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# The Adolescent Patient Perspective on Activity Limitations After Sport-Related Concussion

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***Context:*** Assessment of sport-related concussion (SRC) has begun to include patient-reported outcome measures. However, understanding of which health limitations are most meaningful to adolescents after SRC is limited.

***Objective:*** To explore patient-perceived activity limitations after SRC and throughout recovery to return to play and mapped according to the International Classification of Functioning, Disability, and Health (ICF) model.

***Design:*** Longitudinal study.

***Setting:*** Secondary school athletic training facilities.

***Patients or Other Participants:*** Fifty patients (41 males, 5 females, 4 sex not reported, age = 14.9 ± 3.5 years, grade = 10.2 ± 0.93 level) with a medically diagnosed SRC.

***Intervention(s):*** The Patient Specific-Functional Scale (PSFS) was used to assess changes in the patient's condition and the effect the injury posed on their ability to perform activities. The PSFS is a self-reported assessment of health used to identify activity limitations and rate the difficulty of performing those tasks. The PSFS was administered to patients on days 3 (D3) and 10 (D10) after SRC and at return to play.

***Main Outcome Measure(s):*** Activities affected by injury were coded into common categories and themes by a 3-person research team for subsequent analysis. The coded themes were also mapped to the ICF domains, chapters, and categories. The dependent variables were the PSFS themes, number of activities endorsed, PSFS scores, ICF domains, chapters, and categories. Descriptive analyses and frequencies were reported for the dependent variables.

***Results:*** A total of 157 different activities were identified at D3 and coded into 28 categories that fit into 6 themes: activities of daily living, cognitive and school (COG), sports and physical activity (SPA), screen time, sleep, and social. On D3, all patients (50/50) identified at least 1 activity limitation. Most related to SPA (37.6%) and COG (31.2%). Sixty percent of patients endorsed activity limitations at D10, primarily in COG (38.6%) and SPA (36.6%). All (100%) response categories were mapped to the ICF, with most (75%) fitting the activities and participation domain.

***Conclusions:*** Our primary findings suggest that SRC influences many facets of the lives of adolescent athletes. Specifically, adolescent athletes identified activity restrictions primarily related to physical activity and sports participation.

***Key Words:*** mild traumatic brain injury, health-related quality of life, cognitive, school, outcomes

**Key Points**

- After concussion, adolescent athletes reported activity limitations that affected their quality of life.
- Most self-reported activity limitations were related to sport and physical activity and cognitive and school activities.
- The International Classification of Functioning, Disability, and Health model provides a common framework to assess the multiple factors that affect a patient's health condition. The results of our study demonstrated that patient responses of physical activity limitations after concussion were related to the activities and participation component.

Sport-related concussions (SRCs) are one of the most common sports injuries in the high school athletic population.[1] Concussions typically present with various physical symptoms, including headache, blurry vision, dizziness, fatigue, difficulty concentrating, nausea, vomiting, or any of the above in combination.[2] However, while symptoms are widely known, the presentation and severity of these symptoms can vary between patients and may be influenced by several personal (eg, age, medical history) and injury related (eg, initial symptom burden, time to medical care) factors. Because of the heterogeneity of head injuries, clinical care of a concussion incorporates a multifaceted approach to monitor health domains in neurology, vestibular, balance, oculomotor, visual, neurocognitive, psychological, and cervical spine.[3] The individual nature of concussions makes it imperative for clinicians to consider each patient individually and to design a care plan that meets the patient's specific health care needs.

Due to the differences between patients in the clinical presentation of concussion and recovery timelines, a patient-centered approach to assessment, treatment, and management is recommended. As clinicians assess and create rehabilitation plans for patients after a concussion, the focus should be on the whole person, including the physical, psychological, and social domains of health. A useful strategy is an emphasis on establishing a patient-centered approach to care using the International Classification of Functioning, Disability and Health (ICF) disablement model framework to understand the

