

Prior Injury, Health-Related Quality of Life, Disablement, and Physical Activity in Former Women's Soccer Players

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Context: Former collegiate athletes may be at risk for negative health outcomes such as lower health-related quality of life (HRQoL), greater disablement, and lower lifetime physical activity (PA) participation. A history of severe sport injury may play a role in these outcomes.

Objective: To assess the role of prior sport injury in self-reported HRQoL, levels of disablement, and PA behaviors of former National Collegiate Athletic Association Division I women's soccer players.

Design: Cross-sectional study.

Setting: Online survey.

Patients or Other Participants: Former Division I women's soccer players ($n = 382$, age = 36.41 ± 7.76 years) provided demographics and injury history and completed the Patient-Reported Outcomes Measurement Information System (HRQoL), the Disablement in the Physically Active Scale (disablement), and the Godin Leisure Time Physical Activity Questionnaire (PA).

Main Outcome Measure(s): The dependent variables were the physical and mental component summary scores for HRQoL and disablement and the frequency of moderate-to-vigorous PA.

Means, SDs, and correlations among the main outcome variables were examined for those who reported a severe injury ($n = 261$) and those who did not ($n = 121$). To address our primary aim, we conducted multiple regression analyses to predict HRQoL, disablement, and PA based on a history of severe injury, accounting for age.

Results: Having a severe injury significantly predicted worse physical HRQoL and worse physical disablement. Severe injury predicted a >2 -point decrease and 5-point increase on the respective scales. Injury status did not predict mental HRQoL, mental disablement, or PA.

Conclusions: Most participants reported sustaining a prior severe soccer-related injury, which may have had a negative long-term effect on health outcomes for former women's soccer players. Athletic trainers should be aware of the risk for decreased HRQoL and increased disablement with injury and encourage continued monitoring of relevant patient-reported outcomes.

Key Words: retired athletes, physical health, mental health, exercise

Key Points

- More than two-thirds (68.3%) of participants described experiencing a severe injury during their soccer playing career, with knee and ankle injuries being the most common.
- Having sustained a prior severe soccer-related injury predicted worse physical health-related quality of life and physical disablement scores.
- Athletic trainers should consider the value of using population-relevant patient-reported outcomes and develop population-specific normative values to determine clinically relevant deficits in health-related quality of life and disablement in former athletes.

Although collegiate athletes are often viewed as the quintessential picture of health, growing evidence indicates that former athletes are at risk of developing negative health outcomes.^{1–7} For example, decreased health-related quality of life (HRQoL)^{1,2,5,6} and declines in physical activity (PA) and fitness^{3–5} have been found in former collegiate athletes. Prior sport-related injury may play a key role in the development of these negative health outcomes. Specifically, *disablement* (ie, the inability to perform activities that are important to the individual⁸) as a result of prior injury sustained while participating in sport is likely a contributing factor.⁹ Researchers^{1–3,6,10} studying diverse cohorts of former

collegiate athletes have documented a relationship between prior injury and lower HRQoL scores.

Health-related quality of life is a measure of health domains that usually includes physical, mental, and social components and is unique to the individual.^{11,12} The disablement process incorporates this uniqueness by describing the interrelated factors that result in disability, including how the functioning of body systems is affected and the resulting physical and mental consequences.⁸ *Disability*, or the level of disablement, is characterized by the inability, due to a health or physical problem, to perform physical activities or social responsibilities that are important to the individual.⁸ Additionally, HRQoL has been found to be highly connected to PA, as HRQoL is enhanced

by regular PA participation.¹³ Sport injury can have short- and long-term consequences that usually include impairments such as physical pain and stiffness and functional limitations such as impaired activities of daily living and fitness-related PA.¹² The disablement model offers a useful framework for understanding how injury can have a lasting effect on former athletes' PA levels and, subsequently, HRQoL.⁹

