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Current Health-Related Quality of Life in Former National Collegiate Athletic Association Division I Collision Athletes Compared With Contact and Limited-Contact Athletes

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Context: Previous researchers have shown that current health-related quality of life (HRQoL) is lower in former National Collegiate Athletic Association Division I athletes than in nonathletes. However, evidence supports the idea that individuals in collision sports (football) may suffer more serious injuries that may affect them later in life.

Objective: To measure HRQoL in former Division I collision, contact, and limited-contact athletes.

Design: Cross-sectional study.

Setting: Research laboratory.

Patients or Other Participants: A total of 374 former Division I athletes between the ages of 40 and 65 years were separated into collision, contact, and limited-contact groups.

Intervention(s): All individuals completed the Short Form 36 version 2 via a computer.

Main Outcome Measures(s): The dependent variables were the physical component and mental component summary scores and the physical functioning, physical role functioning, bodily pain, general health, vitality, social role functioning, emotional role functioning, and mental health scales. An initial multivariate analysis of covariance included data from the 2 domains: physical component and mental component summary scores. The second multivariate analysis of covariance included data from the 8 dimensions: physical function, role physical, bodily pain scale, general health, mental health, role emotional, social function, and vitality scales. The α level was set at $P < .05$ with a covariate of sex.

Results: The responses were significantly lower (worse) for the former collision athletes compared with the contact and limited-contact athletes for the summary scores ($F_{2,370} = 90.09$, $P < .01$) and all 8 scales ($F_{8,364} = 24.33$, $P < .01$). The largest differences were between the collision and limited-contact athletes for the bodily pain and role physical scales, with mean differences of 12.91 and 11.80 points, respectively.

Conclusions: Competing at the Division I level can be strenuous on an athlete's physical, mental, and social dimensions, which can affect the athlete later in life. Based on these data, collision athletes may sacrifice their future HRQoL compared with contact and limited-contact athletes.

Key Words: collegiate athletes, football players, patient-reported outcomes

Key Points

- Compared with contact and limited-contact athletes, collision athletes may sacrifice their future health-related quality of life.
- The largest differences among collision, contact, and limited-contact athletes were in the physical dimensions of health-related quality of life.
- Many collegiate athletes need to find their "new sport" and understand that collegiate athletic participation does not necessarily translate to maintaining lifelong fitness.

Competing at the collegiate level has been identified as an exceptional opportunity for education and personal growth.[1,2] However, the long-term consequences of participation in athletics are rarely considered because the drive to be successful is the main priority. Because of this drive, an athlete may play through pain or injury to maintain his or her position on the team.[3] Athletes regularly express the expectation of sport-related bodily pain.[4,5] These feelings are often without apparent concern or belief that it could be avoided or may affect them later in life. Part of the collegiate athletic experience can and should include strategies for lifetime health and well-being. Some initiatives for collegiate athletes incorporate holistic health and whole-person development theory.[6,7] These are a step in the right direction; however, it has been argued that these programs are inherently reactive to current long-term health concerns instead of addressing primary prevention.[2,8] Therefore, a proactive approach should be taken to maximize the benefits and minimize the risks of participating in collegiate athletics. This is the key to creating an infrastructure that improves both current performance and long-term health-related quality of life (HRQoL). To date, few researchers have evaluated the HRQoL of student-athletes after they retire from their collegiate career. *Health-related quality of life* is a broad construct that includes both subjective and objective indicators that affect physical and mental health.[9,10]

The health benefits of regular exercise are well established. Reductions in mortality and cardiovascular disease are some of the most documented benefits,[11] but exercise has also been demonstrated to increase muscle strength; preserve bone mass; reduce fall risk; and improve measures of psychosocial health, including depression, anxiety, cognitive function, overall well-being, and quality of life.[12] Conversely, participation in competitive sports is also recognized as a potential health risk.[13–15] Concern for athlete health and safety has led to public scrutiny, especially regarding the long-term consequences of sport participation, notably with regard to orthopaedic injury,[16] cardiovascular disease,[17] head injury,[18] and psychosocial problems.[19] These risks have been significant enough to prompt formal inquiries by the US Congress,[14,20] legal action,[21] and changes to health policy.[22] Despite this attention, data on health outcomes across the lifespan of former National Collegiate Athletic Association (NCAA) Division I athletes remain limited.

