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Patient-Reported Outcomes at Return to Sport After Lateral Ankle Sprain Injuries: A Report From the Athletic Training Practice-Based Research Network

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Context: Limited evidence exists regarding the assessment of single-item patient-reported outcomes when patients are medically cleared to return to sport after a lateral ankle sprain (LAS) injury.

Objective: To evaluate self-reports of improvement in health status, pain, function, and disability at return to sport after an LAS.

Design: Descriptive study.

Setting: Sixty-nine athletic training facilities across 24 states.

Patients or Other Participants: A total of 637 patients (males = 53.2%) who were diagnosed with an LAS, restricted from sport after injury, and subsequently medically cleared to return to sport within 60 days were included.

Main Outcome Measure(s): Descriptive statistics were used to summarize scores for health status (Global Rating of Change), pain (Numeric Pain Rating Scale), function (Global Rating of Function), and disability (Global Rating of Disability). Mann-Whitney *U* tests were used to compare score differences between sexes. A Kaplan-Meier analysis was performed to provide a visual depiction of sex differences in the time to return to sport.

Results: Most patients sustained an LAS injury while participating in basketball, football, or soccer and were cleared to return to sport 8 days after injury. More than two-thirds of patients reported a meaningful improvement in health status between the time of injury and return to sport. However, many noted deficits related to pain (65.1%), function (86.2%), or disability (35.8%) at return to sport. No differences were seen between males and females for pain ($P = .90$), function ($P = .68$), change in health status ($P = .45$), or disability ($P = .21$) at return to sport, although males returned to sport slightly sooner than females ($P = .025$).

Conclusions: Despite self-perceived improvements in health status since the time of injury, patients typically returned to sport with deficits in pain, function, and disability after an LAS. Patients may be returning to unrestricted sport participation before they feel their bodies have fully recovered from the injury.

Key Words: pain, function, disablement, numeric pain rating scale, Global Rating of Function

Key Points

- The majority of patients reported a meaningful improvement in health status between the time of injury and return to sport after a lateral ankle sprain.
- Despite being medically cleared for unrestricted participation, most patients continued to experience deficits related to pain and function at return to sport after a lateral ankle sprain injury.
- Single-item patient-reported outcome measures can provide an efficient and meaningful way to capture the patient's perspective during patient care.

Lateral ankle sprains (LASs) are the most common injury during sport participation, accounting for more than 60% of all sport-related injuries.[1,2] After an LAS, most patients report relatively rapid improvements in impairment-based symptoms (eg, pain, range of motion) and return to sport participation in a comparatively short period of time.[3,4] In fact, almost all patients will return to unrestricted participation within 10 days of injury.[4] Due to the short time frame between injury and return to sport, LASs are typically viewed as inconvenient but inconsequential injuries by patients and clinicians. However, evidence indicates that LAS injuries can result in long-term consequences, including lingering impairment-based symptoms (eg, pain, swelling, instability), decreased function, and decreased health-related quality of life and increased risk of chronic conditions, including chronic ankle instability and posttraumatic osteoarthritis.[5] Because of these negative consequences, increased emphasis has been placed on providing evidence-based guidelines to assist clinicians in the management of patients with LASs.

In 2018, the International Ankle Consortium[6] released a consensus statement that identified the essential components clinicians should evaluate and consider during the assessment of a patient with an LAS. Before this consensus statement, the National Athletic Trainers' Association[7] released a position statement that summarized and endorsed

approaches to the effective treatment of LAS. Together, these documents provide clinicians with comprehensive evidence-based recommendations, and each one highlights the need for assessing patient-reported outcomes in the management of LAS injuries. *Patient-reported outcomes* are outcomes that are important and meaningful to the patient and should inform the approach to patient care, including return-to-sport decisions.[8]

Current best practices recommend a shared approach that incorporates biological (eg, structure and function) as well as psychological (eg, tolerance) assessments when making a return-to-sport decision.[9] Patient-reported outcomes (eg, self-report of function) are recommended as a primary component of a battery of return-to-sport criteria.[7,9–11] However, despite an increased emphasis on capturing patient perspectives using patient-reported outcomes measures as part of the management and return-to-sport decision making after LAS injuries, limited evidence exists describing patient-reported outcomes after acute LAS injuries, particularly at return to sport.