Current collegiate athletes have reported declines in HRQoL after injury, which often remain even after the return to full sport participation.^{14–16} Consequently, HRQoL appears to continue to decline in retirement from sport; a history of sport injury has been linked to decreased HRQoL scores and difficulty performing activities of daily living.^{1–3,10} In particular, a history of ankle or knee injury or surgery has been associated with dramatically high rates of osteoarthritis (OA) and subsequent decreases in HRQoL.^{15,17}

As demonstrated by this previous research, negative health outcomes in former collegiate athletes appeared to be related to their prior sport experiences, including a history of injury. However, every sport involves unique experiences and injury risks. Soccer is one of the most popular sports in the United States and also has one of the highest rates of injury at the collegiate level.^{18,19} Women's soccer had the highest competition injury rate for women's sports and the second highest injury rate overall, in the National Collegiate Athletic Association (NCAA) from 2009 to 2014.¹⁸ Injuries to the hip/thigh/upper leg, knee, ankle, and head/face were the most common injuries in women's collegiate soccer.¹⁹ These injuries were also linked to declines in HRQoL among collegiate athletes even after they returned to full participation.^{14–16} Anterior cruciate ligament injuries are especially concerning for former female soccer athletes: 82% reported OA within 12 years of experiencing the injury, and 75% noted challenges to their knee-related quality of life.¹⁷ Prien et al²⁰ identified health concerns specific to former elite women's soccer players related to knee, ankle, and head injuries. However, the authors studied former German professional women's players, not players from the American collegiate system. This is an important distinction because the American system essentially peaks at the NCAA Division I level, with only a small fraction of women's players continuing to the American professional league.^{21,22} Therefore, the most equivalent comparison group to the European professional among American soccer athletes is the Division I collegiate player.

Given that most US soccer athletes reach the pinnacle of their careers in college, it is important to understand how elite sport participation and potentially high rates of injury affect their future long-term health, especially when earlier investigators^{1–3,6,9,10,14–16,17} demonstrated a strong likelihood of detriments to HRQoL and activities of daily living after severe sport-related injury. Despite the high rates of participation and injury in women's soccer, most of the research on former collegiate athletes' health has relied on mixed-sport cohorts that consisted primarily of male athletes or inadequate sample sizes for comparisons across individual sports or both.^{1–5} Simon et al^{3,5} observed that around 30% of their sample consisted of former football players whose injury experiences and sequelae in a male-dominated collision sport may not be comparable with

those of female athletes participating in a contact sport such as soccer. Additionally, most soccer-specific research has involved male players,^{23–26} whereas female athletes have been underrepresented. More sport- and sex-specific research is needed to identify the long-term effects of injury in women's soccer. Thus, the purpose of our study was to assess the current perceived health of former Division I collegiate women's soccer players and specifically to examine the role of prior sport injury in the health and PA behaviors of these former athletes. By determining the relationships among prior sport injury, HRQoL, current disablement, and PA of former women's collegiate soccer players, athletic trainers can gain a better understanding of the long-term consequences of severe injury in former athletes. Increasing knowledge of HRQoL, disablement, and PA behaviors in former athletes can aid athletic trainers in promoting lifespan wellness and PA, as well as inform strategies for enhancing health outcomes in former athletes and those transitioning into athletic retirement.

METHODS

Study Design

This research study used a cross-sectional design focusing on former NCAA Division I women's soccer players. Participants completed an online survey that contained measures of injury history, HRQoL, disablement, and PA.

