

Health and Well-Being Measures of Collegiate Athlete and Non-Athlete Graduates

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American collegiate sport participation has been linked with psychosocial and career-related benefits as well as with mental and physical health risks, with extant research revealing mixed results. The study purpose, informed by the Health through Sport Conceptual Model, was to describe and compare associations among health-related quality of life and psychosocial measures of former U.S. collegiate athletes ($n = 594$) and non-athletes ($n = 742$) from four university graduation cohorts. Results suggest on aggregate former collegiate athletes report more positive outcomes than their non-athlete peers. Study findings were, in some instances, mitigated/reversed when participants endorsed concussion, career ending injury or revenue sport participation histories or were female. Results provide some support for protective associations/benefits of collegiate athletics participation and inform the work of practitioners working with athletes during and after the collegiate sport experience. This study also provides a theoretical bridge from intercollegiate athletics to broader sport promotion literature.

Keywords: athlete perceptions, intercollegiate athletics, social psychology

Intercollegiate athletics overseen by the National Collegiate Athletic Association (NCAA) provides opportunities for more than 490,000 young adults annually to participate in organized competitive sport (Irick, 2017). Yet, the nature of this sport exposure is not homogeneous. Physical demands may differ by sport (Kerr et al., 2015), competition level, gender, coaching (e.g., Singer, 2008), and other contextual differences (e.g., sport revenue generation). Thus, the potential for different athlete psychosocial demands and outcomes exists within a given experience context. College sport participation has been linked with social, psychological, and career-related benefits (e.g., Armstrong & Oomen-Early, 2009; Berg et al., 2015; Chalfin et al., 2015; Inoue et al., 2013; Spaaij & Schulenkorf, 2014; Warner & Dixon, 2011; Weight et al., 2018; Weight et al., 2014). However, elite competitive sport participation can also expose athletes to both short and long-term risks to their mental and physical health (e.g., Brooks et al., 2014; Houston et al., 2016; Huang et al., 2007). During their careers, as many as thirty-three percent of college athletes may experi-



ence symptoms of depression (Cox et al., 2017) with anxiety also being a common concern according to NCAA data (NCAA, 2016b). Moreover, maladaptive psychological health outcomes of disordered eating behaviors are also common concerns of collegiate athletes (Petrie et al., 2008).

However, lifespan outcomes beyond the collegiate sport experience are also important to consider beyond the transition from collegiate sport participation. Both research and high-profile case examples have prompted societal concern and discussion surrounding the potential long-term effects associated with competing in American collegiate sport (e.g., Gayles & Blanchard, 2018; Weight & Cooper, 2015). Yet, to date there is relatively little research to inform this public health concern. This study addresses this gap by using the Health through Sport Conceptual Model to inform a comparison of health-related quality of life and psychosocial outcomes of former U.S. NCAA Division I Power Five collegiate athletes and non-athletes.

Theoretical Framework

The Health through Sport Conceptual Model (Eime et al., 2013) theoretical/conceptual framework guided the examination of health-related quality of life and psychosocial outcomes in the current study. Based on a thorough literature review (Eime et al., 2013), this model was developed because of insufficient evidence un-

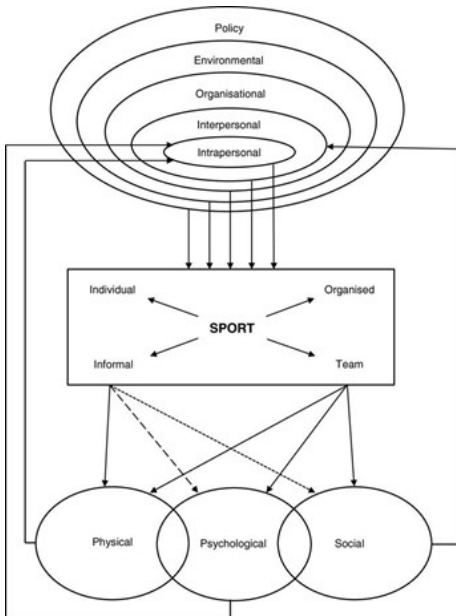


Figure 1. Health through Sport Conceptual Model (Eime, Young, Harvey, Charity, Payne, 2013)

derpinning levels/types of physical activity associated with psychological and social health benefits. The resulting Health through Sport Conceptual Model (see Figure 1) describes the positive relationships between sport participation and physical, psychological, and social health domains and is built upon substantive evidence of these domains associated with participation in sport (e.g., Hansen et al., 2003; Linver et al., 2009). Evidence from this meta-analysis also led to a conclusion that participation in team sports rather than isolated (i.e., non-social) activity is associated with increased health measures (e.g., Howie et al., 2010; Michaud et al., 2006; Tali-ferro et al., 2008; Valois et al., 2004).