Previously, McCann et al[12] and Simon et al[13] investigated patient outcomes at return to sport after ankle injuries and described deficits in self-report of function, as measured by the Foot and Ankle Ability Measure. Although these findings begin to provide insight into patient outcomes at return to sport, they offer only a narrow view of the patient from a disablement perspective (ie, function or activity).[14] Assessing the patient's health risk on multiple levels of disablement (eg, impairment or body structures and functions, function or activity, and disability or participation) may provide a more comprehensive perspective of the patient[14] and further inform return-to-sport decisions. Earlier researchers have suggested that single-item patient-reported outcome measures may offer similar information as multi-item patient-reported outcome measures[15,16] and capture all levels of disablement[17] in a time-efficient manner. Thus, the purpose of our study was to evaluate self-reports of improvement, pain, function, and disability at return to sport after an LAS injury using single-item patient-reported outcome measures. In addition, we evaluated possible sex differences in days to return to sport and scores on single-item outcome measures because previous authors have demonstrated sex differences in patient-reported outcome scores[18] and outcomes specific to LAS injuries, such as an increased risk of reinjury[19] and the development of chronic ankle instability.[20]

METHODS

Design and Setting

We conducted a retrospective analysis of patient records in the Athletic Training Practice-Based Research Network (AT-PBRN). From 2010 to 2021, patient records were created by 119 athletic trainers practicing at 69 clinical practice sites (secondary schools = 58, colleges = 10, and other = 1) across 24 states that represented the Southern (n = 7), Midwestern (n = 6), Northeastern (n = 5), Western (n = 5), and Pacific (n = 1) regions of the United States.[21] Most athletic trainers were female (55.5%, n = 66) and, on average (mean ± SD), were 29.4 ± 8.7 years old, certified for 4.7 ± 6.0 years, and employed at their current site for 1.6 ± 4.1 years at the time of the study.

Patients

Cases were included if the patient was diagnosed with an LAS, restricted from sport at the time of injury, and then medically cleared to return to sport within 60 days. Because the investigation was a retrospective analysis of deidentified patient records, the university's Institutional Review Board determined it was exempt.

Procedures

Patient data were recorded in a web-based electronic medical record (EMR; CORE-AT) by athletic trainers who were members of the AT-PBRN. Before data collection, all athletic trainers completed a training session that provided an overview of the functions and features of the EMR. To preserve data integrity and quality, we abstracted data from the EMR using standard procedures described previously.[22] Relevant patient cases were first identified using the *International Classification of Diseases*, version 10, code associated with an LAS injury diagnosis (S93.409A). The type of injury (new or recurrent) was not recorded in the EMR. From this subset, we then identified cases in which the patient was restricted from sport at the time of injury (no participation, noncontact only, light contact only, or other restrictions) and then medically cleared to return to sport (no restrictions). These patient cases were analyzed for the current examination. Using a unique identification number for each included patient case, we identified and abstracted the remaining data from the injury demographics and daily treatment forms in the EMR for analysis.

Instrumentation

The CORE-AT EMR (www.core-at.com) is a web-based system that is compliant with Health Insurance Portability and Accountability Act regulations.[23] The functionality and features of the CORE-AT EMR have been described in detail.[23] From the injury demographics forms, we abstracted variables associated with injury characteristics including sex, sport, and participation status at the time of injury. From the daily treatment forms, we abstracted participation status and scores from the following single-item patient-reported outcome measures at return to sport: Global Rating of Change (improvement), Numeric Pain Rating Scale (pain), Global Rating of Function (function), and Global Rating of Disability (disability). All of these single-item patient-reported outcome measures are commonly used during patient care and possess established measurement properties.[17] A summary of the single-item patient-reported outcome measures, including disablement level, score ranges, and score interpretation, can be found in Table 1. The number of days to return to sport was calculated as the difference in days between the date of injury and the date of return to sport.

