each research team member (n = 3, all of whom had expertise in clinical outcomes assessment [eg, teaching, presentation, and research experience in clinical outcomes assessment]) to review the included PROMs independently and classify each PROM question within 1 ICF health domain[20] and 1 HRQOL dimension.[21,22] After performing independent reviews of all PROMs and initial classification of questions according to ICF health domains and HRQOL dimensions, the raters met as a group to compare their classifications. Discrepancies in classifications were discussed, and a final classification was determined by group consensus.

Descriptions of the specific ICF health domains and HRQOL dimensions used for this study were detailed in a previous investigation.[29] In brief, for the ICF health domains, raters classified each question in one of the following domains: health condition, body structure and function, activity, participation, environmental factors, or personal factors.[20,29] When necessary, the raters were able to consult the ICF Web site (apps.who.int/classifications/icfbrowser/) during the review process for guidance in categorizing ICF health domains. For the HRQOL dimensions, each item was classified in one of the following areas: physiological (ie, impairments such as pain and swelling), physical (ie, ability to perform activities

and attributes such as mobility and performance), psychological (ie, emotional well-being, including happiness and sadness), spiritual (ie, value of religious beliefs and practices), social (ie, interactions with family and friends), or economic (ie, financial status and burden) functioning.[21,22,29]

KEY FINDINGS

Based on the findings of Lam et al,[15] a total of 17 region-specific, 6 generic, and 3 single-item PROMs were endorsed by at least 10% of the ATs who used PROMs and thus were reviewed for this report. For region-specific PROMs, 11 lower extremity–specific (3 foot and ankle, 3 knee, 3 hip, 2 back) and 10 upper extremity–specific (3 shoulder-elbow, 3 wrist-hand, 1 neck, 3 head) instruments were studied (Table 1). Four PROMs were identified for use in multiple body regions: the Lower Extremity Functional Scale (knee and hip), Disabilities of the Arm, Shoulder and Hand (DASH; wrist-hand and shoulder-elbow), QuickDASH (wrist-hand and shoulder-elbow), and Upper Extremity Functional Scale (wrist-hand and shoulder-elbow).

As a result, a total of 26 unique PROMs (10 lower extremity region specific, 7 upper extremity region specific, 6 generic, and 3 single item) were evaluated in this review. Consistent with Lam et al,[15] we classified the PSFS as a single-item measure because it is neither a specific nor a generic measure. Table 1 provides a general summary of the instrument essentials and clinical utility of each included PROM for quick reference. More detailed summaries of the instrument essentials, including specific measurement property values, of lower extremity–specific, upper extremity–specific, and generic and single-item measures can be found in Tables 2, 3, and 4, respectively. Summaries of considerations for clinical utility can be found in Tables 5, 6, and 7.

Region-Specific Measures

Instrument Essentials. Of the 10 lower and 7 upper extremity region-specific PROMs, all (100.0%, 17 of 17) were associated with the appropriate instrument essentials, with a reported systematic development process and evidence of reliability and validity (Tables 2 and 3). In addition, responsiveness values were reported for almost all region-specific PROMs (88.2%, 15 of 17), with the exception of the American Academy of Orthopedic Surgeons Foot and Ankle Questionnaire and Abbreviated Profiles of Mood States. The precision of the PROMs varied within and among instruments, with response scales including some combination of binary, modified visual analog scale, 3- to 7-point adjectival, and 5-point Likert-scale responses.

Clinical Utility. In terms of clinical utility, the region-specific PROMs also generally demonstrated appropriate acceptability (Tables 5 and 6). Patient completion time was estimated as less than 10 minutes for almost all of the PROMs (15 of 17, 88.2%), with the expectation that many could be completed in 5 minutes or less (11 of 17, 64.7%). Readability of the measures ranged from fourth to 10th grade (Table 5) and third to sixth grade (Table 6) for the lower extremity and upper extremity PROMs, respectively. Most PROMs (13 of 17, 76.6%) had an estimated reading level of seventh grade or below. The region-specific PROMs also demonstrated good feasibility, with none requiring (1) special training to understand the administration process, (2) a clinician to complete the questions, or (3) clinician supervision of the patient during completion. Although 3 instruments (17.6%) required a user agreement, only 1 instrument, the Shortened Headache Impact Test, required paid access for use. In addition, the clinician burden was relatively low, with the time to score each measure estimated at $\leq$5 minutes. In terms of appropriateness, most appeared relevant to the types of conditions or areas of health effect that are important to athletes. Further, although the majority of the region-specific PROMs appeared to address items of importance to athletes, most were not developed specifically for high-functioning athletic populations (94.1%, 16 of 17). From an ICF health domain perspective, the region-specific PROMs generally captured the body structure and function (39.1%, 163 of 417 items) and activity (45.1%, 188 of 417 items) domains. Very few of the items on the region-specific instruments were related to the participation (13.2%, 55 of 417 items) or environmental factors (2.6%, 11 of 417 items) domain, and none included questions related to the health condition domain. From an HRQOL dimension perspective, the region-specific PROM instruments included questions that predominantly evaluated the physical (54.7%, 228 of 417 items) and physiological (23.7%, 99 of 417 items) dimensions. The psychological (12.7%, 53 of 417) and social (8.9%, 37 of 417 items) dimensions were captured less frequently, and none of the region-specific measures addressed the spiritual or economic dimension.

Generic Measures

Instrument Essentials. We reviewed 6 generic PROMs. All were developed using a systematic process, had evidence of reliability and validity, and had established responsiveness values in some populations (Table 4). Similar to the region-specific PROMs, the precision of the generic PROMs varied within and among instruments, with questions requiring binary, 3- to 11-point adjectival, and 5- to 15-point Likert responses.