The complex relationship between physical activity and HRQoL after retirement from collegiate athletics must be better understood in order to implement effective intervention strategies to help former student-athletes who experience distress as a result of transitioning into retirement. Injuries that occur during a collegiate athlete's competitive years may limit the athlete's ability to participate in physical activity as he or she ages. Vigorous or intense physical activity may increase the risk of lower limb osteoarthritis, but the same activity done in moderation may delay the onset of disability and actually improve HRQoL.[23,24] Authors[25,26] have called for greater attention to a whole-person–centered health care approach and evidence-based practice. This is particularly important when describing health status, disability, and patient-reported outcomes.[27,28] Patient-reported outcomes allow clinicians and researchers to gain a better understanding of the structural, functional, mental, and social impairments an injury causes in a patient.

In a recent investigation,[29] former Division I athletes demonstrated worse HRQoL than individuals who were nonathletes but were physically active in college. The overall scores were significantly worse for the former Division I athletes than for the nonathletes on 5 of the 7 Patient-Reported Outcomes Measurement Information System (PROMIS) scales: the physical function, depression, pain interference, fatigue, and sleep disturbance scales.[29] This investigation considered all former Division I athletes as 1 group; however, there are many types of athletes. To include all athletes in 1 cohort assumes that all athletes are similar, but individuals in collision sports (most notably football) may suffer more serious injuries that affect them later in life.[13] Previous researchers[30–32] have also shown that sustaining an injury affects an individual's HRQoL[30–32]; however, there have been no investigations studying athlete types. It is likely that both injury history and sport type contribute to an individual's future HRQoL, as athletes in collision sports have been shown to have higher injury rates.[33] Therefore, the purpose of our study was to measure HRQoL in former Division I collision, contact, and limited-contact athletes. We hypothesized that the former Division I collision athletes would have worse HRQoL than the contact and limited-contact athletes.

METHODS

Participants

Participants were between the ages of 40 and 65 years (based on birth date) and were recruited from a large midwest Division I university athletics alumni database. All potential participants had competed in an NCAA–sanctioned sport. Of the 600 athletes contacted, a total of 374 participated in the research study (response rate = 62.3%). Participants were separated into former collision athletes (n = 124; 120 men, 4 women; age = 52.29 ± 7.36 years), contact athletes (n = 136; 75 men, 61 women; age = 52.92 ± 7.37 years), or limited-contact athletes (n = 114; 57 men, 57 women; age = 51.79 ± 7.83 years) groups. The athlete categorization was based on the guidelines from the American Academy of Pediatrics.[34] *Division I athlete* was defined as a person who had competed in an NCAA Division I–sanctioned sport in the United States. There were no other inclusion or exclusion criteria for participation in the study. Before the study, the university's Institutional Review Board for the Protection of Human Subjects approved it and all volunteers read and signed an informed consent form.

Procedures

All participants completed a health history questionnaire, a demographics questionnaire, and the Short Form 36 version 2 (SF36v2) on 1 occasion via a computer. These data were collected as part of a larger project assessing other health-related measures. The demographics questionnaire was a paper-and-pencil instrument that assessed sport played in college; years played in college; whether the participant had sustained either a *time-loss injury* (defined as missing more than 1 day) or a *chronic injury* (defined as an overuse injury) or both in his or her collegiate career; whether the participant had sustained a career-ending injury, had played with an injury in college, or had been diagnosed with a concussion in college; and whether the participant thought he or she had had an undiagnosed concussion in college based on this definition: a *concussion* is a blow to the head followed by a variety of symptoms that may include any of the following: headache, dizziness, loss of balance, blurred vision, "seeing stars," feeling in a fog or slowed down, memory problems, poor concentration, nausea, or throwing up.[35] Getting "knocked out" or losing consciousness does not always occur with a concussion.[35]