Analysis

We calculated descriptive statistics (frequency count, percentage, median, interquartile range [IQR], and range) to summarize the variables as appropriate. Variables were sex, sport, number of days to return to sport, and scores on the single-item measures at return to sport. We used the minimal clinically important difference (MCID) value for the Numeric Pain Rating Scale (2 points)[24] to describe

Table 1. Single-Item Patient-Reported Measures[17]

Name	Health Construct	Disablement Level	Score Scale	Score Interpretation
Global Rating of Change	Improvement	Varies	15-point Likert scale	Improvement experienced if rating is better than *a little bit better* Meaningful improvement experienced if rating is better than *quite a bit better*
Numeric Pain Rating Scale	Pain	Body structure and function	11-point adjectival	Deficits exist if rating is >0 Minimal clinically importance difference is a change of 2 points
Global Rating of Function	Function	Activity	0%–100%	Deficits exist if rating is <100% Meaningful deficit if rating is <90%
Global Rating of Disability	Disablement	Participation	6-point adjectival	Deficits exist if rating is less than *no difficulty*

meaningful improvement in pain over time. We also reported the percentage of patient cases with Global Rating of Function scores <90%, as earlier researchers[25,26] have suggested a score below this threshold represents a meaningful deficit in self-report of function. We computed Mann-Whitney *U* tests for comparisons of males and females on days to return to sport and scores on single-item patient-reported measures because the preliminary analysis indicated these variables demonstrated nonnormal distributions. A Kaplan-Meier analysis was also performed to provide a visual depiction of sex differences in the time to return to sport. A 2-tailed α level = .05 was the criterion for statistical significance. We used SPSS (version 27; IBM Corp) for all analyses.

RESULTS

A total of 2954 patient cases with LAS were reported in the AT-PBRN via an injury demographics form from 2010 to 2021. Figure 1 provides a flow diagram that illustrates how patient cases were identified and selected based on our inclusion criteria.[27] Among patients who otherwise met the criteria for the study, 19 (2.8%) were excluded because they did not return to play within 60 days (1 did not return for 395 days). For the period beyond 60 days, the distribution became too sparse to model reliably. An additional 16 patients (2.4%) were removed because they either had an indeterminate score on the Global Functioning Scale (n = 12) or were missing scores on other outcome variables (n = 4).

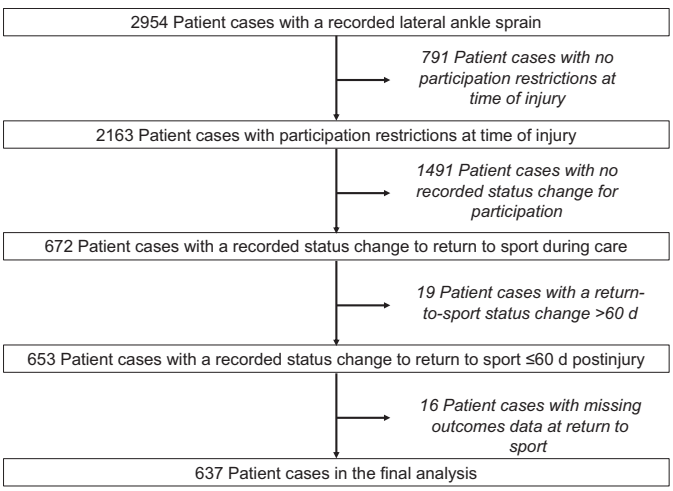

Figure 1. Flow diagram for selection of study cohort.

Therefore, a total of 637 patient cases (male = 53.2%) were included in the final analysis. Most of the patients were cared for within a secondary school setting (n = 504, 79.1%), followed by collegiate (n = 102, 16.0%) and clinic or other (n = 31, 4.9%) settings. More than 78% of patients sustained an LAS while participating in basketball (n = 191, 30.0%), football (n = 130, 20.4%), soccer (n = 113, 17.7%), or volleyball (n = 65, 10.2%; Figure 2). At the time of injury evaluation, patients exhibited a median pain score of 5 (IQR = 3–6, range = 0–10). After injury evaluations by the athletic trainers, patients were restricted from participation according to the following categories: *no participation* (68.0%, n = 433), *other restrictions* (21.0%, n = 134), *light contact only* (8.0%, n = 51), and *noncontact only* (3.0%, n = 19).