Clinical Utility. In general, most generic PROMs (4 of 6, 66.7%) demonstrated good acceptability and feasibility, including appropriate patient completion time (less than 5 minutes), no comfort-level concerns, and limited clinician burden associated with the Disablement in the Physically Active (DPA) scale, Pediatric Quality of Life, Medical Outcomes Study 36-Item Short Form Health Survey, and Short Form 12 (Table 7). Of note, the Musculoskeletal Function Assessment (MFA) and Short MFA both consist of more items (110 and 46, respectively) and, thus, require more time to complete (15 and 5–10 minutes, respectively) relative to the other generic PROMs. In addition, the MFA and Short MFA also include items with potential comfort-level items (ie, *Has your sexual life changed? Do you enjoy sex less? How much difficulty are you having with sexual activity?*) for patients. The readability of the included generic PROMs ranged from second to 10th grade, with 77.8% (7 of 9) estimated at sixth grade or below (Table 7). From an ICF health domain perspective, the generic PROMs generally captured the body structure and function (35.0%, 85 of 243 items), activity (35.0%, 85 of 243 items),

Table 1. Concise Summary of Included Patient-Reported Outcome Measures

	Instrument Essentials				Clinical Utility		
	Development	Reliability	Validity	Responsiveness	Acceptability	Feasibility	Appropriateness
Foot and ankle							
American Academy of Orthopaedic Surgeons Foot and Ankle Questionnaire	✓	✓	✓	X	✓	✓	✓
Foot and Ankle Ability Measure	✓	✓	✓	✓	✓	✓	✓
Foot and Ankle Disability Index	✓	✓	✓	✓	✓	✓	✓
Knee							
International Knee Documentation Committee Questionnaire	✓	✓	✓	✓	✓	✓	✓
Knee Injury and Osteoarthritis Outcome Score	✓	✓	✓	✓[a]	✓	✓	✓
Lower Extremity Functional Scale	✓	✓	✓	✓	✓	✓	✓
Hip							
Hip Disability and Osteoarthritis Outcome Score	✓	✓	✓	✓	✓	✓	✓
Hip Outcome Score	✓	✓	✓	✓	✓	✓	✓
Lower Extremity Functional Scale	✓	✓	✓	✓	✓	✓	✓
Low back							
Low Back Outcome Score	✓	✓	✓	✓	✓	✓	✓
Oswestry Disability Index	✓	✓	✓	✓	✓	✓	✓
Wrist and hand							
Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH)	✓	✓	✓	✓	✓	✓	✓
QuickDASH Questionnaire	✓	✓	✓	✓	✓	✓	✓
Upper Extremity Functional Instrument	✓	✓	✓	✓	✓	✓	✓
Shoulder and elbow							
DASH	✓	✓	✓	✓	✓	✓	✓
QuickDASH	✓	✓	✓	✓	✓	✓	✓
Upper Extremity Functional Instrument	✓	✓	✓	✓	✓	✓	✓
Neck							
Neck Disability Instrument	✓	✓	✓	✓	✓	✓	✓
Head							
Dizziness Handicap Index	✓	✓	✓	✓	✓	✓	✓
Shortened Headache Impact Test	✓	✓	✓	✓	✓	✓	✓
Abbreviated Profile of Mood States Questionnaire	✓[b]	✓	✓	X	✓	✓	✓
Generic outcome measures							
Disablement of the Physically Active Scale	✓[b]	✓	✓	✓	✓	✓	✓
Musculoskeletal Function Assessment	✓	✓	✓	✓	?	?	?
Musculoskeletal Function Assessment–Short	✓	✓	✓	✓	?	?	?
Pediatric Quality of Life Inventory	✓	✓	✓	✓	✓	✓	✓
Short Form 36	✓	✓	✓	✓	✓	✓	✓
Short Form 12	✓	✓	✓	✓	✓	✓	✓
Single-item outcome measures							
Numeric Pain Rating Scale	X	✓	✓	✓	✓	✓	✓
Global Rating of Change	X	✓	✓	✓	✓	✓	✓
Patient-Specific Functional Scale	✓	✓	✓	✓	✓	✓	✓

Symbols: X, no evidence found in current literature; ✓, available evidence in current literature; ?, available evidence in current literature but may not be appropriate for all settings.

[a] Responsiveness was not formally assessed in patients but was estimated based on comparison with data from the Western Ontario and McMaster Universities Osteoarthritis Index.

[b] Instrument was developed with athletes as the intended patient population.

Table 2. Lower Extremity Patient-Reported Outcome Measures: Essential Elements

Region	Instrument	Development	Reliability	Validity	Responsiveness and Interpretability	Precision
Foot and Ankle	American Academy of Orthopaedic Surgeons Foot and Ankle Questionnaire	Content developed and refined with input from clinician focus groups; reliability, validity, and sensitivity testing[30]	Internal consistency: = .93 (Global Foot and Ankle Scale)[30] Test-retest: $R = 0.79$ (Global Foot and Ankle Scale); $R = 0.87$ (Shoe Comfort Scale)[30]	Construct: $r = 0.66$ (SF-36 physical), $r = 0.16$ (SF-36 mental)[30] Criterion: = .79 (physician-rated ability)[30]	Not reported	Binary 5-point adjectival 7-point adjectival 6-point adjectival[30]
	Foot and Ankle Ability Measure	Generation of potential items; initial item reduction; item response theory; final item reduction; reliability and validity testing[31]	Internal consistency[31]: = .96–.98 Test-retest: ICC (2,1) = 0.89 (ADL subscale), ICC (2,1) = 0.87 (Sport subscale)[31]	Construct: $r = 0.78$–0.84 (SF-36 physical), $r = 0.11$–0.18 (SF-36 mental)[32]	MDC: 5.7 points (ADL), 12.3 points (Sports)[31] MCID: 8 points (ADL), 9 points (Sports)[31]	5-point adjectival 4-point adjectival[31]
	Foot and Ankle Disability Index	Generation of potential items; initial item reduction; item response theory; final item reduction; reliability and validity testing[33]	Test-retest: ICC (2,1) = 0.85–0.91 (FADI), 0.67–0.92 (FADI Sport)[34]	Construct: lower scores on the involved versus uninvolved side[34]	MDC: 7.2 points (FADI), 14.7 points (Sport subscale)[34] Effect size: 0.52 (FADI), 0.71 (FADI Sport)[34]	5-point adjectival[33]
Knee	International Knee Documentation Committee Questionnaire	Instrument purposed; defined constructs; generation of potential items; pilot testing; item reduction; reliability and validity testing[35]	Internal consistency[35]: = .77–.97 Test-retest[35]: ICC (2,1) = 0.87–0.99	Construct: $r = 0.66$ (SF-36 physical), $r = 0.16$ (SF-36 mental)[35]	MDC: 9 points[35] MCID: 11.5 points (sensitivity = 0.82, specificity = 0.64), 20.5 points (sensitivity = 0.64, specificity[36] = 0.84)	Binary 5-point adjectival Modified VAS[35]
	Knee Injury and Osteoarthritis Outcome Score (KOOS)	Instrument purposed; generation of items through literature review and expert panel feedback; pilot testing; reliability, validity, and responsiveness testing[37]	Internal consistency[37]: = .75–.96 Test-retest[37,38]: ICC (2,1) = 0.75–0.93	Construct: $r = 0.47$–0.57 (SF-36 physical)[37] Content: >75% relevant items for symptoms, sports/recreational, and QOL subscales[37]	MPCI: 8–10 points[37,a]	5-point Likert 5-point adjectival[37]
Knee and hip	Lower Extremity Functional Scale	Instrument purposed; generation of items by reviewing existing questionnaires, clinician and patient feedback, and consulting the WHO model of disability; pilot testing; item reduction; reliability, validity, and sensitivity testing[39]	Internal consistency[39]: = .96 Test-retest[39]: $R = 0.86$	Construct: $r = 0.64$ (SF-36 physical), $r = 0.30$ (SF-36 mental)[39]	MDC: 9 points[39] MCID: 9 points[39]	5-point adjectival[39]
Hip	Hip Disability and Osteoarthritis Outcome Score	Modification of the KOOS; pilot testing; item reduction; patient interviews; reliability and validity testing[40]	Internal consistency[40,41]: = .77–.98 Test-retest[40,41]: ICC = 0.75–0.97	Construct: predetermined hypotheses confirmed[41–43] Content: patient input in scale development[40,41]	MDC: 9.6 points (ADL), 16.2 points (QOL)[43]	5-point Likert 5-point adjectival[40]
	Hip Outcome Score	Instrument purposed; generation of items through input from physicians and physical therapists; item response theory; reliability and validity testing[44]	Internal consistency: = .96 (ADL), = .95 (Sport)[44] Test-retest: ICC (2,1) = 0.98 (ADL), ICC (2,1) = 0.92 (Sport)[45]	Construct: $r = 0.72$–0.76 (SF-36 physical), $r = 0.11$–0.18 (SF-36 mental)[44]	MDC: 3 points (ADL and Sport)[45] MCID: 9 points (ADL), 6 points (Sport)[45]	5-point adjectival 4-point adjectival[44]
Low Back	Low Back Outcome Score	Content developed and refined based on the practice of a single orthopaedic surgeon; constructs compared with similar patient-reported outcome measures; validity testing[46]	Internal consistency[47]: = .85 Test-retest[47]: $r = 0.92$	Construct: $r = 0.63$–0.87 (other region-specific instruments)[46]	MCID: 7.5 points[47]	6-point adjectival 4-point adjectival[46]
	Oswestry Disability Index	Instrument purposed; generation of items through an expert panel; reliability testing[48]	Internal consistency[48]: = .71–.87 Test-retest[48–50]: $r = 0.83$–0.99	Construct: correlation with region-specific and generic instruments[51]	MCID: 10 points[50,52]	6-point adjectival 6-point Likert[48]