Participants

Participants ($n = 382$, age = 36.41 ± 7.76 years) were drawn from a convenience and snowball sample of former NCAA Division I women's soccer players. To be eligible for the study, participants must have played NCAA Division I women's soccer and no longer be playing elite competitive soccer (eg, collegiately, semiprofessionally, professionally). On average, they reported 3.87 years of Division I soccer. Most ($n = 308$, 80.6% of total) stated that they were starters during the best season of their collegiate career. The breakdown by primary position played was forward ($n = 69$, 18.1%), midfield ($n = 132$, 34.6%), defender ($n = 117$, 30.6%), and goalkeeper ($n = 64$, 16.8%). Respondents were between the ages of 22 and 59 years with the majority ($n = 298$, 78.0%) being ≥ 10 years (14.6 ± 7.76) removed from their NCAA playing career. Many individuals were still involved in soccer; most described recreational play ($n = 138$, 36.1%) or coaching ($n = 140$, 36.6%). However, more than one-third ($n = 135$, 35.3%) were no longer involved in soccer in any capacity. The most frequent reasons for terminating their soccer careers were injury related ($n = 92$, 24.1%), work or career not related to soccer ($n = 78$, 20.4%), lack of opportunity or no monetary compensation ($n = 51$, 13.4%), graduating college ($n = 27$, 7.1%), and change in desire or burnout ($n = 47$, 12.3%).

Procedures

Participants completed an online survey through Qualtrics. The university's institutional review board approved the study before data collection, and all participants provided informed consent electronically. We recruited volunteers through email and social media (eg, Facebook,

Instagram, Twitter). Current Division I collegiate coaches were asked to send study information to their alumni through email and social media alumni groups, and respondents were asked to forward the electronic survey link to former teammates. The online survey was accessed a total of 487 times during a 3-month study window. A total of 382 participants were included in the data analysis, including 372 who completed the full survey (completion rate = 79.6%) and an additional 10 participants who completed at least 1 main outcome measure.

Demographic Questionnaire. Participants provided information about their age, playing position, the number of years they played in NCAA Division I, the number of years removed from playing collegiate soccer, and current involvement with the sport (see Supplemental Material, available online at <http://dx.doi.org/10.4085/1062-6050-0731.20.S1>).

Injury History. Recruits were asked to provide a detailed background of their injury history, including the number of severe injuries experienced throughout their entire soccer career, specific body part(s) affected, and whether surgery was required. In line with the authors^{10,14} of similar studies, we defined *severe injury* as any injury that kept an athlete out of participation ≥ 21 days.

Global Health Patient-Reported Outcome Information System. The Adult Global Health Measure of the Patient-Reported Outcome Measurement Information System (PROMIS; version 1.2) was used to measure HRQoL. The PROMIS is a 10-item measure with Physical and Mental Function domain scores that were validated for use in diverse clinical and research populations.²⁷ The physical component score (PCS) and mental component score (MCS) consist of 4 items each.²⁷ Answers to the remaining 2 questions (“In general, would you say your health is . . .” and “In general, please rate how well you carry out your usual social activities and roles.”) were not combined in the domain scores and were reported separately.²⁷ We manually converted the raw mental and physical domain scores to T-scores using a standardized table. The standardized T-scores allowed for comparison of our results with those of the general population (mean score = 50 and SD = 10). A score > 50 equated to a better than average level of health.²⁷ When the PROMIS global health summary scores were developed and tested on a general US population sample, internal consistency was 0.86 for the MCS and 0.81 for the PCS.²⁸ In the current study, MCS reliability was acceptable (Cronbach $\alpha = 0.80$). The PCS was lower ($\alpha = 0.63$), but all 4 items correlated and contributed to the total reliability.

Disablement in the Physically Active Scale. The Disablement in the Physically Active Scale (DPA) is a reliable and valid tool designed to measure the level of disablement in physically active populations.^{29,30} The DPA is a 16-item survey with 12 items that assess physical health (eg, impairment, activity limitations) and 4 items that assess mental health (eg, psychosocial and emotional wellbeing) based on how much of a problem the athlete had within the past 24 hours. Higher PCS and MCS scores indicate greater levels of disablement.³⁰ High test-retest reliability (intraclass correlation coefficient = 0.94) were reported for the DPA.²⁹ Our PCS ($\alpha = .95$) and MCS ($\alpha = .83$) scores displayed high reliability. Similar PCS ($\alpha = .94$) and MCS ($\alpha = .88$) reliabilities were reported by previous researchers³⁰ who tested current athletes.