As a group, the median days to return to sport was 8 (IQR = 4–15, range = 1–59), with males (median = 8, IQR = 4–13, range = 1–59 days) returning to sport slightly sooner ($P = .025$) than females (median = 9, IQR = 5–15, range = 1–59 days). A time-to-event curve (Figure 3) provides a graphic image of the differences between sexes in days since injury. As noted in Table 2, male and female athletes did not differ on any of the single-item patient-reported outcome measures at return to sport.

At return to sport, most patients (84.5%, n = 538) reported some level of improvement (Global Rating of Change rating that was better than *a little bit better*) since the time of injury (Figure 4). More than 67% (n = 431) described a meaningful improvement in health status (Global Rating of Change rating that was better than *quite a bit better*) at return to sport. When considering the top 4 sports, we found that the percentage of patients who rated *quite a bit better* or higher on the Global Rating of Change was similar at return to sport (basketball = 143, 74.9%; football = 88, 67.7%; soccer = 73, 64.6%; and volleyball = 46, 70.8%).

As a group, the median score change for pain between injury evaluation and return to sport was 3 (IQR = 2–5; range = −6 to 10; a negative number represents an increase in pain). Between injury evaluation and return to play, most patients experienced a meaningful improvement in pain, with 488 (76.6%) displaying a change score that met or exceeded the MCID. The sport distributions between those who met or exceeded the MCID (football = 34, 22.8%; soccer = 33, 22.1%; basketball = 31, 20.8%; volleyball = 12, 8.1%; and other sports = 39, 26.2%) by the time they returned to sport and those who did not meet the MCID (basketball = 160, 32.8%; football = 96, 19.7%; soccer = 80, 16.4%; volleyball = 53, 10.9%; and other sports = 99, 79.7%) were similar. Despite these meaningful improvements in

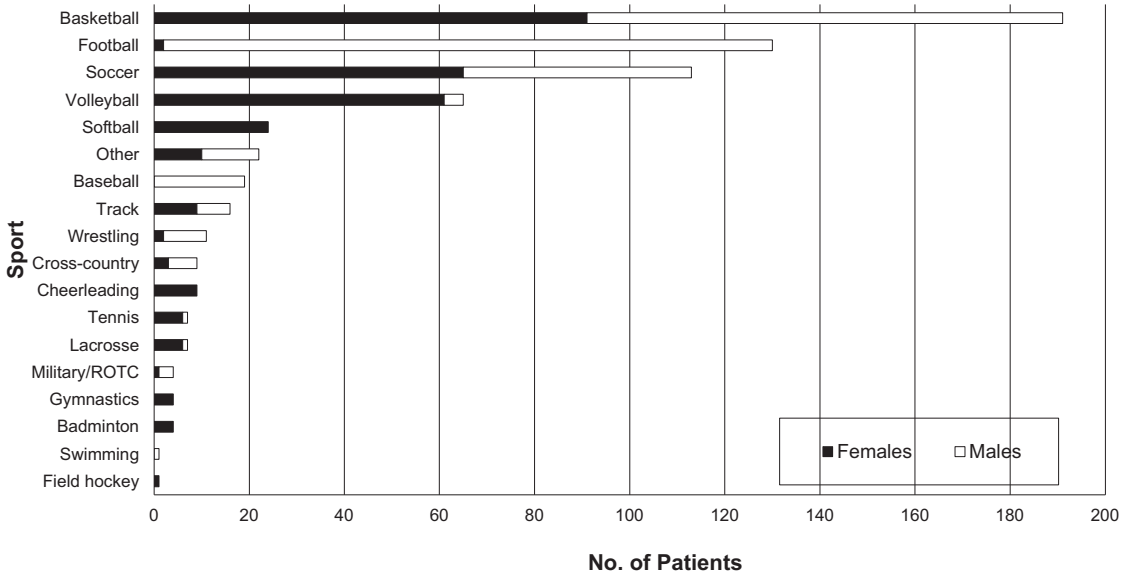

Figure 2. Sport participation of patients (n = 637). Abbreviation: ROTC, Reserve Officers' Training Corps.

pain scores over time, most patients reported some level of pain at return to sport (65.1%, n = 415; Numeric Pain Rating Scale rating >0; Table 2 and Figure 4).