patients.[4,5] The ICF model has been adopted internationally as a key framework for clinical practice, especially for diverse patient populations and conditions. The framework of the ICF is based on the biopsychosocial model and is intended to serve as a common language for health care providers to document clinical examination findings to aid interprofessional collaboration.[4,5] The model classifies patient impairments noted during the subjective and objective patient evaluation into body structures and function (eg, mental and physical aspects) and activities and participation (AP; eg, ability to function in one's environment) while including environmental (eg, support, relationships, access to care) and personal factors (eg, individual features).[4,5] Further, to capture the patient's perspective of health, the multifaceted assessment approach should include patient-reported outcome measures (PROMs) to help clinicians personalize their treatment strategies.[6,7] Patient-reported outcome measures capture domains of health that a physical exam may not, including social functions, daily activities, psychosocial health, or sport participation, all of which are important elements of the ICF framework.[4,7,8] However, many of the available PROMs were not designed specifically for adolescents or athletes, and currently, no PROMs evaluate the effect of concussion as a result of sport participation. Gathering information from patients about the perceived effect of concussion on their lives in a structured, objective manner would help clinicians design rehabilitation strategies that address the areas of most importance to these patients.[9,10]

One PROM that allows for more individualized input from patients is the Patient-Specific Functional Scale (PSFS). The PSFS is a PROM used to identify the specific functional limitations or activities a patient is experiencing as a result of an injury or condition, such as SRC.[11] When considering the ICF framework and individual function at the level of body, the PSFS assists in understanding the activity limitations the patient may experience or other affected areas of involvement in their life, such as participation restrictions or social and environmental barriers. Unlike the typical specific or generic PROM in which questions and response options are predetermined, the PSFS uses open-ended questions that allow the patient to identify and list their specific activities of concern. Clinicians can use the items listed on the PSFS to inform care decisions and direct treatment and rehabilitation to the specific limitations reported by the patient.

What remains unknown with the use of the PSFS in adolescent athletes who sustain SRC are the domains of health that are most often reported as sources of activity limitation.[4,8] One benefit of using PROMs is obtaining a patient perspective of health that goes beyond clinician-based findings, such as body structures and function concerns, and evaluates a broad range of health domains, such as the effect on daily living and social roles.[4,8,12,13] Greater insight into the types of activities adolescent athletes with SRC report would help ensure a whole-person evaluation. Additionally, because no PROMs are specific to this patient population, studying the activities listed on the PSFS would inform the development of a PROM specific to adolescent athletes who have suffered SRC. Therefore, in this study, we aimed to explore patient-perceived activity limitations after concussion and throughout return to play (RTP) using the PSFS. A secondary purpose was to map activity limitations reported on the PSFS to the ICF disablement model to describe the domains of health that cause adolescent patients most concern after SRC and throughout recovery.

**Table 1. Patient Demographic Information**

| Demographic Variable | |
|---|---|
| Age, mean ± SD | 14.9 ± 3.5 |
| Grade, mean ± SD | 10.2 ± 0.9 |
| Sex, No. (%) | |
| Male | 41 (82) |
| Female | 5 (10) |
| Not reported | 4 (8) |
| Prior concussion history, No. (%) | |
| Yes | 22 (44) |
| No | 21 (42) |
| Not reported | 7 (14) |
| Primary sport, No. (%) | |
| Football | 34 (68) |
| Baseball | 2 (4) |
| Wrestling | 2 (4) |
| Soccer | 2 (4) |
| Alpine skiing | 1 (2) |
| Basketball | 1 (2) |
| Cheerleading | 1 (2) |
| Hockey | 1 (2) |
| Volleyball | 1 (2) |
| Not reported | 5 (10) |

## METHODS

### Participants

Fifty patients with medically diagnosed SRC were included.[14,15] Patients were excluded if they were unable to speak or read English. Table 1 presents the patient demographic data. Symptom duration averaged 12.2 ± 10.3 days (range, 1–42 days), and days until medical clearance averaged 16.5 ± 9.7 (range, 5–42 days). The A.T. Still University Institutional Review Board approved the study with a waiver of consent.