The Eime et al. (2013) model was created in the context of children and adolescents but has been extended to older adults' sport participation in follow-up research (e.g., Hulteen et al., 2018). It forms a rich conceptual foundation for

additional research into the outcomes of sport participation in other contexts, including American intercollegiate athletics – the focus of the current research. In the current study, we examine athlete outcomes in each of the three intra- and inter-personal impact categories of health through sport participation (physical, psychological, and social) in order to test the theorized associations in this new sport context of U.S. intercollegiate athletics. These associations can be utilized to build a theoretical bridge from the current literature on intercollegiate athletics participation “outcomes” and “benefits” to those utilized more broadly in health and sport promotion literature on physical, psychological, and social impacts of general participation. The “outcomes” and “benefits” nomenclature is broadly used in this research, though in the absence of controlled or randomized longitudinal studies which assess all three impact categories (i.e., physical, psychological, and social), it is difficult to demonstrate causality between associations of sport participation and post-collegiate measures (Eime et al., 2013; Weight et al., 2018). The measures of interest in this study were informed by the Health through Sport Conceptual Model. Specifically, we utilized valid and reliable psychometric measures to examine associations of model components of intercollegiate athletics participation with physical, psychological, and social outcomes.

Health-Related Quality of Life Among Former College Athletes and Non-Athletes

To date, a limited number of studies have compared health outcomes of former athletes with non-athletes. Simon and Docherty (2014) examined the health-related quality of life (HRQoL) of 40-65-year-old alumni from one university. Their sample included active non-athletes who participated in recreational activity, club, or intramural sport while attending college ($n = 225$) and intercollegiate varsity athletes ($n = 232$). The sample of former athletes yielded significantly worse scores on physical function, sleep, and pain interference, and significantly better scores on depression and fatigue than their control-sample active peers. Researchers concluded HRQoL to be lower in the former varsity athlete sample because “the demands of Division I athletics may result in injuries that linger into adulthood and possibly make participants incapable of staying active as they age” (p. 1), though the lower scores for depression and fatigue for former athletes also indicated some positive associations. Additional findings of physical risk associated with collegiate athletics participation were found when athlete alumni from a single university were tracked five-years post-collegiate participation (albeit with no non-athlete comparison group). Authors concluded collegiate athletics participation is linked with “substantial physical cost” defined as long-term risk of incurring a disabling physical condition (Brooks et al., 2014, p. 1).

Another study (Kerr et al., 2014) compared physical and mental health outcomes of graduated athletes (ages 18-54) at one institution with general US population norms. Results revealed athletes sampled ($n = 797$) to be similar to US population norms on most study outcomes. However, athletes were less likely to have depression, bipolar, or attention deficit disorders, and more likely to exhibit alcohol dependence or disordered eating. Physical health (via Veterans Rand 12 physical

functioning scores) was worse among athletes who had incurred three or more concussions or a career-ending injury. These generally positive findings were supported in a meta-analysis of eight athlete HRQoL studies which found former athletes to exhibit overall better reported HRQoL than non-athletes, and athletes reporting no injury history to report greater HRQoL than athletes reporting an injury history, though overall effect sizes were small (Houston et al., 2016).

Health-Related Quality of Life Among Current College Student Athletes and Non-Athletes

Finally, a recent study (Snedden et al., 2019) compared self-report physical activity involvement and HRQoL measures between current undergraduate Division I athletes ($n = 842$) and general undergraduate students ($n = 1322$) with varying levels of physical activity participation. Overall, study results showed, after controlling for potential sex differences, collegiate sport participation to be protective for participant mental (but not physical) functioning. Interestingly, current collegiate athletes endorsed the highest mental functioning, followed by club sport, intramural sport or regularly active college student participants. Physically inactive participants sampled reported the lowest levels of mental functioning. This study showcased potential protective benefits of college sport participation possibly driven by the required physical activity exposure. However, notable risks of physical activity exposure were not accounted for such as injury or transition from sport (i.e., for former athletes).

Study Significance

Research comparing the long-term health and well-being of former American collegiate athletes has shown mixed results. One notable limitation of extant work in this area is that amalgamated HRQoL measures, though useful for illustrating broad patterns of functioning, fail to also target specific psychosocial markers (e.g., social support, perceived stress, life satisfaction) salient to sport transition and identity (Taylor & Ogilvie, 1994). Research would benefit from the use of targeted psychosocial markers (i.e., social support, perceived stress, life satisfaction), in addition to HRQoL variables, to further understand former collegiate athlete post-career experiences via enhanced knowledge of athlete support networks, stress experiences, and overall psychological well-being. Moreover, differences in sample demographics, sampling strategies, and sample-specific environmental influences both during and post-college could have contributed to extant research differences. Such limitations merit continued examination, guided by psychosocial theory, including random sampling and non-athlete controls. Addressing these limitations, the purpose of this study was to describe and compare the HRQoL, social support, perceived stress, and life satisfaction of former collegiate athletes and non-athletes. Environmental factors germane to former athlete health and well-being (i.e., gender, revenue sport status, concussion history, career ending injury history) were also considered. This line of research unearthing important differences in former college athletes and non-athletes could inform the development of interventions designed to support the unique lifespan health and well-being needs of both populations. Specific hypotheses informed

by the extant research include:

H₁: There would be no differences in markers of health and well-being between former collegiate athletes and non-athletes,

H₂: There would be no differences in markers of health and well-being among former athletes based on gender or sport type (e.g., “revenue vs. non-revenue”), and

H₃: Former athletes who experienced two or more concussions and/or a career-ending injury would endorse significantly lower health and well-being than non-endorsers.