Godin Leisure Time Physical Activity Questionnaire.

The Godin Leisure Time Physical Activity Questionnaire (Godin) was used to measure participants’ weekly moderate-to-vigorous PA. The Godin assessed the frequency of participation in strenuous (eg, running, vigorous swimming), moderate (eg, fast walking, biking), and light (eg, yoga, easy walking) activities for > 15 -minute periods. A metabolic equivalent unit was then created from these values using a standard equation. Because a summary score of only strenuous and moderate activities has been suggested as a better indicator of health contribution,³¹ we computed weekly PA levels using the following equation:

(Frequency of Strenuous Activity/Week $\times 9$) + (Frequency of Moderate Activity/Week $\times 5$).

Higher total scores represented greater participation in PA, and scores ≥ 24 were considered *active* with substantial health benefits.³¹

Exploratory Questions. We asked individuals to rate on a 4-point scale (0 = *never*, 3 = *almost always*) how much their injury history affected their current ability to participate in sports and PA. We also asked whether they had any concerns regarding the health of various body systems (eg, joint, skin, mental, cardiovascular health).

Statistical Analysis

After the data were collected, we downloaded them into SPSS (version 26; IBM Corp) for data reduction, scoring, and analysis. Scores that were reported in minutes of PA rather than frequency of PA were removed from the analysis ($n = 5$). A descriptive analysis was completed for all demographic, playing history, injury history, and exploratory questions. Means and SDs of the main outcome variables, along with correlations, were examined separately for those who reported a severe injury and those who did not (Table 1). To address the primary aim of the study, we conducted separate multiple regression analyses to predict HRQoL, disablement, and PA based on a history of severe injury (dummy coded with no prior severe injury as the reference group), controlling for age. Although group sizes were uneven, the assumption of homogeneity of variance was not violated based on an examination of the residual plots. The distributions of the dependent variables resulted in a violation of the residual normality assumption of ordinary least squares regression. Therefore, nonparametric bootstrapping procedures were performed with 5000 replications; significance was determined based on 99% bias-corrected CIs. Further, we calculated semipartial correlations to estimate the variance in outcomes uniquely accounted for by injury history given that age was a control variable. Effect sizes were interpreted as *small* (0.1), *moderate* (0.3), or *large* (0.5).³²

RESULTS

More than two-thirds (68.3%) of participants reported sustaining a severe injury during their playing career. Knee and ankle injuries were the most commonly reported severe injuries. The majority of former athletes who reported a knee injury also had at least 1 surgery (Table 2).

The separate regression analyses (Table 3) indicated that having a severe injury significantly predicted worse physical HRQoL (PROMIS-PCS; semipartial correlation =

Table 1. Descriptive Statistics for Main Outcome Measures^a

Variable	Mean ± SD		Correlations				
	No Severe Injury Group	Severe Injury Group	1	2	3	4	5
PA	40.49 ± 23.54	38.08 ± 21.66		0.44	0.29	-0.30	-0.19
PROMIS-PCS ^b	54.82 ± 6.54	52.91 ± 6.54	0.24		0.60	-0.61	-0.52
PROMIS-MCS ^b	54.70 ± 7.89	54.17 ± 7.35	0.15	0.56		-0.28	-0.69
DPA-PCS ^c	8.86 ± 10.69	13.77 ± 11.60	-0.07	-0.63	-0.33		0.37
DPA-MCS ^c	2.94 ± 3.26	2.95 ± 3.41	-0.14	-0.48	-0.65	0.43	

Abbreviations: DPA, Disablement in the Physically Active scale; MCS, mental component score; PA, physical activity; PCS, physical component score; PROMIS, Patient-Reported Outcome Measurement Information System.