### Instrumentation

**Patient-Specific Functional Scale.** The PSFS, developed by Stratford et al, was used to assess patients' perceptions of their health condition in terms of their ability to complete desired activities.[11] To complete the PSFS, patients are asked to identify 3 to 5 activities that are affected by their injury, by way of free-text entry, and to rate the difficulty of performing each activity on an incremental scale ranging from 0 (*unable to perform activity*) to 10 (*able to perform activity at the same level as before*).[11] The original version of the PSFS has a blank line for the injury or condition. In our instructions, we filled in the blank, so patients were clear we were asking specifically about their concussion:

> Please identify 3 to 5 important activities that you are unable to do or are having difficulty with as a result of your concussion. Please rate the level of difficulty you are having with the 3 to 5 activities that you are unable to do or are having difficulty with as a result of your concussion, using the scale provided.

Researchers have suggested the PSFS is a valid, responsive, and reliable PROM and has been used to evaluate patients with a variety of orthopaedic and neurologic health conditions.[16–21] The PSFS is a clinician- and patient-friendly instrument because it is highly applicable to many health conditions and is easy to use, complete, and interpret.[22]

| Sport and Physical Activity | Cognitive and School | Activities of Daily Living | Screen Time | Sleep | Social Activity |
|---|---|---|---|---|---|
| Sports<br>Physical education<br>Running<br>Lifting<br>Recreational activities | School<br>Paying attention<br>Thinking quickly<br>Reading<br>Remembering<br>Focusing in class<br>Taking notes<br>Multitasking | Showering<br>Driving<br>Walking up stairs<br>Walking to class | Video games<br>Watching film<br>Watching TV<br>Texting<br>Computer work | Bright lights<br>Sleep<br>Staying awake | Social activities<br>Playing music<br>Loud noises |

**Figure 1. Themes and categories derived from the activities listed by patients.**

### Procedures

Concussions were diagnosed by the athletic trainer or directing physician at 7 participating secondary schools using commonly accepted concussion definitions.[14,15] The investigators asked the school medical providers to complete 1 study packet per patient enrolled and collect the PSFS at the requested time points. As a point-of-care study, the investigators did not provide any guidance to the school medical personnel regarding the use of specific assessment tools or management practices and were expected to manage the concussion per the individual school's concussion policy or protocol. During the initial evaluation, athletic trainers began a study packet that included a demographic form for the descriptive information about the injury. The PSFS was administered to patients on days 3 (D3) and 10 (D10) after concussion and at RTP. If a patient returned to play before D10, only the D3 and RTP forms were completed. Before the initiation of the study, athletic trainers received a clinician manual that described the data collection forms and administration procedures. Athletic trainers were instructed to administer the PSFS as close to the postinjury time point as they were able, but we acknowledge that sometimes those days fell on weekends or holidays, or a patient may have been absent from school, although the administration time points were very close to the study protocol (D3: 3.6 ± 2.2, D10: 10.6 ± 1.7).

### Analysis

A mixed-methods approach was used for analysis. Activities were restructured into patient response categories (step 1) and common themes (step 2), using the consensual qualitative research approach by a 3-person research team for subsequent analysis.[23] In brief, the consensual qualitative research approach has a series of steps that included generating topic clusters, summarizing core ideas, and cross-analysis across patients to identify common categories and themes.[23] The patient response categories were then coded into and mapped to the ICF domains, chapters, and categories, using a methodology like that of Fairbairn et al.[12,24] The dependent variables were the PSFS themes, number of activities endorsed, PSFS scores, and the ICF domains, chapters, and categories. Descriptive analyses and frequencies were reported for the dependent variables.

## RESULTS

### Activity Coding

An initial 159 activities were noted at the D3 administration of the PSFS. These were coded into 28 patient response categories that fit into 6 themes (Figure 1): activities of daily living (ADLs), cognitive and school (COG), sports and physical activity (SPA), screen time (SCR), sleep (SLP), and social engagement (SOC). On D3, all patients (50/50) identified at least 1 activity limitation with most noted activities related to SPA (37.1%, 59/159), followed by COG (30.8%, 49/159), ADL (15.7%, 25/159), SCR (11.3%, 18/159), SLP (3.8%, 6/159), and SOC (1.3%, 2/159). On D10, 60% of patients endorsed activity limitations on the PSFS, with most themes represented as COG (38.6%, 39/101) and SPA (36.6%, 37/101), followed by ADL (14.9%, 15/101), SCR (5.0%, 3/101), SLP (3.0%), and SOC (2.0%, 2/101). Descriptive data for the PSFS scores at each time point are provided in Table 2.