The SF36v2 was administered to participants in its original form with no other verbal instructions. The most widely used HRQoL instrument in research, the SF36v2 is appealing because it is easy to read, can be self-administered, has norm-based data, and has numerous sources detailing its psychometric properties.[36–39] The SF36v2 is a multidimensional scale consisting of 36 items, 8 health-related dimensions, and 2 domains. The 8 dimensions are (1) physical functioning, (2) physical role functioning, (3) bodily pain, (4) general health, (5) vitality, (6) social role functioning, (7) emotional role functioning, and (8) mental health (see Table 1 for a description of each scale). These 8 dimensions fit into 2 domains, physical and mental, to create 2 component summary scores. The physical component summary score consists of the first 4

Table 1. Description of Each Short Form 36 Version 2 Scale

Scale	Description
Physical role functioning	Assesses limitations on normal physical activities (lifting, climbing stairs, bending, kneeling, walking), designed to estimate the severity of the limitation
Role physical	Assesses limitation on the individual's work function that is caused by physical health problems
Bodily pain	Assesses the severity of pain and the extent to which it interferes with daily activities
General health	Assesses physical health status (current and prior)
Vitality	Assesses a subjective feeling of well-being including energy and fatigue
Social role functioning	Assesses the quantity and quality of interaction with others, extending measurements beyond exclusively physical and mental health concepts
Emotional role functioning	Assesses limitations in the individual's work functions but restricts the causes to those distinct from those caused by physical problems
Mental health	Assesses the 4 major mental health dimensions of anxiety, depression, loss of behavioral or emotional control, and psychological well-being

dimensions. The mental component summary score consists of the last 4 dimensions.[36]

The scoring of the SF36v2 is relatively simple, relying on the assumption that item scores are linearly related according to the Likert approach.[39] The SF36v2 has good reliability (intraclass correlation coefficient = 0.87) and good construct validity (as measured with factor analysis).[37] The principal component analysis provided evidence of both convergent and divergent validity.[40] Each scale is scored by simply summing all the items in the scale. For interpretation, each scale is then transformed on a 0–100 scale using a transformation formula.[37] For analysis, the norm-based versions of the domain scales and component summaries were used for easy comparison with the population values.

Statistical Analysis

Descriptive statistics (frequencies and percentages) were calculated based on information obtained from the health history and demographics questionnaires. Specifically, we analyzed information related to type of sport, presence of a major injury in college, presence of a chronic injury in college, history of a concussion in college, history of a career-ending injury in college, and participation in one's sport while injured in college. Two multivariate analyses of covariance (MANCOVAs) were used to analyze the difference[37] among groups (collision, contact, and limited-contact sports). We chose sex as a covariate because a majority of the individuals in the collision group were men who played American football; sex was used as a covariate to take this limitation into consideration. The first MANCOVA includes data from the 2 domains. The second MANCOVA includes data from the 8 dimensions. The α level was set at $P < .05$ and the covariate of sex was used for both MANCOVAs.

The final SF36v2 scale scores for each group were also compared with age-matched US population norms. Across the SF36v2 scales, the approximate age-matched population mean is 50 with a standard deviation of 10, which was used to evaluate a minimally important difference (MID). An *MID* is defined as the effect that might be considered important or the smallest difference in scores between groups that is important in making clinical decisions.[41] For an MID to be identified between group comparisons, we set a 0.5-standard deviation difference (in this case, 5 points) as the significant threshold.[42]

RESULTS

Of the former athletes in the collision group, the majority were football players (n = 116); the remaining 8 were divers. For the other groups, no single sport predominated (Table 2). Of all the former Division I athletes, 75% indicated they had competed for 4 years in college; other responses were 2, 3, or 5 years, each accounting for 10% or less. A total of 30% indicated they had spent between 1 and 10 years competing in professional athletics after college.