Abbreviations: ADL, activities of daily living; FADI, Foot and Ankle Disability Index; ICC, intraclass correlation coefficient; MCID, minimal clinically important difference; MDC, minimal detectable change; MPCI, minimal perceptible clinical improvement; QOL, quality of life; SF-36, Short Form 36; VAS, visual analog scale; WHO, World Health Organization.

[a] Responsiveness was not formally assessed in patients but estimated based on comparison with data from the Western Ontario and McMaster Universities Osteoarthritis Index.

Table 3. Upper Extremity Patient-Reported Outcome Measures: Essential Elements

Region	Instrument	Development	Reliability	Validity	Responsiveness and Interpretability	Precision
Shoulder-elbow and wrist-hand	Disabilities of the Arm, Shoulder and Hand Questionnaire	Instrument purposed; defined constructs; pilot testing; reliability and validity testing[53]	Internal consistency[54]: = .96 Test-retest[55–57]: ICC = 0.93–0.98	Content: significant ceiling effect in intercollegiate athletes[58] Construct: >75% hypotheses met[54] Convergent[55]: r = 0.67–0.92	SEM: 4.6 points[55] MDC: 10.81–19.0 points[54,56,59,60] MIC: 6.7 points[54] MCID: 10.83 points[56] SCB: 40% reduction in score[61]	5-point adjectival[53]
	Quick Disabilities of the Arm, Shoulder and Hand Questionnaire	3 item-reduction approaches used to modify the original instrument; reliability and validity testing[62]	Internal consistency[57]: = .90 Test-retest[56,57,62,63]: ICC = 0.90–0.94	Content: no reported floor or ceiling effects[57] Convergent[62]: r = 0.70–0.80	MDC: 12.84–17.1 points[56,60] MIC[60]: 13.4 MID: 19 points[64] MCID: 8–15.91 points[56,63]	5-point adjectival[62]
	Upper Extremity Functional Instrument	Based on the WHO model of impairment, disability, and handicap; identified original items through responses on the Patient-Specific Functional Scale, review of existing patient-reported outcome measures, and clinician feedback; 2-stage item-reduction process; reliability, validity, and sensitivity to change testing[65]	Internal consistency[66]: = .94 Test-retest[65]: ICC = 0.95	Content: no reported floor or ceiling effects[65] Convergent[66]: r = 0.54–0.57 Discriminant: able to discriminate among work status levels[65,66]	SEM: 3.9–4.0 points[65,66] MDC: 9.1–9.4 points[65,66] MCID: 8 points[66]	5-point adjectival[65]
Neck	Neck Disability Instrument	Developed through a modification of the Oswestry Disability Index and review of descriptive literature on whiplash and chronic neck pain; peer and patient review performed to confirm and modify questions; reliability and validity testing[67]	Internal consistency[67]: = .76–.84 Test-retest[67–69]: ICC = 0.68–0.89	Face: through peer review and patient feedback[67] Concurrent: r = 0.69–0.70 (McGill Pain Questionnaire)[67]	SEM: 4.4 points[69] MDC: 10.2 points[69] MCIC: 7 points[69]	6-point adjectival[67]
Head	Shortened Headache Impact Test	Item generation and modification; item response theory; readability evaluation; reliability and validity testing[70]	Internal consistency[70,71]: = .87–.89 Test-retest[70]: ICC = 0.80	Construct[71]: r = −0.22 to −0.57 (SF-36) Content: 1-factor scale with large factor loadings on the construct of disability[71] (0.57–0.86)	MIC: 2.5 points[72] MID: 6 points[72] MCIC: 8 points[73]	5-point adjectival[70]
	Abbreviated Profile of Mood States Questionnaire	Modification to the Short instrument to improve brevity and comprehensiveness for the athletic population; reliability and validity testing[74,a]	Internal consistency[74]: = .66–.95	Discriminant: able to discriminate between winners and losers[74]	Not reported	5-point adjectival[74]
	Dizziness Handicap Index	Developed empirically from case-history reports of patients with dizziness; pilot testing; item reduction; reliability and validity testing[75]	Internal consistency[75]: = .72–.89 Test-retest[75,76]: ICC = 0.94–0.97	Face: through analysis of case-history reports of patients with dizziness[75] Content: no reported floor or ceiling effects[76] Discriminant: able to discriminate based on frequency of headache occurrence[75]	SEM: 6.23 points[75] MDC: 18 points[75]	3-point adjectival[75]

Abbreviations: ICC, intraclass correlation coefficient; MCIC, minimal clinically important change; MCID, minimal clinically important difference; MDC, minimal detectable change; MIC, minimal important change; MID, minimal important difference; SCB, substantial clinical benefit; SEM, standard error of measurement; WHO, World Health Organization.