### ICF Mapping

For each of the 28 patient response categories, all (100%) responses were mapped to the ICF with most (75%, 21/28) fitting the AP domain (Figure 2, Table 3). Within the AP domain, most patient response categories mapped to community, social, and civic life chapters (48%, 10/21), followed by learning and applying knowledge (14%, 3/21) and mobility (14%, 3/21). The most common categories mapped within the AP chapters were recreation and leisure (48%, 10/21), applying knowledge (14%, 3/21), and school education (9.5%, 2/21). Of the 25% (7/28) fitting body structures and functions, items primarily mapped to mental functions (71.4%, 5/7) and sensory function and pain (28.6%, 2/7) chapters and to specific mental functions (42.9%, 3/7) and SLP (28.6%, 2/7) categories.

## DISCUSSION

Our primary findings suggest that SRC affects many facets of the lives of adolescent athletes. Every patient endorsed at least 1 activity limitation on D3 postconcussion. As expected, most of those activity limitations were related to SPA; however, patients also identified activity limitations with COG activities, ADLs, SCR, SLP, and social activities. During recovery, the number of activities endorsed decreased, and the ratings of the activity limitations increased, noting less effect of activity limitations on the perception of health status. In addition, all categories in which the activities were coded

**Table 2. Descriptive PSFS Scores at Each Time Point**

| Statistic | Day 3 | Day 10 | RTP |
|---|---|---|---|
| Mean ± SD | 5.4 ± 2.9 | 6.5 ± 3.7 | 9.0 ± 2.6 |
| Median | 4.9 | 7.7 | 10.0 |
| 25th percentile | 3.2 | 3.3 | 9.9 |
| 75th percentile | 6.9 | 10.0 | 10.0 |
| Range | 0–10 | 0–10 | 0–10 |
| Skewness (SE) | −0.170 (0.197) | −0.731 (0.281) | −2.952 (0.244) |
| Kurtosis (SE) | −0.076 (0.391) | −0.930 (0.555) | 7.474 (0.483) |

Abbreviations: PSFS, Patient Specific-Functional Scale; RTP, return to play; SE, standard error.

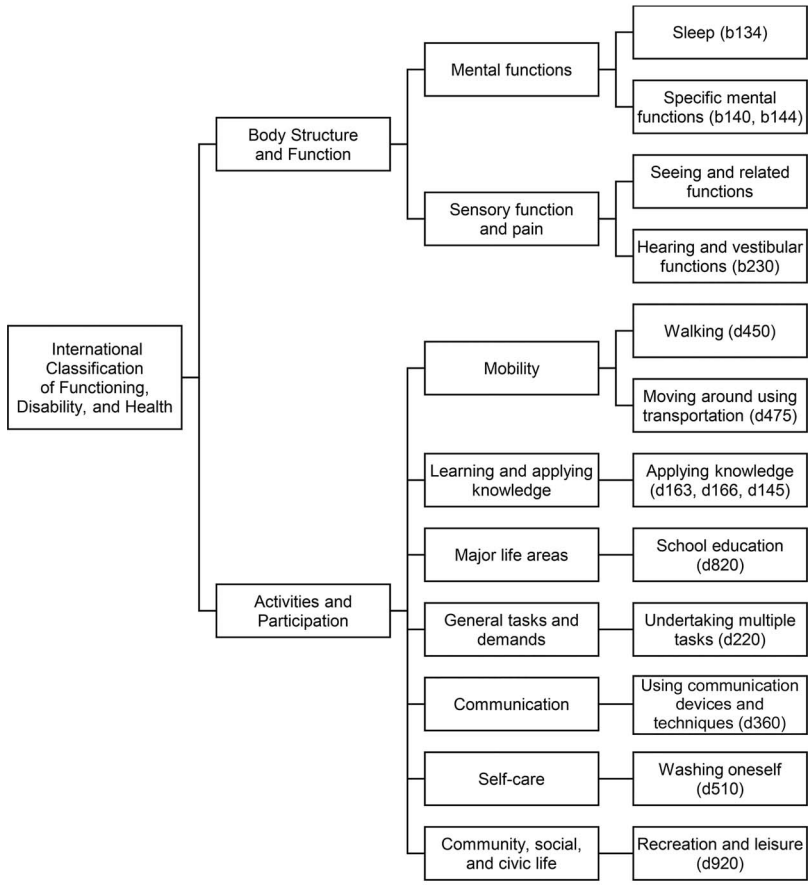


**Figure 2. ICF domains, chapters, and categories mapped from PSFS patient responses. Abbreviation: PSFS, Patient Specific-Functional Scale.**