Among the former athletes, 78% (n = 292) indicated they had sustained a time-loss injury and 60% (n = 224) indicated they had sustained a chronic injury while competing in their sport. Of those with a time-loss injury, 35% (n = 102) needed to have a surgical procedure. Of those with a chronic injury, 10% (n = 22) required a surgical procedure. Seven percent (n = 26) specified that they had been diagnosed with a concussion; however, 39%

Table 2. Identification of Collision, Contact, and Limited-Contact Sports (n = 374)

Sport		
Collision (n = 124)	Contact (n = 136)	Limited Contact (n = 114)
Men's and women's diving (n = 8)	Men's and women's basketball (n = 30)	Baseball (n = 11)
Football (n = 116)	Field hockey (n = 14)	Men's and women's cross-country (n = 10)
	Men's and women's gymnastics (n = 19)	Men's rifle (n = 10)
	Men's and women's high jump and pole vault (n = 8)	Women's rowing (n = 8)
	Men's and women's soccer (n = 28)	Softball (n = 11)
	Women's volleyball (n = 22)	Men's and women's swimming (n = 20)
	Wrestling (n = 15)	Men's and women's tennis (n = 23)
		Men's and women's track and field (n = 21)

Table 3. Breakdown of Descriptive Statistics by Sport Categories

	Sport		
Sport Category	Collision (n = 124)	Contact (n = 136)	Limited Contact (n = 114)
Competed professionally	55	37	20
Major injury	116	100	76
Chronic injury	90	71	63
Diagnosed concussion	12	8	6
Sustained undiagnosed concussion	72	46	27
Sustained career-ending injury	25	12	8
Participated in sport with injury	119	94	67

(n = 145) thought they had had a concussion but never been diagnosed based on the definition provided. The individuals who had a diagnosed concussion reported an average of 1.5 ± 0.4 occurrences during their athletic career, whereas those who thought they had had an undiagnosed concussion reported an average of 3.6 ± 1.5 occurrences. Only 12% (n = 45) of the former athletes said they had sustained a career-ending injury. Lastly, 75% (n = 280) of former athletes stated that they had participated in their sport with an injury when they thought they should have been removed from play (Table 3).

For the first MANCOVA (2 domains), evaluations of assumptions of normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory. Using Wilks' criterion, there was a significant effect of group ($F_{2,370} = 90.09$, $P < .01$, $\eta_p^2 = 0.79$, $1 - \beta = 0.99$) but not of the covariate sex ($F_{2,369} = 0.25$, $P = .77$, $\eta_p^2 = 0.01$, $1 - \beta = 0.08$). Univariate analyses for the 2 domains revealed the largest differences between the collision and limited-contact athletes. The collision athletes scored worse, with mean differences between the collision and limited-contact athletes of 12.7 points ($F_{2,370} = 63.37$, $P < .01$, $\eta_p^2 = 0.55$, $1 - \beta = 0.99$) for the physical summary score and 8.6 points ($F_{2,370} = 58.79$, $P < .01$, $\eta_p^2 = 0.41$, $1 - \beta = 0.99$) for the mental summary score.

For the second MANCOVA (8 dimensions), evaluations of assumptions of normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory. Using Wilks' criterion, there was a significant effect of group ($F_{8,364} = 24.33$, $P < .01$, $\eta_p^2 = 0.48$, $1 - \beta = 0.99$) but not of the covariate sex ($F_{8,363} = 1.18$, $P = .31$, $\eta_p^2 = 0.03$, $1 - \beta = 0.55$). Univariate analyses for the effect of group were significant for all 8 dimensions (physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health scales). Overall, the responses were significantly worse for the former collision athletes than for the contact athletes, followed by the limited-contact athletes, for all 8 scales (Figure and Table 4), which confirms our stated hypotheses. The largest differences were seen between the collision and limited-contact athletes. We also compared the age-matched US population and the 3 groups (collision, contact, and limited-contact; Table 5). Collision athletes had worse HRQoL but mainly on the physical scales. Specifically, the bodily pain scale had the largest deficit, with collision athletes scoring 10 points worse than the age-matched US population mean, which exceeded the MID. The physical function, role physical, social functioning, and role emotional scores also exceeded the MID for the age-matched US population. There were no negative differences between contact and limited-contact athletes and the age-matched US population. However, contact athletes exceeded the MID on the vitality scale (on average, 5.3 points) by scoring better than the US population, and limited-contact athletes exceeded the MID on the vitality (on average, 7.3 points) and mental health (on average, 5.1 points) scales by scoring better than the US population.