[a] Instrument was developed with athletes as the intended patient population.

Table 4. Generic and Single-Item Patient-Reported Outcome Measures: Essential Elements

Region	Instrument	Development	Reliability	Validity	Responsiveness and Interpretability	Precision
Generic	Disablement of the Physically Active Scale	Instrument purposed; generation of items through a mixed-methods study (theoretical sampling); reliability, validity, and responsiveness testing[77,78,a]	Internal consistency[78]: = .89–.91 Test-retest[78]: ICC (2, 1) = 0.94	Content: no floor or ceiling effects[78] Concurrent: $r = 0.75$ (Global Function)[78]	MCID: 6–9 points[78]	5-point adjectival[77]
	Musculoskeletal Function Assessment	Instrument purposed; generation of items through interviews with patients and clinicians and a review of existing instruments; reliability and validity testing[79]	Internal consistency[79]: = .71–.87 Test-retest[79]: % agreement = 78–100	Face: adequacy and completeness of instrument reviewed by experts[79] Content: no floor or ceiling effects[79] Convergent[80] (SF-36): $r = 0.40$ Discriminant: demonstrated for a variety of known groups[80]	SRM[80]: 0.65–1.13	Binary 5-point adjectival[79]
	Musculoskeletal Function Assessment–Short	Modification of the original instrument; systematic item reduction and addition of composite questions; pilot testing; reliability, validity, and responsiveness testing[81]	Internal consistency[80,81]: = .87–.90 Test-retest[80]: ICC = 0.67–0.99	Content: few ceiling effects (<5%), no floor effects[80,81] Convergent: $r = 0.42$–0.81 (pain scales), ≤0.40 (physicians' rating)[80,81] Discriminant: demonstrated for a variety of known groups[80,81]	SRM (Dysfunction Index): −1.14 (condition deteriorated); 1.08 (condition improved)[80,81] SRM (Bother Index): −0.79 (condition deteriorated); 0.76 (condition improved)[80]	5-point adjectival[81]
	Pediatric Quality of Life Inventory	Derived from the Pediatric Cancer Quality of Life Inventory; generation of items through an extensive literature review, patient and parent interviews, and consultation with health care professionals; pilot testing; item revision; readability assessed; reliability and validity testing[82]	Internal consistency[82–86]: = .69–.91	Construct: healthy children scored higher than children with a chronic health condition[82–84] Discriminant: demonstrated for a variety of known groups[82] Convergent: small to medium positive intercorrelations, supporting the multidimensional measurement model[82]	MCID (total score): 4.4 points[84]	5-point adjectival[82]
	Short Form 36	Instrument purposed; defined constructs; generation of items through extensive literature review; pilot testing; validity testing[87,88]	Internal consistency[89,90]: = .76–.93 Test-retest[88]: ICC = 0.63–0.89	Criterion: decreasing scores with worsening self-rated general health[88,91] Discriminant: demonstrated for a variety of known groups[88,89]	Normative scores for each domain (PCS, MCS)[88]: mean ± SD = 50 ± 10	Binary 6-point adjectival 5-point adjectival 5-point Likert 3-point adjectival[87]
	Short Form 12	Modification of the SF-36; item reduction; pilot testing; reliability and validity testing[92]	Internal consistency: = .77 (PCS), 0.80 (MCS)[93] Test-retest: ICC = 0.87–0.89 (PCS), ICC = 0.76–0.77 (MCS)[92]	Construct: significant correlations with scales for well-being, back pain, back disability, depression[93] Relative validity[92] (SF-36): PCS = 0.43–0.93, MCS = 0.6–1.07	MID (PCS): 6.5–7.3 points[59] SEM (PCS)[59]: 3.53–4.47	5-point adjectival 3-point adjectival[92]
Single item	Numeric Pain Rating Scale	Not reported	Internal consistency[94]: = .86–.90 Test-retest[63,94]: ICC = 0.74–0.88	Construct[94,95]: $r = 0.94$–0.96 Concurrent[94]: $r = 0.80$–0.88 Convergent (VAS)[96]: $r = 0.79$–0.95	MCID: 1–3 points[63,95,97,98]	11-point adjectival[99]
	Global Rating of Change	Not reported	Test-retest: ICC = 0.90 (11-point)[100]	Face[102,103]: $r = 0.72$–0.90 Construct: significant correlation with change on a variety of scales[100]	MCIC: 2 points (11-point scale)[100] MDC: 0.45 points (11-point scale)[100]	15-point Likert[101]
	Patient Specific Functional Scale	Instrument purposed; pilot testing; reliability, validity, and sensitivity testing[104]	Test-retest[105]: ICC = 0.71	Construct[69,105,106]: $r = 0.34$–0.83 Concurrent[68,106]: $r = 0.66$–0.83	MDC: 1–3 points[105]	11-point adjectival[104]

Abbreviations: ICC, intraclass correlation coefficient; MCIC, minimal clinically important change; MCID, minimal clinically important difference; MCS, mental component summary; MDC, minimal detectable change; MID, minimal important difference; PCS, physical component summary; SEM, standard error of measurement; SF-36, Short Form 36; SRM, standardized response mean; VAS, visual analog scale.

[a] Instrument was developed with athletes as the intended patient population.

and participation (30.0%, 73 of 243 items) domains. None of the items on the generic instruments were related to the health condition or environmental factors domain. From an HRQOL dimension perspective, the generic instruments included questions that predominantly evaluated the physical (40.7%, 99 of 243 items), physiological (25.1%, 61 of 243 items), and social (23.9%, 58 of 243 items) dimensions of health. The psychological (10.3%, 25 of 243) dimension was captured less frequently, and none of the region-specific measures addressed the spiritual or economic dimension.

Single-Item Measures

Instrument Essentials. The Numeric Pain Rating Scale (NPRS), Global Rating of Change (GROC), and PSFS have established reliability, validity, and responsiveness in some populations; however, only the GROC involved a systematic development process (Table 4). The NPRS and PSFS use 10- and 5-point adjectival scales, respectively, whereas the GROC was developed as a 15-point Likert-type scale.

Clinical Utility. The single-item measures appear to have good acceptability and feasibility with short times for patient completion (<3 minutes) and low clinician burden (<1 minute; Table 7). The NPRS captures the body structure and function domain and the physiological HRQOL dimension, and the PSFS assesses the activity domain and physical HRQOL dimension; however, the ICF health domain and HRQOL dimension captured by the GROC vary, as they depend on how patients perceive their condition or injury and the subsequent frame of reference when reflecting on and answering the question.