mapped to the ICF model, with most affecting AP. A unique aspect of the current study is the investigation of postconcussion perceived health limitations using a PROM that provides greater individual patient voice, adding to our understanding of past studies of postconcussion health-related quality of life (HRQOL) using standardized PROMs and qualitative inquiry.[6,25–28]

In our patient sample, sport participation and weightlifting, 2 categories from the SPA theme, were endorsed the most; however, the next 2 categories with the highest endorsement were reading and school, from the COG theme. Additional categories noted with greater endorsement included recreational activities, walking to class, remembering, focusing in class, computer use, and running, demonstrating that the effect of concussion on activity limitations extends beyond sports and into other areas of an adolescent's life. These findings are like past qualitative studies in which patients have identified the influence of their concussion on school activities or roles and societal roles.[27,28] In addition, authors of past studies using generic PROMs have found deficits in physical functioning, school or cognitive functioning, and social functioning; however, any deficits in HRQOL were resolved at the time of full return to participation across all studies.[6,25,26,29] Regardless, these collective findings suggest that concussion management should extend beyond considerations for sport and into all aspects the patient deems important to his or her overall HRQOL. Furthermore, recent changes to the return-to-sport strategy that begin almost immediately after the concussion with a resumption of ADLs, followed by early aerobic exercise as a treatment, may provide patients with a more positive approach to engaging in activities that are important to them than past strategies that recommended longer periods of rest and isolation from school and sport activities.[3] Authors of future studies could assess the influence of engaging in early aerobic exercise and other treatment modalities on patient perceptions of activity limitations after concussion.

Over the postinjury time points, the number of patients endorsing activity limitations decreased, with all patients endorsing at least 1 activity limitation on D3 to only 60% of patients endorsing an activity on D10. Similarly, the number of activities endorsed dropped from 159 to 101 between the D3 and D10 administrations. These findings may suggest that, as patients were recovering from their concussions, the earlier endorsed activity limitations were no longer limitations from their perspective. This aligns with past work in which it was demonstrated that adolescent athletes who recovered within 1 week after their concussion did not note any deficits in any HRQOL domain as assessed with the Pediatric Quality of Life Inventory.[25] However, 2 instances occurred in which a later time point was endorsed more than an earlier time point, specific to the COG and SOC themes. On D10, about 7% more