DISCUSSION

Based on these results, it appears that former collision athletes had worse HRQoL scores than the limited-contact athletes for all of the HRQoL scales. The SF36v2 is a useful tool to evaluate HRQoL because it also allows for comparisons with the US population. When athletes were compared with the age-matched general US population, the collision athletes still had worse HRQoL but mainly on the physical scales (Table 5). Conversely, there were no differences between the contact athletes and the age-

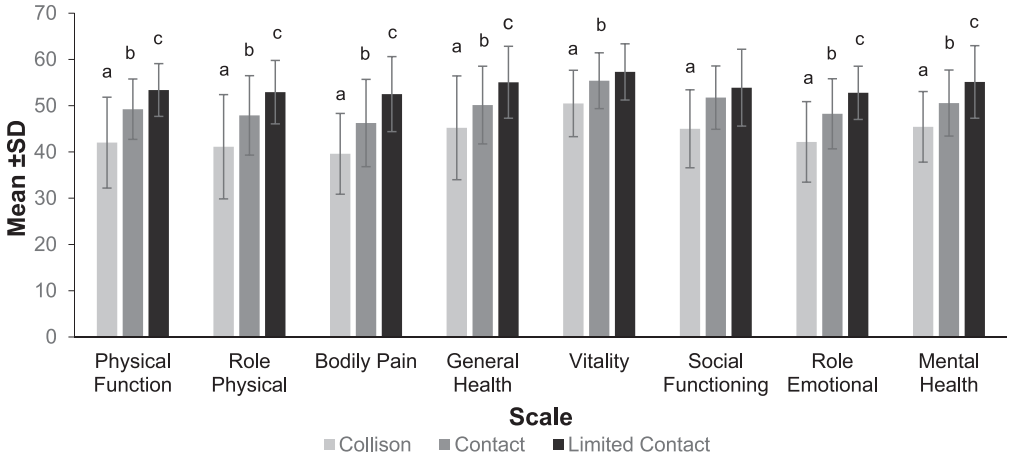

Figure. Dimensions of health-related quality of life (Short Form 36 version 2) in collision, contact, and limited-contact former Division I athletes (mean ± SD). [a] Difference between collision and limited-contact groups ($P < .05$). [b] Difference between collision and contact groups ($P < .05$). [c] Difference between contact and limited-contact groups ($P < .05$).

Table 4. Univariate Analysis-of-Covariance Results for Greatest Differences Between Groups

Scale	Greatest Mean Difference, Collision Versus Limited-Contact Athletes	*F* Value	*P* Value	Effect Size, Cohen d (95% Confidence Interval)	Power (1 − β)
Physical role functioning	11.38	60.28	<.01	1.41 (1.12, 1.69)	0.99
Role physical	11.80	50.33	<.01	1.25 (0.97, 1.53)	0.99
Bodily pain	12.91	63.79	<.01	1.53 (1.24, 1.82)	0.99
General health	9.84	33.44	<.01	1.01 (0.74, 1.28)	0.99
Vitality	6.83	36.21	<.01	1.02 (0.75, 1.29)	0.99
Social role functioning	8.89	31.97	<.01	0.73 (0.44, 1.02)	0.99
Emotional role functioning	10.52	59.80	<.01	1.29 (1.01, 1.57)	0.99
Mental health	9.71	60.01	<.01	1.45 (1.17, 1.74)	0.99

matched US population or between the limited-contact athletes and the age-matched US population. Both the contact and limited-contact athlete groups actually scored better than the age-matched US population on 1 or 2 mental scales. We may conclude that participating in a contact or limited-contact sport does not decrease one's HRQoL and may improve the mental component of HRQoL compared with the age-matched US population; however, being a former Division I collision athlete may be detrimental to one's HRQoL when compared with the normative data.