^a Correlations below the diagonal are for the severe injury group, correlations for the no severe injury group are above the diagonal.

Significant values in bold based on bootstrapped 99% bias-corrected CIs.

^b Higher scores indicate better health.

^c Higher scores indicate poorer health.

-0.15) and worse physical disablement (DPA-PCS; semi-partial correlation = 0.22). Injury status did not predict mental HRQoL (PROMIS-MCS), mental disablement (DPA-MCS), or PA.

Most of the sample participants (n = 314, 82.2%) rated their current health as *very good* or *excellent* overall; however, many (n = 231, 60.5%) listed at least 1 area of concern, with joint health (n = 149, 39%) and mental health (n = 69, 18.1%) cited most often. When participants in the severe injury group (n = 261) were asked the extent to which they felt their prior injury limited or hindered their current ability to engage in recreational activities, sports, or PA, 28.4% (n = 74) reported *often* or *almost always*; 44.4% (n = 116), *rarely*; and 25.7% (n = 67), *never*.

DISCUSSION

The primary goal of our study was to examine the role of previous severe sport injury in the perceived levels of HRQoL and disablement and the self-reported PA behaviors of former Division I women's soccer players. The former soccer players described high rates of severe sport-related injury overall. Knee injuries were most frequently reported, with the majority of participants requiring surgery. A 10-year study on the epidemiology of athletic knee injuries showed that 79.35% of internal knee trauma injuries resulted in surgery.³³ With female soccer players having a 3 to 5 times higher risk of this injury than men,³⁴ the high rate of surgery in our sample was not unexpected.

Overall, those with a history of severe injury were more likely to endorse worse physical HRQoL and greater physical disablement. In particular, a small to moderate effect was observed for physical disablement, suggesting

that having a severe injury predicted a >5-point increase in the DPA PCS. However, more research is needed to evaluate the clinically meaningful influence of injury on the DPA summary components.³⁰

These results are consistent with those of previous authors who determined that former collegiate athletes may experience health consequences,¹⁻⁵ with a history of sport injury being related to decreased health outcomes.^{1-3,6,10} Earlier investigators²⁰ similarly indicated that former elite women's soccer players should be concerned about the long-term effect of knee, ankle, and head injuries. Our participants reported high rates of injuries at those same locations and cited joint and mental health as their areas of greatest concern. These findings also align with the disablement theory model in suggesting that HRQoL has many interrelated factors that contribute to a person's perceived level of health.^{8,9,12} Although not all previously injured athletes have extreme disablement or health deficits, a prior sport injury that has lingering physical, emotional, social, and mental health consequences can play a role in current HRQoL.

The DPA scores we noted were similar to those in a recent study³⁵ of former Division II athletes. The DPA has not been used much to date in former athletes, yet Russell et al⁹ proposed that it provides a more nuanced understanding of the PA-related barriers these athletes may encounter when compared with generic HRQoL scales that have floor-to-ceiling effects. In addition, the DPA measures constructs that are more relevant to a physically active population.²⁹ With a high Cronbach α for both the PCS ($\alpha = 0.95$) and MCS ($\alpha = 0.83$) scores on the DPA, our findings supported the DPA as a reliable tool for use in former athletes and highlights the limitations in global physical functioning these athletes may have experienced due to prior sport-related injury.

It is worth noting that most participants in this sample rated their current health as *very good* or *excellent* in general, and the mean PROMIS scores in the prior severe injury group (mean = 52.91) were above the general population norm of mean = 50,²⁷ but their physical HRQoL was worse (or lower) than in their uninjured peers. Our results were consistent with those of other researchers⁶ who observed that former athletes were not much different from the general population, regardless of the HRQoL survey used. Additionally, athletes may have rated their health at a high level even when injured because they tended to function at a higher level of health.³⁶ Therefore, clinicians