Most patients also noted a functional deficit (n = 549, 86.2%; Global Rating of Function rating of <100%; Table 2 and Figure 5) even though they were medically cleared for full participation in sport. Further, on the Global Rating of Function, more than one-third of patients (36.7%, n = 234) had a score of <90%. No differences were apparent among sports in the median Global Rating of Function score, with athletes in all sports endorsing a score of ≥90% except those in softball (n = 24, median score = 85%), other sports (n = 22, median score = 85%), and badminton (n = 4, median score = 81.5%). Approximately one-third of patients (35.8%, n = 228) detailed some level of disability (Global Rating of Disability rating worse than *no difficulty*; Figure 6) at return to sport, with no apparent differences among the top 4 sports (basketball = 74, 38.7%; football = 42, 32.3%; soccer = 43, 38.1%; and volleyball = 22, 33.8%).

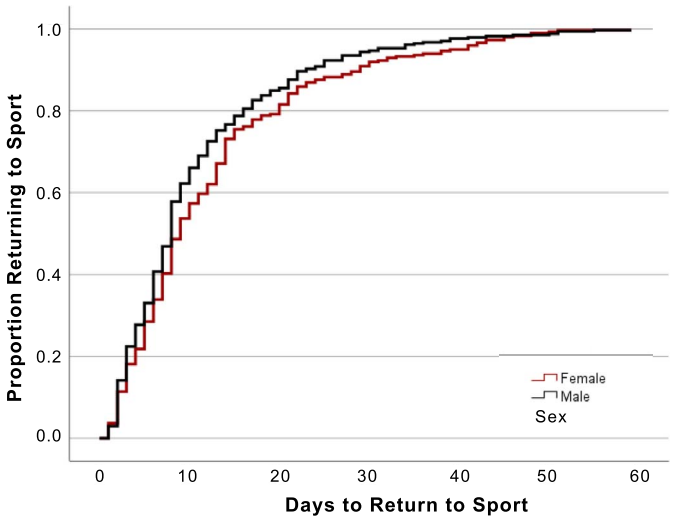

Figure 3. A time-to-event curve of the differences between sexes in days to return to sport.

DISCUSSION

Our study adds to the limited body of literature describing patient outcomes at return to sport after an LAS injury. To the best of our knowledge, we are the first to describe patient outcomes at return to sport at all levels of disablement using single-item patient-reported measures. Our results suggest that, despite reporting meaningful improvements in overall health status since the time of injury, patients continued to experience deficits in pain, function, and disability at return to sport after LAS. These findings further indicate that patients are returning to unrestricted sport participation before they perceive that their bodies have fully recovered from the injury. Patient-reported outcomes at return to sport did not differ based on sex, but males returned to unrestricted sport participation slightly sooner than their female counterparts.

Pain is a common impairment after any sport-related injury and can be an important yet complex component in return-to-sport decisions. Although pain is viewed as a sign that the body is inflamed, injured, or otherwise unwell, pain is also an accepted component of sport participation, with most athletes playing with some level of pain.[28,29] This notion was supported by our study, as we determined that 65% of patients recounted some level of pain at return to sport, despite perceiving a meaningful improvement in pain between injury evaluation and return to sport. The short-term perspective is to accept the pain and continue to participate,[28,29] yet it may also have long-term consequences. For example, athletes who were injured during collegiate athletics experienced more bodily pain than their uninjured[30] and nonathlete[31] counterparts in later years. Furthermore, persistent pain in later years has also been associated with reduced physical activity and depression, which can affect overall quality of life.[32] As the sports medicine community continues to identify ways to preserve health and wellness across a patient's lifespan, researchers should seek to better understand how stakeholders (eg, patients, clinicians,