The results from a previous study[29] of current HRQoL in former Division I athletes compared with nonathletes showed that the former group had lower HRQoL compared with the latter group. Specifically, former Division I athletes scored worse on the physical function, depression, fatigue, sleep disturbance, and pain interference PROMIS scales than nonathletes.[29] Even though this previous work used a different HRQoL questionnaire, we explored the variations in different types of athletes and our data further support the hypothesis that previous injury may contribute to a decrease in future HRQoL, especially in collision athletes.

Current athletes report better HRQoL than their nonathlete counterparts.[31,43] However, this may change as the athlete ages.[44] The "pressure to compete in the face of physical adversity, and to win also comes from spectators and the media."[44(p400)] Playing with pain and injuries may not affect athletes' levels of HRQoL while they are competing, but it may catch up with them years later. This idea is supported by our findings as well as those of a previous investigation[29] in which former athletes scored worse than the general US population on the HRQoL scales. Other authors[12,24] have reported an elevated prevalence of joint and musculoskeletal health disorders among elite competitive athletes, including the male Finnish former elite athlete cohort, retired soccer and track and field athletes, and National Football League (NFL) football players, compared with reference populations. The effect of previous injury on HRQoL has been supported by Cameron et al,[32] who collected patient-reported outcomes of incoming military cadets using the Knee Injury and Osteoarthritis Outcome Score (KOOS). Both male and female cadets who reported a previous history of knee ligament injury had lower scores than cadets who did not report a similar injury. The effect of injury on HRQoL has also been supported by Valovich McLeod et al[30] and McAllister et al[31] using generic HRQoL measures.

Comparing the sport group with the age-matched general US population is important because it provides insight regarding the effects of different types of sports. It appears that the individuals who played either contact or limited-contact sports are very similar to the age-matched general US population, which leads us to believe there is something different about the experiences of former collision athletes in collegiate athletics. One potential explanation for this finding is that former Division I collision athletes may suffer more serious injuries. These injuries are often repetitive in nature and are the result of high levels of impact and torsional loading. These characteristics may cause the injuries to linger and may prevent the athlete from maintaining an active lifestyle later in life. A majority of the athletes in the whole cohort did indicate sustaining a time-loss injury in college (78%), and 35% of those with a time-loss injury needed surgery. In addition, most athletes (75%) stated that they participated in their sport with an injury when they thought they should not have played. However, the numbers jump significantly when we look only at the collision athletes: 94% (n = 116) of the individuals in the collision-athlete group described sustaining a time-loss injury, 73% (n = 90) described sustaining a chronic injury, 58% (n = 72) suspected they had sustained a concussion but never had it diagnosed, and 96% (n = 119) indicated playing with an injury when they thought they should have sat out. The percentages for these health history items were highest for the collision group compared with the contact or limited-contact groups. The previous history of injury and, furthermore, the injuries that needed surgical intervention may have had a lasting effect on the

Table 5. Minimally Important Difference Calculations Among Former Division I Athlete Sport Categorizations and Age-Matched US Population[a]

Scale	Athlete Type/US Population Standard Deviation		
	Collision	Contact	Limited Contact
Physical role functioning	−0.80[b]	−0.07	0.33
Role physical	−0.88[b]	−0.21	0.29
Bodily pain	−1.04[b]	−0.37	0.49
General health	−0.48	0.14	0.49
Vitality	−0.04	0.53[b]	0.73[b]
Social role functioning	−0.50[b]	0.18	0.39
Emotional role functioning	−0.78[b]	−0.17	0.28
Mental health	−0.46	0.06	0.51[b]

[a] Calculations are standard deviation differences between groups. Positive scores are better than the age-matched US population. Negative scores are worse than the age-matched US population.
[b] Significance >0.5 standard deviation.

individual, especially for the collision athletes. All of these factors could explain the decreased HRQoL in the collision group.