COMMENTARY

To our knowledge, this is the first report to critically review and summarize the instrument essentials and clinical utility of generic, specific, and single-item PROMs that are used in athletic health care. In addition, we provided a summary of the ICF health domains and HRQOL dimensions that questions within each PROM addressed to offer insight into their use when delivering patient-centered care. Overall, we aimed to provide a helpful, concise resource for ATs to consult when selecting and implementing PROMs.

In general, the PROMs studied in this commentary demonstrated appropriate instrument essentials, with almost all having a systematic development process and acceptable psychometric properties including reliability, validity, and responsiveness. However, it is important to note that only a few of the instruments were specifically designed to evaluate aspects of disablement and health among highly functional patients, such as athletes. For example, of the instruments reviewed, only the DPA[77,78] and the Abbreviated Profile of Mood States[74] were developed with athletes as the intended population. Further, much of the research to date related to the instrument measurement properties of generic, specific, and single-item PROMs has been conducted in populations other than a highly functional patient population such as athletes. This finding is a concern when considering the validity of the instruments for use in athletic health care.

Other PROMs were designed for the athletic population, such as the Kerlan-Jobe Orthopaedic Clinic overhead athlete score,[142] the Functional Arm Scale for Throwers,[143,144] the Athlete Fear Avoidance Questionnaire,[145] and the Swimmer's Functional Pain Scale.[146] Yet previous research[15] indicated that fewer than 10% of ATs routinely used these instruments. Thus, they were not included in this report. However, even though many of the included PROMs were developed for more general populations, these patients often presented with injuries similar to those sustained by athletes.[35,53] Ideally, measurement properties such as reliability, validity, and responsiveness should be established for the intended population.[19] Because evidence[147–149] suggested that the HRQOL of highly functional patients is different than that of the general population, future work is needed to establish the validity, reliability, and responsiveness of the PROMs most commonly used in athletes.

The PROMs included in this report appear appropriate, acceptable, and feasible for use in athletic health care. Considering readability specifically, the general guidance was that the calculated reading grade level be 2 reading levels below a patient's actual grade level.[27,28] For example, a patient in the ninth grade should be administered a PROM with a reading level of seventh grade or lower. Of the reviewed PROMs, the vast majority (20 of 26, 76.2%) had an estimated reading level of seventh grade or lower, suggesting that they would likely be appropriate for adult and adolescent patients. However, it is important to note that a patient's grade level may not necessarily align with his or her actual reading level (eg, students of English as a second language); clinicians should take this into account when selecting a PROM.

When we assessed the ICF health domains and HRQOL dimensions of health captured by the reviewed PROMs, it was not surprising that many of the instruments emphasized specific aspects of health. Most instruments include questions that evaluate the ICF health domains of body structure and function and the HRQOL dimensions of physiological and physical functioning. For example, the Lower Extremity Functional Scale and the FAAM are region-specific PROMs that focus solely on functional ability. Using PROMs that evaluate physical function in athletic health care is appropriate because highly functional patients often focus on maintaining or regaining high levels of physical function to perform activities in daily life and sports. For example, a common goal of athletes is to restore function to compete in their sports and fulfill their role as an athlete. Instruments that evaluate function allow ATs to better direct rehabilitation to meet these performance and role goals (ie, participation domain of the ICF). Even though regaining function is a common goal of athletes, other ICF health domains and HRQOL dimensions may warrant attention.[19]

Information related to body structures and functions, such as range of motion and strength, is helpful for clinicians to obtain a more complete understanding of the status of tissue healing, which may support treatment decisions to promote continued recovery.[20] An equally important area of health to evaluate is participation. However, the participation domain was not a frequent component of the PROMs included in this review. Participation reflects the areas of health that many patients care most about because it relates to the ability to complete necessary or desired life roles, such as

Table 5. Lower Extremity (LE) Patient-Reported Outcome Measures: Considerations for Clinical Utility Extended on Next Page

Aspect	Foot and Ankle			Knee
	American Academy of Orthopedic Surgeons Foot and Ankle Questionnaire	Foot and Ankle Ability Measure	Foot and Ankle Disability Index	International Knee Documentation Committee Questionnaire
Acceptability				
No. of items	20 (Global); 5 (Shoe Comfort)[30]	21 (ADL); 8 (Sport)[31]	26 (FADI); 8 (Sport)[33]	19 items[35]
Score range	0%–100%; ↑ scores = ↓ function[30]	0–84 (ADL); 0–32 (Sport); ↑ scores = ↑ function[31]	0–104 (FADI); 0–32 (FADI Sport); ↑ scores = ↑ function[33]	0%–100%; ↑ scores = ↑ function[35]
Time to complete	3–5 min[30]	<5 min[31]	5 min[33]	5–10 min[35]
Readability, Flesch-Kincaid grade level	7	10	9	6
Comfort issues	None[30]	None[31]	None[33]	None[35]
Feasibility				
Ease of use	No training or supervision; easy to administer[107]	No training or supervision; easy to administer[31]	No training or supervision; easy to administer[34]	No training or supervision; easy to administer[35]
Role of clinician	No questions for clinician; recall period = 1 wk[30]	No questions for clinician; recall period = 1 wk[31]	No questions for clinician; recall period = 1 wk[33]	No questions for clinician; recall period = 4 wk[35]
Time to score	5 min[30]	5 min[31]	5 min[33]	5 min[35]
Costs	None[30]	None[31]	None[33]	None[35]
Appropriateness				
Intended patient population	Musculoskeletal problems of the foot and ankle[30]	Receiving PT for musculoskeletal disorders of the leg, foot, and ankle[31]	Chronic ankle instability[34]	Variety of knee injuries[35]
Other populations	Tumor, synovitis, diabetes mellitus[110,111]	Diabetes mellitus[112]	Injury or surgery to ankle or foot[113–117]	Adolescents[118]
HRQOL dimension, No. items				
Physiological	15	0	5	7
Social	2	1	2	1
Spiritual	0	0	0	0
Physical	8	28	27	11
Economic	0	0	0	0
Psychological	0	0	0	0
ICF health domain, No. items				
Health condition	0	0	0	0
Body structure and function	15	0	5	7
Activity	3	28	27	11
Participation	2	1	2	1
Environmental and personal factors	5	0	0	0
Global purpose of use	Evaluate patient perception of foot health and measure of surgical outcomes[30]	Assess change in physical function of patients with leg, ankle, and foot musculoskeletal disorders[31]	Assess functional limitations related to foot and ankle conditions[33]	Measure symptoms and limitations in function and sports activity[35]

Abbreviations: ADL, activities of daily living; FADI, Foot and Ankle Disability Index; FAI, femoroacetabular impingement; HRQOL, health-related quality of life; ICF, International Classification of Functioning, Disability and Health; PT, physical therapy; PTOA, posttraumatic osteoarthritis.

athlete, friend, student, parent, or employee.[20] When selecting PROMs, ATs should consider whether the patient case warrants evaluation of the participation domain, particularly because athletes often have a strong identity grounded in being an athlete. The effect of identity loss due to injury and removal from sport may be an important focus when managing and coordinating care for a patient. In general, generic instruments include more questions that capture participation than specific instruments because they are designed to assess health on a more global level. However, some of the region-specific measures, such as the DASH,[53] the Dizziness Handicap Inventory,[75] and the Low Back Outcome Score,[46] do contain several questions related to the participation domain and may be considered depending on the region of the patient's injury.