Table 2. Descriptive Statistics for Single-Item Measures by Sex

	All (n = 637)		Males (n = 339)		Females (n = 298)		
Single-Item Measure	Median (IQR)	Range	Median (IQR)	Range	Median (IQR)	Range	*P* Value
Global Rating of Change	6.0 (5.0–7.0)	1–11	6.0 (5.0–7.0)	1–11	6.0 (4.0–7.0)	1–13	.45
Numeric Pain Rating Scale	1.0 (1.0–2.0)	0–8	1.0 (1.0–2.0)	0–8	1.0 (1.0–2.0)	0–7	.90
Global Rating of Function, %	90 (85–95)	0–100	90 (85–95)	0–100	90 (85–95)	0–100	.68
Global Rating of Disability	1.0 (1.0–2.0)	1–7	1.0 (2.0)	1–5	1.0 (1.0–2.0)	1–7	.21

Abbreviation: IQR, interquartile range.

family members) consider the possibility of long-term consequences and how this topic is discussed.

Self-report of function is also a commonly measured patient outcome after an LAS injury, and best-practice guidelines recommend evaluating self-report of function at return to sport.[7,10] Both McCann et al[12] and Simon et al[13] showed that patients indicated deficits in self-report of function at return to sport using the Foot and Ankle Ability Measure. Specifically, McCann et al[12] and Simon et al,[13] respectively, identified patient scores of 58% and 78% on the Activities of Daily Living subscale and 72% and 73% on the Sports subscale. Notably, these scores were <90%, which has been characterized as reflecting a meaningful deficit in self-report of function.[25] We found similar deficits, with a median score of 90% and more than one-third of patients receiving a score <90% on the Global Rating of Function. The presence of functional deficits at return to sport may facilitate the persistence of such deficits over the long term. Recently, Marshall et al[33] determined that those with a previous ankle injury who were later cleared for full participation had an average score of 94% on the Activities of Daily Living subscale of the Foot and Ankle Ability Measure during the preparticipation examinations in future seasons. Similar to the lingering effects of pain, deficits in self-report of function may lead to long-term consequences such as reduced physical activity[34] and lower health-related quality of life[35] and warrant further investigations into the effects of these deficits on long-term outcomes.

The Global Rating of Disability is a single-item measure that is less commonly used in sports medicine.[36] To our knowledge, this is the first study to use the Global Rating of Disability after an LAS injury. We found that one-third of patients reported some level of disablement at return to sport. Interestingly, a lower percentage of patients cited deficits in ability than in pain and function. However, because disability relates to a patient's perception of the ability to perform social roles such as playing a sport, the lower percentage may have reflected the fact that they were returning to sport at that time and so may not have yet perceived deficits in this category.

Taken together, deficits indicated using single-item measures suggest that patients may be returning to unrestricted sport participation before they feel their bodies have fully recovered from the injury. Returning to sport before full recovery could lead to lingering deficits in patient-reported outcomes, such as function and health-related quality of life, which have been observed for patients with ankle[12,33] or knee[37,38] injuries. Nonetheless, the decision to return to sport participation may come at a time when the balance between full recovery and the risk of an adverse outcome is tolerable for the athlete.[9] Specifically, athletes or those advising them may have a higher level of risk tolerance for the possibility of a recurrent injury, persistent impairment, or a chronic condition in considering when to return to sport participation after an injury.[5,39] In the context of persistent impairment and long-term conditions such as posttraumatic osteoarthritis, it is important for clinicians, researchers, and stakeholders to better understand how lingering deficits in pain, function, and disability affect long-term health and well-being after sport-related injuries and identify management strategies to reduce their effects. For example, a better understanding of injury and subsequent functional limitations may be needed because pain-related depression appears to be mediated by functional ability.[32,40]

Using multiple single-item patient-reported outcome measures, we were able to identify deficits analogous to those identified on multi-item patient-reported outcome measures in patients with LAS.[12,13] Therefore, the use of single-item patient-reported outcome measures may offer an efficient and meaningful way to capture the perspective of a patient with an LAS or other musculoskeletal injury on a global level.