In a survey[45] of 1617 retired NFL players with a mean age of 53.4 years, the most frequent retirement problems reported were pain (48%), loss of fitness and lack of exercise (29%), weight gain (28%), trouble sleeping (28%), difficulty with aging (27%), and trouble transitioning to life after professional football (27%).[45] The most commonly reported barriers to seeking help for these problems were a preference to use spiritual means to deal with these concerns (36%), preference to deal with these issues with family and friends (33%), lack of insurance coverage (33%), and lack of recognition that these problems were important (33%).[45] Many retired NFL players also indicated that they would want programs to help with the following: fitness and exercise (48%), nutrition (46%), financial assistance (46%), pain management (43%), relaxation (42%), distress or depression, (42%) and spirituality (41%).[45]

Even though our sample was different than that of a previous investigation[29] of former Division I athletes, the results were similar. The collision athletes, mostly former Division I football players, scored worse on the physical functioning, bodily pain, and mental health scales than the contact athletes, the limited-contact athletes, and the US population. The reported symptoms of depression-like behavior, physical limitations, and bodily pain put former collision athletes at higher risk of having significant difficulties as they transition from being elite to recreational athletes. The relationship between depression and pain is important and complex. Authors[46] of a systematic review of almost 60 studies of the comorbidity of pain and depression showed that roughly two-thirds of patients with major depressive disorder had significant pain symptoms, and roughly half of patients seen in chronic pain clinics met criteria for a major depressive disorder.

Sports in the United States are a way of life. This mentality starts at the youth level and continues in middle and high school; the enjoyment persists in the college years through participation or the pleasure of attending sporting events. Athletes who compete in collision sports may face an increased risk of diminished HRQoL measured through the physical limitation, bodily pain, and mental health scales as they age, whereas those who participate in more lifelong sports such as tennis and swimming may experience better HRQoL in the future.

Our study had several limitations. These student-athletes do not necessarily represent the overall NCAA student-athlete population or that of other elite competitive athletes (eg, professional and Olympic sports). Also, the sample size was insufficient to evaluate sport-specific results. However, comparisons of the collision, contact, and limited-contact groups were possible. The SF36v2 does not assess smoking or alcohol consumption, which are important potential confounders to be considered in future studies. Selection bias may have been a factor: former athletes who were more interested in health and exercise or more interested in the pain and limitations they had may have been more inclined to respond to the questionnaires. All self-report instruments are subject to response misclassification (eg, overreporting or underreporting). Finally, although a cross-sectional study provides less causative evidence than a longitudinal study, it does so in a timely manner while supporting the development of long-term studies. Future studies should be longitudinal, focusing on the transition from collegiate athlete to nonathlete. Other explorations should incorporate similar investigations at the Division II and III levels, especially comparing across divisions for collision sports. Implementing intervention studies that incorporate some of the programs the retired NFL football players mentioned would shed further light on whether such programs can improve reported HRQoL.

CONCLUSIONS

Competing in athletics is very demanding. Based on these data, collision athletes may sacrifice their future HRQoL for their relatively short athletic careers in collegiate sports when compared with participants in contact or limited-contact sports or the general population. Specifically, the collision athletes scored worse than the limited-contact athletes on all of the HRQoL scales. When compared with contact athletes, collision athletes scored worse on 6 of the 8 scales. When collision athletes were compared with the general population, they scored worse on 5 of the scales (specifically, the physical scales).

The specific athlete cohorts appear to demonstrate differences. However, it is also important to see how the different athlete cohorts compare with the age-matched general population. In this study, the collision athletes scored worse than the age-matched general population, whereas the contact and limited-contact groups did not score worse on a majority of the scales and actually scored better than the age-matched US population on 1 or 2 scales. Athletic departments have made strides in incorporating and teaching holistic health; however, more programs targeting whole-person development are needed for collegiate athletes (especially collision athletes) to maintain HRQoL. Clinicians should also be proactive when working with athletes, particularly collision athletes, who are transitioning from collegiate athletics to the general population. Many athletes need to find their "new sport" and understand that competitive athletics does not necessarily translate to maintaining fitness. In addition, clinicians should understand the effect that a previous injury may have on an individual's HRQoL and include measures of HRQoL and patient-centered outcomes in their evaluation and rehabilitation processes.

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