Consider, for example, the care of a patient with an ankle sprain. The FAAM may be the PROM that a clinician identifies for use based on the fit of the instrument to the region of interest, instrument essentials, and patient friendliness. However, one consideration is that the FAAM is largely focused on functional ability.[31] If the AT is approaching care from a patient-centered, whole-person perspective, coupling the FAAM with additional PROMs may be necessary, as the FAAM may evaluate only a limited scope of the HRQOL dimensions affected by an injury. A generic instrument (eg, Pediatric Quality of Life, DPA) could be considered depending on the HRQOL dimensions most relevant to the patient. In a

Table 5. Extended From Previous Page

Knee	Knee and Hip	Hip		Low Back	
Knee Injury and Osteoarthritis Outcome Score	Lower Extremity Functional Scale	Hip Disability and Osteoarthritis Outcome Score	Hip Outcome Score	Low Back Outcome Score	Oswestry Disability Index
42 items[37]	20 items[39]	40 items[40]	19 (ADL); 9 (Sport)[44]	12 items[51]	10 items[51]
0–100; ↑ scores = ↑ function[37]	0–80; ↑ scores = ↑ function[39]	0–100; ↑ scores = ↑ function[40]	0–68 (ADL); 0–36 (Sport); ↑ scores = ↑ function[44]	0–75; ↑ scores = ↑ function[51]	0–100; ↑ scores = ↑ disability[48]
10 min[37]	2 min[39]	10–15 min[40]	5–10 min[44]	5 min[51]	5 min[51]
4	5	4	9	10	4
None[37]	None[39]	None[40]	None[44]	1 question regarding sex life[51]	1 question regarding sex life[48]
No training or supervision; easy to administer[37]	No training or supervision; easy to administer[39]	No training or supervision; easy to administer[40]	No training or supervision; easy to administer[44]	No training or supervision; easy to administer[51]	No training or supervision; easy to administer[48,108]
No questions for clinician; recall period = 1 wk[37]	No questions for clinician; recall period = 1 wk[39]	No questions for clinician; recall period = 1 wk[40,109]	No questions for clinician; recall period = 1 wk[44]	No questions for clinician; recall period = 1 wk[51]	No questions for clinician; recall period = 1 d[48]
5 min[37]	<1 min[39]	5 min[40]	5 min[44]	1 min[51]	1 min[51]
None[37]	None[39]	None[40]	None[44]	None[51]	None[51]
Young and middle-aged patients with ACL injury, meniscus injury, or PTOA[37]	LE musculoskeletal dysfunction referred for PT[39]	Adult population with hip disability with or without osteoarthritis[40]	Patients receiving treatment for acetabular tears[44]	Acute or chronic low back pain[46]	Acute or chronic low back pain[108]
Patellofemoral pain, total knee replacement[119,120]	Stroke[121]	Total hip replacement, hip arthroscopic surgery[41,122]	FAI, hip arthroplasty[45,123]	Spine surgery[124]	Spine surgery[124]
19	0	17	0	5	3
1	2	1	1	3	1
0	0	0	0	0	0
22	18	22	27	4	6
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
19	0	17	0	5	3
22	18	22	27	4	6
1	2	1	1	3	1
0	0	0	0	0	0
Assess self-reported pain, symptoms, function, and knee-related quality of life[37]	Determine patients' initial function, ongoing progress, outcome, and set functional goals[39]	Assess patients' opinion about their hip and associated problems[109]	Assess self-reported functional status in individuals with musculoskeletal hip disorders[44]	Distinguish small reductions in performance and gross mobility in patients with low back pain[46]	Assess pain-related disability in persons with low back pain[48]

recent case report, Fraser and Hertel[150] described the effect of a lateral ankle sprain on comprehensive function, HRQOL, and kinesiophobia. Through their use of multiple PROMs (ie, Godin Leisure-Time Exercise questionnaire, FAAM, Identification of Functional Ankle Instability, Tampa Scale of Kinesiophobia, Patient-Reported Outcomes Measurement Information System, EuroQoL), the authors were able to capture postinjury deficits across multiple ICF health domains and HRQOL dimensions and comprehensively manage the rehabilitation process while considering the patient's perspective via PROMs. In this case report,[150] they used many instruments, which may be unrealistic for everyday patient care. However, the diversity of these instruments provided the clinicians with unique information that helped drive treatment and emphasized patient-centered care. This example shows that whereas most of the PROMs are valid for use in managing patient care, patient goals and case details (eg, ICF health domains, health dimensions) may be strong factors influencing instrument selection.[19]

Of the PROMs reviewed, the MFA and Short MFA appeared to possess challenges for use in some patient groups related to athletic training. These instruments were originally developed[79,81] to assess musculoskeletal disorders in patients within the community and academic settings, which may limit their appropriateness for the athletic population. Although these scales are attractive because of their applicability to patients with a wide variety of musculoskeletal conditions,[79,81] their long length, due to the inclusion of questions that pertain to functioning over the entire body, makes them less patient (eg, completion time, survey fatigue) and clinician (eg, time required to score) friendly. Further, specific questions may be considered unacceptable for some patients because of their sensitive nature (eg, items related to sexual functioning). Based on previous findings,[15] the MFA and Short MFA

Table 6. Upper Extremity (UE) Patient-Reported Outcome Measures: Considerations for Clinical Utility Continued on Next Page