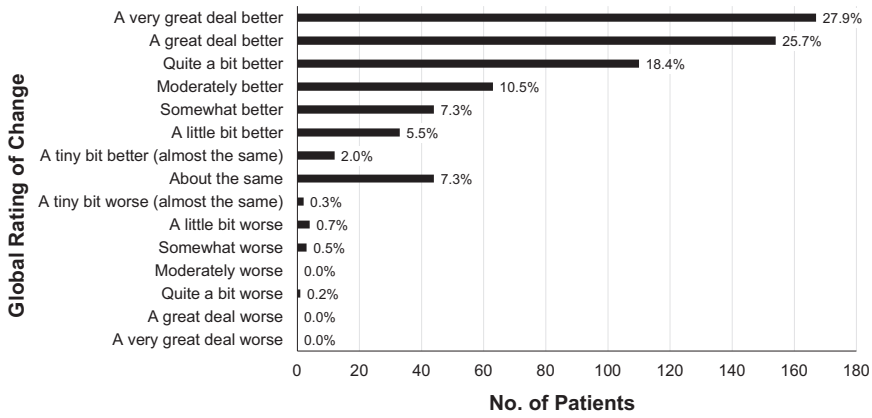

Figure 4. Global Rating of Change scores at return to sport (n = 637).

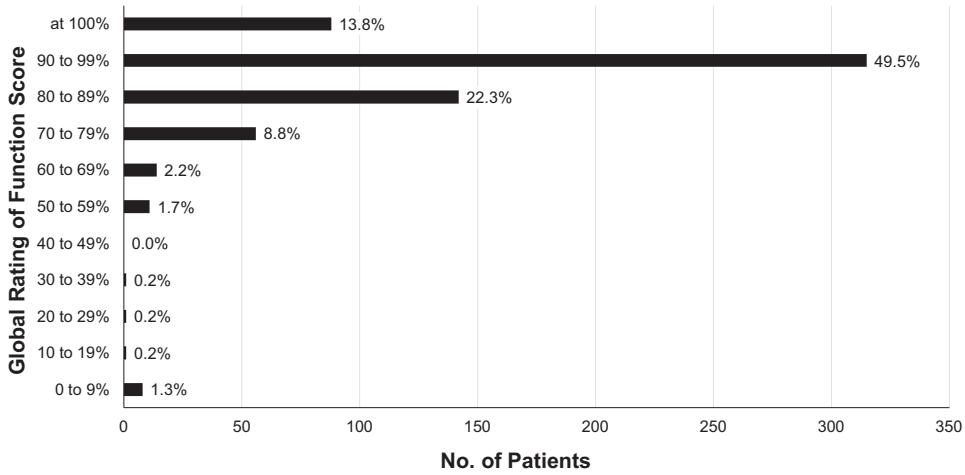

Figure 5. Global Rating of Function scores at return to sport (n = 637).

Although the use of multi-item patient-reported outcome measures is recommended because they can more comprehensively capture the patient's perspective,[8] practical challenges exist in terms of successfully implementing these measures (eg, time, lack of organizational support).[36] The use of several single-item patient-reported outcome measures that capture different levels of disablement (eg, body structure and function such as pain, activity such as function, participation such as disability) has been proposed as one way to incorporate patient-reported outcome measures into patient care and address common barriers related to the use of these measures.[17] Previous findings[15,16] suggested that scores on single-item patient-reported outcome measures correlated with scores on multi-item measures. Still, it remains optimal to use multi-item patient-reported outcome measures as they provide the best opportunity to capture the patient's perspective in the most comprehensive manner.[8] For instance, no single-item patient-reported outcome measure can capture health-related quality of life[17] or risk tolerance,[9] which are important patient outcomes. However, clinicians who are using patient-reported outcome measures for the first time might consider single-item measures as a starting point.[17]

Sex appears to be an important factor to take into account when investigating return-to-play timelines after sport-related injuries such as concussion.[41,42] Yet the authors[4,12,13] of earlier studies on return-to-play timelines after an ankle sprain did not address possible sex differences. Thus, to our knowledge, we are the first to suggest that sex differences may exist in return-to-play timelines after LAS. Male athletes in our study returned to full participation 1 day sooner than their female counterparts; the difference was statistically significant, but whether it is clinically meaningful is currently unknown. Hence, more efforts are needed to better understand the potential effect of sex on return-to-play timelines after an LAS. Similarly, prior researchers demonstrated possible sex differences in patient-reported outcome scores at return to play after sport-related injuries such as anterior cruciate ligament reconstruction.[43] Still, little is known of possible sex differences in patient-reported outcomes after LAS injuries. Although we did not identify any sex differences in patient-reported outcomes at return to play after an LAS, sex should be considered an important factor in future investigations.