**Table 3. Frequency of Endorsed ICF Chapters Mapped From the PSFS Patient Response Categories**

| ICF Domain | Patient Response(s) Category | ICF Chapters Represented | ICF Categories Represented | Frequency Endorsed: Day 3 | Frequency Endorsed: Day 10 |
|---|---|---|---|---|---|
| Body structures and function | Sleep | Mental functions | Sleep (b134) | 4 | 3 |
| | Staying awake | Mental functions | Sleep (b134) | 1 | |
| | Paying attention | Mental functions | Specific mental functions (b140) | 5 | |
| | Remembering | Mental functions | Specific mental functions (b144) | 6 | 2 |
| | Focus in class | Mental functions | Specific mental functions (b140) | 6 | 5 |
| | Light sensitivity | Sensory functions and pain | Seeing and related functions (b210) | 2 | |
| | Noise sensitivity | Sensory functions and pain | Hearing and vestibular functions (b230) | 2 | |
| Activities and participation | Thinking quick | Learning and applying knowledge | Applying knowledge (d163) | 4 | 1 |
| | Reading | Learning and applying knowledge | Applying knowledge (d166) | 14 | 9 |
| | Taking notes | Learning and applying knowledge | Applying knowledge (d145) | 2 | 1 |
| | Multitasking | General tasks and demands | Undertaking multiple tasks (d220) | 1 | |
| | Texting | Communication | Using communication devices and techniques (d360) | 1 | 1 |
| | Walking up stairs | Mobility | Walking (d450) | 7 | 6 |
| | Walking to class | Mobility | Walking (d450) | 10 | 1 |
| | Driving | Mobility | Moving around using transportation (d475) | 2 | 2 |
| | Showering | Self-care | Washing oneself (d510) | 2 | 1 |
| | School | Major life areas | School education (d820) | 12 | 10 |
| | Physical education class | Major life areas | School education (d820) | 5 | |
| | Sport participation | Community, social, and civic life | Recreation and leisure (d920) | 26 | 12 |
| | Weightlifting | Community, social, and civic life | Recreation and leisure (d920) | 13 | 6 |
| | Recreational activities | Community, social, and civic life | Recreation and leisure (d920) | 9 | 5 |
| | Playing music | Community, social, and civic life | Recreation and leisure (d920) | 1 | 1 |
| | Running | Community, social, and civic life | Recreation and leisure (d920) | 6 | 5 |
| | Social activities | Community, social, and civic life | Recreation and leisure (d920) | 1 | 2 |
| | Video games | Community, social, and civic life | Recreation and leisure (d920) | 1 | 1 |
| | Television | Community, social, and civic life | Recreation and leisure (d920) | 6 | 6 |
| | Watching game film | Community, social, and civic life | Recreation and leisure (d920) | 1 | |
| | Computer use | Community, social, and civic life | Recreation and leisure (d920) | 7 | |

Abbreviations: ICF, International Classification of Functioning, Disability, and Health; PSFS, Patient Specific-Functional Scale.

patients endorsed categories within the COG theme compared with D3, and endorsements in the SOC theme slightly increased. This may be due to the time needed to reflect on the concussion's effect on the inability to engage in school or social activities and the resultant challenges associated with the patient's return to the classroom that may not have been apparent on D3.

With respect to the scoring of the activity limitations across the time points, the mean D3 postinjury score was 5.0, at the midpoint of the scale between unable to perform activity and able to perform activity at the same level as before, suggesting moderate limitations in the activities identified. Scores at D10 had increased to 6.6 and continued to increase at RTP, where mean scores were at 9.0, essentially noting they were able to perform almost at their preinjury levels. It should be noted that the range of scores at each time point did span from 0 to 10, suggesting variability among activity limitation scores across patients. The change in score from D3 to D10 fell just below the minimal detectable change of 2.0 and minimal clinically important difference of 2.2, as noted in past studies of the PSFS.[11,30] However, the scores at RTP well exceed both change metrics, suggesting a clinically important improvement. These scores seem to align with the average symptom duration of this patient sample being just over 9 days and most patients having a recovery between 7 to 21 days.

A unique aspect of the current study is the use of the PSFS as a PROM. In the past, researchers have used the Head Impact Test, Pediatric Quality of Life Inventory, Multidimensional Fatigue Scale, and Patient Reported Outcome Measurement Information System to monitor adolescent health status after a concussive injury.[6,25,26,29] Authors of this collective body of research have identified transient deficits in domains of HRQOL during the acute phase postconcussion that tend to return to baseline or normative values at the time the patient has been cleared to return to sport activity.[6,25,26,29] However, these common outcome measures are not concussion specific, and a criticism of the existing measures is the lack of specificity of items to the sport context, resulting in a ceiling effect on some instruments.[6] Additionally, existing PROMs may not evaluate the entire spectrum of HRQOL as noted by Lam et al in their evaluation of PROMs for use in athletic training.[31] As such, clinicians may need to consider using multiple PROMs for patients with concussion to evaluate the numerous areas that may be affected by this injury or consider using the PSFS that allows patients to identify their own activity limitations. One must also be cognizant of the potential limitations of using PSFS alone, in that it focuses on activities and does not assess emotional or mood-related concerns that have been identified as important in the management of concussion.[32] The current reality that multiple PROMs may be required to fully evaluate patients with concussion across all the possible affected health domains suggests the need for a concussion-specific PROM.