	Shoulder-Elbow and Wrist-Hand			Neck	Head		
Aspect	Disabilities of the Arm, Shoulder and Hand Questionnaire	Quick Disabilities of the Arm, Shoulder and Hand Questionnaire	Upper Extremity Functional Instrument	Neck Disability Instrument	Shortened Headache Impact Test	Abbreviated Profile of Mood States Questionnaire	Dizziness Handicap Index
Acceptability							
No. of items	30 (general), 4 (work), 4 (sports and performing arts)[53]	11 (general); 4 (work); 4 (sports and performing arts)[62]	20 items[65]	10 items[67]	6 items[70]	40 items[74]	25 items[75]
Score range	0–100; ↑ scores = ↑ disability[53]	0–100; ↑ scores = ↑ disability[62]	0–80; ↑ scores = ↑ function[65]	0–50 or 0%–100%; ↑ scores = ↑ disability[67]	36–78; ↑ scores = ↓ HRQOL[70]	0–160; ↑ scores on tension, depression, confusion and anger subscales = ↑ negative affect; ↑ scores on vigor and esteem subscales = ↑ positive affect[74]	0–100; ↑ scores = ↑ perceived handicap due to dizziness[75]
Time to complete	6 min[62]	5 min[62]	3–5 min[65]	3 min[67]	1 min[70]	8 min[74]	3 min[75]
Readability, Flesch-Kincaid grade level	5	5	3	5	5	6	6
Comfort issues	1 question regarding sexual activity[53]	None[62]	None[65]	None[67]	None[70]	None[74]	None[75]
Feasibility							
Ease of use	No training or supervision, easy to administer[53]	No training or supervision, easy to administer[62]	No training or supervision, easy to administer[65]	No training or supervision, easy to administer[67]	No training or supervision, easy to administer[70]	No training or supervision, easy to administer[74]	No training or supervision, easy to administer[75]
Role of clinician	No questions for clinician to complete; recall period = 1 wk[53]	No questions for clinician to complete; recall period = 1 wk[62]	No questions for clinician to complete; recall period = current day[65]	No questions for clinician to complete; recall period = current day[67]	No questions for clinician to complete; recall period = 1 mo[70]	No questions for clinician to complete; recall period = current day[74]	No questions for clinician to complete; recall period not reported
Time to score	3 min[53]	2 min[62]	30 s[65]	1 min[67]	1 min[70]	3 min[74]	2 min[75]
Costs	None, with user agreement[53]	None, with user agreement[62]	None[65]	None[67]	Paid access and licensing agreement[70]	None[74]	None[75]
Appropriateness							
Intended patient population	UE musculoskeletal conditions[53]	UE musculoskeletal conditions[62]	Receiving PT for UE musculoskeletal disorders[65]	Neck pain, particularly from whiplash injuries[67]	Seeking care for a headache[70]	Competitive athletes[74]	Vestibular diseases or other conditions that produce dizziness[75]
Other populations	UE amputees[125]	UE burn injury, UE amputees[126,127]	Stroke, breast cancer surgery[128,129]	TMJ disorders[130]	Concussion[133]	General population[131]	Concussion[132]
HRQOL dimension, No. items							
Physiological	9	5	1	4	2	0	7
Social	7	3	2	3	3	0	4
Spiritual	0	0	0	0	0	0	0
Physical	20	9	17	3	0	0	6
Economic	0	0	0	0	0	0	0
Psychological	2	2	0	0	1	40	8

Table 6. Continued From Previous Page

Aspect	Shoulder-Elbow and Wrist-Hand			Neck	Head		
	Disabilities of the Arm, Shoulder and Hand Questionnaire	Quick Disabilities of the Arm, Shoulder and Hand Questionnaire	Upper Extremity Functional Instrument	Neck Disability Instrument	Shortened Headache Impact Test	Abbreviated Profile of Mood States Questionnaire	Dizziness Handicap Index
ICF health domain, No. items							
Health condition	0	0	0	0	0	0	0
Body structure and function	7	0	1	4	3	40	9
Activity	16	5	17	3	0	0	6
Participation	15	11	2	3	3	0	7
Environmental and personal factors	0	3	0	0	0	0	3
Global purpose of use	Assess symptoms and functional status, with a focus on physical function in populations with UE musculoskeletal conditions[53]	Assess symptoms and functional status, with a focus on physical function in populations with UE musculoskeletal conditions[62]	Measure functional outcomes in patients with UE dysfunctions based on the ICF model[65]	Assess activities of daily living in persons with neck pain[67]	Evaluate the effect of a headache on HRQOL[70]	Assess mood states in athletes[74]	Assess perceived handicapping effects imposed by dizziness[75]

Abbreviations: HRQOL, health-related quality of life; ICF, International Classification of Functioning, Disability and Health; PT, physical therapy; TMJ, temporomandibular joint.

were used by ATs, albeit at relatively low percentages (10.9% for the MFA and 13.5% for the Short MFA). In some athletic training facilities, the MFA and Short MFA may be appropriate because of factors such as patient demographics (eg, age) or greater ability and organizational support to complete longer PROMs, although an instrument that is more focused on the body region of interest may provide a similar assessment in a shorter amount of time. Nonetheless, ATs interested in using the MFA or Short MFA should be aware of these factors when deciding if these instruments are appropriate and if they fit the intended use in the target patient population.

Time is the primary factor that influences whether clinicians implement PROMs.[14,15] In addition, the reality is that many ATs are relatively new to the assessment of patient outcomes as a routine component of care.[14,15] One type of PROM that may be appealing for clinicians who are beginning to implement outcomes assessment into care is the single-item instrument. Single-item instruments are arguably the easiest to incorporate into patient care because they consist of 1 question and take little time to administer, complete, and score. As a result, these measures are very patient and clinician friendly. Although single-item PROMs provide a quick glimpse of health in a short amount of time, these measures have limitations. Single-item PROMs do not provide as much information related to any specific ICF health domain or HRQOL dimension as multi-item measures. Also, the wording of some single-item instruments is vague and refers to health status or injury or illness in general and not specifically to characteristics such as pain or function. Thus, the exact aspect of health that the patient is reflecting upon when completing some single-item PROMs is unknown.[100] For example, the GROC instrument asks patients to compare their health between one point in time and another.[100] Not only does the GROC question ask patients to calculate a difference between time points, the health construct focused on by the patient could be related to a number of different aspects of health (eg, pain, function, ability to complete roles).[100] In addition, clinicians should consider whether an instrument has been modified from its original version and if those modifications are psychometrically sound. The GROC was originally developed as a 15-point scale;[101] however, modifications (eg, 11-point,[151] 9-point,[133] 7-point,[144] and 5-point[152] scales) are available. The abbreviated versions are frequently incorporated into patient care and used in research studies, yet limited information exists regarding their development. Athletic trainers should consider the use of single-item PROMs in practice because of their versatility and ease of use, and these instruments are helpful when an AT is starting to include outcomes assessment as a routine part of patient care. However, ATs should also be aware that the brevity of these instruments results in less information gained about the patient and the health condition than from multi-item measures.