Table 2. Frequency of Severe Injury and Surgery

Injury Location	Participants With at Least 1 Severe Injury No. (%)	Participants Requiring at Least 1 Surgery No. (%)
Knee	164 (42.9)	131 (79.8)
Ankle	88 (23.0)	29 (32.9)
Soft tissue	61 (15.9)	5 (8.2)
Lower leg	47 (12.3)	22 (46.8)
Head/concussion	45 (11.7)	0 (0)
Upper body	44 (11.5)	23 (52.3)
Spine (neck/back)	22 (5.7)	4 (18.1)
Hip	19 (4.9)	8 (42.1)
Other	16 (4.2)	8 (50.0)

Table 3. Prediction of Self-Reported Physical Activity, Perceived Health-Related Quality of Life, and Disablement by History of Severe Injury^a

Model	Adjusted R ²	Predictor	B	SE	Bootstrapped Bias-Corrected 99% CI	
					Lower	Upper
PA	0.00	Intercept	40.72	2.21	35.09	46.43
		Age	-0.16	0.15	-0.54	0.24
		Severe injury	-2.73	2.65	-9.79	3.94
PROMIS-PCS	0.02	Intercept	54.91	0.59	53.37	56.42
		Age	-0.07	0.04	-1.8	0.04
		Severe injury	-2.05	0.72	-3.81	-0.16
PROMIS-MCS	0.01	Intercept	54.57	0.71	52.70	56.36
		Age	0.09	0.05	-0.02	0.21
		Severe injury	-0.35	0.85	-2.57	1.84
DPA-PCS	0.07	Intercept	8.48	0.94	6.17	11.00
		Age	0.27	0.07	0.08	0.46
		Severe injury	5.44	1.19	2.32	8.54
DPA-MCS	0.01	Intercept	3.02	0.30	2.27	3.85
		Age	-0.06	0.02	-0.11	-0.01
		Severe injury	-0.10	0.37	-1.09	0.84

Abbreviations: DPA, Disablement of the Physically Active scale; MCS, mental component score; PA, physical activity; PCS, physical component score; PROMIS, Patient-Reported Outcome Measurement Information System; SE, standard error of the unstandardized beta coefficient.

^a Age variable is mean centered so that the intercept is the expected value of the dependent variable when participants have no severe injury and are of average age. Significance was determined based on the 99% bootstrapped bias-corrected CI not containing zero, as indicated in bold.

must be mindful that deficits or declines in HRQoL among athletes and former athletes may be population specific and only recognized when compared with uninjured peers, not necessarily with the general population.^{36,37} Furthermore, the amount of PA described by this cohort of former women's soccer players, regardless of the prior injury history, was well above the minimum for health benefits.³¹ However, this may be considerably less PA than what these athletes pursued during college as student-athletes. Interestingly, in a recent follow-up study by Simon et al,⁵ former collegiate athletes reported less PA than their nonathlete peers and showed significant declines in HRQoL compared with 5 years earlier. Their HRQoL was also lower than that of both their nonvarsity athlete peers in the study and the general population. However, that former athlete sample was approximately 20 years older on average than our sample and included former athletes from a variety of sports, with a large representation of former football players (31%). Thus, it may be important for researchers to consider the specific sport played, sex, and current age of former athletes when making comparisons. Moreover, Valier and Lam³⁶ recommended that when determining a minimal clinically important difference, values should be derived from a population as close as possible to the one of interest.

Previous research has been limited in not addressing the effect of injury on HRQoL in specific sports.^{1,3,5,10} Simon et al² compared former athletes based on the level of contact (collision, contact, limited contact) with age-matched general US population norms and found that former collision-sport athletes had a lower HRQoL than those in contact and limited-contact sports and the general population. Values for the former athletes in contact and limited-contact sports did not deviate from the general population values²; however, it has been suggested that athlete

populations require their own set of normative values,^{37,38} as being similar to the general population may actually reflect a decline in HRQoL in that specific population. Therefore, to obtain an accurate frame of reference on which to base clinical decisions, an appropriate patient-reported outcome measure and normative values for that distinct patient population must be used.³⁸ Additional work is needed to establish population-specific normative values with comparisons of injured and uninjured athletes in sport- and sex-specific samples to determine clinically meaningful changes in HRQoL and disablement resulting from prior sport-related injury.