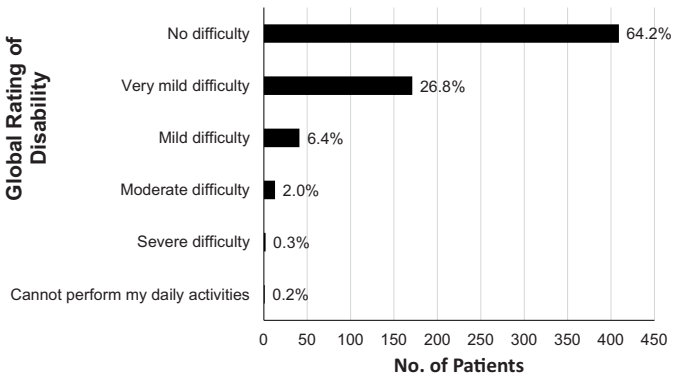

Figure 6. Global Rating of Disability scores at return to sport (n = 637).

Our study was not without limitations. As with most research that relies on data from electronic records systems, a marked difference existed between the number of potential patient cases in our database (ie, database population) and the final sample selected for our examination. Following reporting standards,[27] we were transparent regarding this difference and provided a summary of how the final sample was selected (Figure 1). The primary concern is the potential generalizability of the findings for the selected sample. Although we recognize this potential concern, we believe that our selected sample fairly represents the target population because our findings were based on days to return to sport and self-reports of function at return to sport were consistent with those of earlier authors.[4,12,13] Furthermore, we calculated several indices of central tendency (mean and median) and variability (IQR) to provide the reader with options for interpreting the results. Despite these limitations, to our knowledge, our sample size is the largest reported for patients at return to sport after an LAS injury and thus adds valuable information to the current literature. Future investigators should seek to understand if return-to-sport decisions are influenced by the sport and a patient's risk tolerance for short- and long-term consequences. For example, whether basketball players assume more risk than swimmers when deciding to return to sport is unclear. Similarly, it is unknown if the clinicians providing care for basketball players are more comfortable sending patients back to play

earlier than swimmers or vice versa. One way to determine this is by comparing patient-reported outcome scores at return to sport based on the sporting activity, which we were unable to accomplish in a meaningful way with the current dataset because the top 4 sports accounted for 78% of all patient cases. In addition, we were focusing on patient outcomes at return to sport, so we did not consider specific aspects of sport, characterizing treatments, and more importantly, how the treatment may affect short- and long-term patient outcomes. For example, whether the type, amount, or duration of treatment affects pain, function, or disability is uncertain. Authors of future studies should also characterize how injury history affects patient-reported outcomes during the recovery phase of the injury. Based on how the data were entered into the EMR, we were unable to establish if the injury was new or recurrent. Previous researchers[33,37,38,44] have suggested that a prior injury could affect patient-reported outcomes on a long-term basis, but it is unknown if a prior injury affects the recovery of patient-reported outcomes between injury and return to sport. More work is also needed to better understand how scores from patient-reported outcome measures can be used to guide both patient care and return-to-sport decisions. Guidance such as appropriate score ranges and scoring thresholds for safer return to sport can assist clinicians in making more informed patient care decisions, but such data do not yet exist.[10,45]

CONCLUSIONS

Our study furthers the understanding of patient-reported outcome measure scores at return to sport after an LAS injury. To our knowledge, we are the first to assess all levels of disablement using a combination of single-item patient-reported outcome measures. We found that most patients returned to sport with some level of deficit related to pain and function. Also, despite reporting a meaningful improvement in health status between the time of injury and the return to sport, some patients continued to experience deficits in ability at return to sport after an LAS. Clinically, patients may be returning to unrestricted sport participation before they feel their bodies have fully recovered from the injury. As such, clinicians should be mindful of these potential deficits when considering return-to-sport decisions after an LAS injury.

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