A limitation of our report is that not all of the instruments used in athletic health care were included in this review. In an effort to report on instruments used in athletic training, investigators[15] conducted survey research to identify the PROMs used most often by ATs. Although we believe that the PROMs reviewed in this report have the potential to

Table 7. Generic and Single-Item Patient-Reported Outcome Measures: Considerations for Clinical Utility Extended on Next Page

Aspect	Generic			
	Disablement of the Physically Active Scale	Musculoskeletal Function Assessment	Musculoskeletal Function Assessment–Short	Pediatric Quality of Life Inventory
Acceptability				
No. of items	16 items[77]	110 items[79]	34 (function), 12 (bother)[81]	23 items[83]
Score range	0–64; ↑ scores = ↑ disability[78]	0–100; ↑ scores = ↓ function[79]	0–100; ↑ scores = ↓ function[81]	0–100; ↑ scores = ↑ HRQOL[83]
Time to complete	3–5 min[77]	15 min[79]	5–10 min[81]	4 min[83]
Readability, Flesch-Kincaid grade level	8	4	6	2
Comfort issues	None[77]	Several questions regarding self-care[79]	Several questions regarding self-care[81]	None[83]
Feasibility				
Ease of use	No training or supervision, easy to administer[77,78]	No training or supervision, easy to administer[79]	No training or supervision, easy to administer[81]	No training or supervision, easy to administer[83]
Role of clinician	No questions for clinician to complete; recall period = 24 h[77,78]	No questions for clinician to complete; recall period = 1 wk[79]	No questions for clinician to complete; recall period = 1 wk[81]	No questions for clinician to complete; recall period = 1 mo[83]
Time to score	3 min[77]	10 min[79]	3–5 min[81]	2 min[83]
Costs	None[77]	None[79]	None[81]	None[83]
Appropriateness				
Intended patient population	Physically active patients with musculoskeletal injury[77]	Variety of musculoskeletal disorders[79]	Variety of musculoskeletal disorders[81]	Pediatric chronic health conditions[82]
Other populations	Healthy athletes[135]	Arthritis, healthy individuals[136,137]	Amputees[138]	Cardiac conditions, psychiatric referral, concussion, healthy individuals[85,139–141]
HRQOL dimension, No. items				
Physiological	6	21	6	12
Social	1	25	11	5
Spiritual	0	0	0	0
Physical	8	44	29	6
Economic	0	0	0	0
Psychological	1	20	0	0
International Classification of Functioning, Disability and Health domain, No. items				
Health condition	0	0	0	0
Body structure and function	7	39	13	6
Activity	6	44	20	5
Participation	3	27	13	12
Environmental and personal factors	0	0	0	6
Global purpose of use	Measure impairments, functional limitations, and disability in patients with musculoskeletal injury[77,78]	Detect small differences in functioning among patients with musculoskeletal disorders of the extremities[79]	Detect differences in functional status of patients who have a broad range of musculoskeletal disorders[81]	Generic pediatric quality of life measure to be used noncategorically[82]

Abbreviation: HRQOL, health-related quality of life.

support athletic health care and are commonly used in practice, there are likely other instruments with which ATs should be familiar. Furthermore, the landscape of PROM use in athletic training is ever changing. Thus, newer instruments developed in recent years may not have been reviewed in this report. Despite these limitations, we believe that our concise summary of PROMs used by ATs is a helpful resource for the profession as a whole, given ATs' relatively low use of and general lack of knowledge regarding PROMs, which appear to hinder the overall use of PROMs in athletic health care.

CONCLUSIONS

In general, the PROMs included in this report possess established and appropriate instrument essentials and clinical utility, supporting their use in patient care. With respect to the ICF health domains and HRQOL dimensions of health, the included PROMs generally focus on body structure and function as well as the physical functioning of the patient. Although that focus is not surprising and is typically helpful in caring for athletes, a sole focus on these components does not comprehensively capture the patient from a whole-person perspective. Thus, ATs with the primary goal of evaluating each patient as a whole person

Table 7. Extended From Previous Page

Generic		Single Item		
Short Form 36	Short Form 12	Numeric Pain Rating Scale	Global Rating of Change	Patient Specific Functional Scale
36 items[87]	12 items[92]	3–5: current pain, best pain, worst pain in the past 24 h[99]	1 item[101]	3–5 items[104]
Each scale 0–100; ↑ scores = ↑ function[87]	Each scale 0–100; ↑ scores = ↑ function[92]	Each item 0–10; ↑ scores = ↑ pain[99]	−7 to +7; ↑ positive scores = greater improvement in global health status; ↓ negative scores = greater worsening in global health status; 0 = no change[101]	Each item 0–10; ↑ scores = ↑ function[104]
5–10 min[87]	2 min or less[92]	30 s[99]	30 s[101]	1 min[104]
6	6	6	3	10
None[87]	None[92]	None[99]	None[101]	None[104]
No training or supervision, easy to administer[87]	No training or supervision, easy to administer[92]	No training or supervision, easy to administer[99]	No training or supervision, easy to administer[101]	No training or supervision, easy to administer[104]
No questions for clinician to complete; recall period = 1 mo[87]	No questions for clinician to complete; recall period = 1 mo[92]	No questions for clinician to complete; recall period = 1 d[99]	No questions for clinician to complete; recall period not reported[101]	No questions for clinician to complete; recall period not reported[104]
3–5 min[87]	1 min[92]	<30 s[99]	<30 s[101]	<1 min[104]
Paid access and licensing agreement[87]	Paid access and licensing agreement[92]	None[99]	None[101]	None[104]
Diverse patients—not specific to age, disease, or treatment[87]	Diverse patients—not specific to age, disease, or treatment[92]	Patients presenting with pain[99]	Patients presenting with a health condition and are seen by a clinician on more than 1 occasion[101]	Musculoskeletal disorders[104,134]
NA	NA	NA	NA	Cardiopulmonary, neurologic, and orthopaedic conditions[134]
15	1	3	Varies	0
10	6	0		0
0	0	0		0
10	2	0		3–5 (all activities identified)
0	0	0		0
1	3	0		0
0	0	0	Varies	0
16	4	3		0
8	2	0		3–5 (all activities identified)
12	6	0		0
0	0	0		0
Comprehensively survey patient-reported health status[87]	Comprehensively survey patient-reported health status[92]	Quickly and accurately assess pain[99]	Detect a change in an individual's global health status[101]	Detect a change in an individual's perceived functional status for activities important to the individual[134]

to support patient-centered care should consider a collection of PROMs as opposed to a single instrument. Efforts to make the use of PROMs in athletic training more routine will likely result in the development of new PROMs that are designed specifically for highly functional patients. As a result, in addition to considering the PROMs included in this report, ATs should stay abreast of newly developed PROMs.

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