Wiese-Bjornstal³⁹ described injury as a far-reaching adverse event and suggested that the long-term effects of injury are more significant for athletes than those sustained by nonathletes because of the role PA participation plays in an athlete's life and wellbeing. It has already been noted that former collegiate athletes may experience declines in lifespan PA³⁻⁵ and face challenges in maintaining a physically active lifestyle.⁴⁰ Although PA was not predicted by severe injury status, PA demonstrated small to moderate correlations with many of the main outcome measures, particularly for the former athletes who did not report a severe injury, indicating that worse HRQoL and disablement was associated with less PA. Some evidence of the potential effect of injury and disablement on PA was also apparent in the severe injury group, with more than one-quarter noting that their injury history limited them in recreation, sports, and PA *often* or *almost always*. Wiese-Bjornstal³⁹ evaluated the benefits on mood, motivation, and return to health of alternative forms of PA on physically active populations such as athletes. For former athletes who may be struggling with the inability to perform desired forms of PA due to disablement or a prior injury history, finding alternative forms of PA they enjoy would likely be

beneficial. Thus, athletic trainers can support athletes with a history of sport-related injuries as they transition out of sport by recommending activity modification and providing education on the psychosocial factors surrounding the importance of PA for mental, physical, and social health.

LIMITATIONS AND RECOMMENDATIONS

Our findings should be interpreted within the limitations of the study design. The cross-sectional nature of our investigation precluded causal inferences; future authors should incorporate longitudinal approaches with more complex analysis to provide added insight. Other researchers^{10,14} have relied on self-reported recall, which always carries the possibility of inaccurate reporting of injuries. Additionally, this sample was relatively young, so the results are not necessarily generalizable to an older group of former athletes. Finally, the injury-related care received before, during, and after college likely varied; gathering more information would be beneficial for promoting the care of future athletes.

Given the long-term consequences of sport injury, an emphasis should be placed on prevention. The importance of strength training, injury-prevention programs, adequate rest, and not overtraining as preventive measures for decreasing the risk of injury should be highlighted. When an injury does occur, a quality rehabilitation program should be implemented. Coaches, sports medicine staff, and players should evaluate the appropriate timeline for the athlete's return to play after an injury. Current players at all levels of competition should be educated on the potential long-term consequences of sport-related injury, as should former athletes who have experienced an injury. The latter should be encouraged to obtain follow-up medical care after retirement from sport.

Future authors should explore the numbers and types of injury that may have the greatest negative health implications. Specific interventions to help manage the long-term physical and psychological consequences of prior sports injury are needed and should be implemented and evaluated to determine if they can improve HRQoL and other health outcomes of former athletes. These might include pain management tools, PA modification, and relaxation and mindfulness techniques to assist in promoting mental health and wellbeing.

CONCLUSIONS

Based on the reported rates of previous injury, Division I women's soccer players demonstrated high rates of severe injury, which subsequently predicted physical health consequences in some athletes. Evidence is increasing that athletes may sacrifice their future HRQoL and fitness as a result of sport-related injury incurred during participation in collegiate athletics.^{1-6,10} Athletic trainers should be aware of the risk of decreased HRQoL and increased disablement after injury and use this knowledge in practicing patient-centered care to determine when return to participation after injury is appropriate. Understanding these possible outcomes will allow clinicians to better serve patients while encouraging continued monitoring of patient-reported outcomes over the long term after both return to play and retirement from sport.

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SUPPLEMENTAL MATERIAL

Supplemental Appendix. Demographic questions.

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