With this investigation, we may also be one of the first to map concussion-related activity limitations to the ICF model. The ICF model was developed to provide a common framework for the assessment of clinical outcomes and aid clinicians in organizing clinical practice decisions to enhance evidence-informed practice.[4] The ICF model includes 2 primary domains, body structures and functions and AP to account for function at the body, individual, and societal levels, thus encompassing a patient-centered, whole-person approach to the identification and treatment of individual patient limitations.[4,24] In 2015, the National Athletic Trainers' Association adopted the ICF model as a framework for athletic training clinical practice to assist athletic trainers in integrating the components of evidence-based practice to improve patient care and enhance patient care documentation, ultimately facilitating clinical effectiveness research within athletic training practice.[33] However, since the adoption of the model, we could only identify 1 study published in the athletic training literature in which authors have linked patient outcome findings to the ICF model.[34] Using a qualitative interview methodology, Majewski-Schrage et al assessed the patient experiences and meaningful outcomes of college athletes after lower extremity injury and linked concepts to the ICF model.[34] Like our findings, all patient responses mapped to the ICF. In their study, most responses mapped to AP (44%), followed by body structures and function (37%), and environmental factors 19%.[34] In contrast with their assessment of lower extremity injuries—which included mapping to environmental factors, such as products and technology, natural environment, support and relationships, attitudes, and services, systems, and policies—our use of the PSFS as a means to capture perceived limitations did not provide an avenue for the identification of environmental factors, which may be 1 limitation of this PROM, although authors of past qualitative studies of concussion lived experiences have identified themes regarding peer and familial support and policies for returning to school, which do map to environmental factors and should be considered in concussion management.[27,28] This framework could also be inclusive of social determinants of health regarding concussion care and coming back to the individualized approach to the management of patients with concussions.

In the traumatic brain injury literature, authors of some studies have assessed the items within existing PROMs to the ICF model that noted most items were linked to AP; however, the PROMs assessed were ones not commonly used in the studies of adolescent athletic patients with concussion.[35,36] Van Ierssel et al evaluated 5 existing PROMs and extracted 373 concepts that mapped to AP (58.7%), body structures and function (23.9%), and environmental factors (25.4%), whereas Laxe et al evaluated 6 instruments that included PROMs and cognitive assessments and noted, of the 212 items, most linked to AP (73%), followed by body structures and function (24%) and environmental factors (3%).[35,36] The variation in item mapping to the ICF, along with our findings, suggests that a concussion-specific PROM may be of use for athletic trainers to assess patients throughout the course of concussion recovery. Furthermore, the use of the ICF as a framework for concussion assessment and management may improve communication with other health care providers that collaborate as part of a multidisciplinary concussion management team. The integration of the ICF into routine clinical practice can facilitate a patient-centered care approach that incorporates a focus on health and health-related domains of disablement. This can be accomplished by using the ICF framework in an integrative and holistic way and asking questions of patients that get at the areas of most importance to the patient. When assessing and managing SRC, it is important to create an individualized and patient-centered approach that highlights the societal and environmental factors contributing to concussion-related symptoms and recovery.

This study is not without limitations. Our patient sample is small and came primarily from secondary schools within 1 state. Patients were primarily male football athletes. Data were collected by the athletic trainers at the school, and PROM administration had some variation from the actual D3 and D10 time points due to weekends, holidays, and athletes not reporting to the athletic training facility each day. Athletic trainers were instructed to administer the PSFS on the day closest to the intended target day, thus increasing potential variability. In addition, we did not have access to patients' medical records, including full medical history or medication use, and did not standardize the return-to-activity progressions. Lastly, only English-speaking patients were included. Authors of future studies should expand upon these methods to include a larger and more heterogenous sample of high school football players.

## CONCLUSIONS

High school athletes reported activity limitations associated with a variety of activities related to sports, school, and ADLs. Our results indicate that high school athletes experience activity limitations associated with sport- and nonsport-specific activities that may hinder overall health status. These findings suggest that concussion management should include individualized approaches to treatment and management. As a result, clinicians should be assessing concussion using a holistic approach that follows the framework of the ICF model to assess and address concerns with school and daily life, supporting the addition of PROMs to the typical concussion assessment battery. Until a concussion-specific PROM is developed, the PSFS may be useful to assess patients after SRC, especially when aiming to tailor rehabilitation to the specific needs of the patient is desired.

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