Method

Participants

Study participants were varsity athlete and non-varsity athlete graduates (see Table 1) from a large, Southeastern public university in the United States that competed in a “Power Five” NCAA conference. Participants will be referred to throughout the manuscript as athletes or non-athletes. Notably, the non-athlete cohort may have included individuals who participated in club, intramural, or recreational (but not varsity) sports as a college student. Members of the target population graduated from this institution in cohorts including graduating classes of 2005 (10 years post-graduation), 1995 (20 years post-graduation), 1985 (30 years post-graduation), and 1975 (40 years post-graduation). Each cohort included the graduating classes immediately before and after the target graduation year in order to boost sample sizes. For example, for the 10-year cohort, graduates from 2004, 2005, and 2006 were sampled. The entire population of athletes and a random sample of non-athletes from each graduation class of interest were invited to participate in the study. Approximately 500 athletes and 500 non-athletes were contacted in each of the four graduation cohorts from the institution, totaling 3,936 surveys distributed. The final sample ($N = 1,336$) consisted of ($n = 594$) former collegiate athletes and ($n = 742$) former non-athletes, 688 men and 643 women (5 non-specified). Recruitment procedures yielded a response rate of 34%. Cohorts were relatively equal with 322 participants (24.1%) from the 10-year post-graduation cohort, 338 (25.3%) from the 20 year post-graduation cohort, 351 (26.3%) from the 30 year post-graduation cohort and 305 (22.8%) from the 40 year post-graduation cohort (20 non-specified). The majority of participants ($n = 1196$, 89.5%) identified as Caucasian with the remaining participants identifying as African-American ($n = 91$, 6.8%), Hispanic ($n = 4$, 0.3%), Asian ($n = 23$, 1.7%), Native American ($n = 6$, 0.4%), Pacific Islander ($n = 1$, 0.1%), other ($n = 13$, 1.0%), or non-specified ($n = 2$, 0.1%). Complete demographic information for the full participant sample is described in Table 1. For the former athlete group, 58% ($n = 346$) identified as male vs. female ($n = 245$, 42%), 36% ($n = 216$) participated in a revenue sport, 15% ($n = 92$) reported a concussion history, and 14% ($n = 86$) reported a career-ending-injury.

Table 1

Demographic Information

	Athletes		Non-Athletes	
	%	<i>n</i>	%	<i>n</i>
Gender				
Male	58%	346	46%	342
Female	42%	245	54%	398
Graduation Cohort				
2004-2006	22%	130	26%	192
1994-1996	27%	163	24%	175
1984-1986	26%	154	27%	197
1974-1976	23%	139	22%	166
Ethnicity				
Caucasian	90%	532	90%	664
African American	7%	44	6%	47
Hispanic	0.2%	1	0.4%	3
Asian	1.7%	10	1.8%	13
Native American	0.2%	1	0.7%	5
Pacific Islander	0%	0	0.1%	1
Other	0.8%	5	1%	8

Procedure

Following Institutional Review Board approval, this study was conducted via survey methodology with a sample compiled from an alumni database provided by university alumni services. The random sample of athlete and non-athlete graduates was attained via a random number generator, which populated a spreadsheet containing graduates with known email addresses. Once the contact information was attained and organized, the survey was distributed to each participant via email with consent information embedded within the survey itself. A mailer with the link to the survey was also sent out a week after the initial email with a small gift (scratchpad) bearing the institution's logo. This mailer served as a reminder and thank you for considering participation in the study. This method is consistent with the principle of reciprocity to maximize survey response (Cialdini, 2006; Fehr et al., 2002).

Design and Measures

Participants completed reliable and valid instruments of study variables (i.e., HRQoL, social support, perceived stress, life satisfaction). Measures are outlined in

detail below.

Demographic Information. Participants were asked to self-report their college athlete vs. non-college athlete status, gender, race/ethnicity, whether they sustained a concussion during their collegiate sport career, whether they sustained a career (i.e., sport) ending injury, and whether they participated in a revenue generating sport (i.e., men's basketball or football).

Health-Related Quality of Life. Health-related quality of life was assessed with the 29-item PROMIS-29, a National Institutes of Health Roadmap Initiative to create and validate a comprehensive instrument to measure HRQoL. The PROMIS-29 includes seven subscales (i.e., anxiety, physical function problems, depression, fatigue, sleep disturbance, social roles difficulty, pain) with four items per subscale plus one pain intensity item (Cella et al., 2010; DeWalt et al., 2007; Fries et al., 2005; Reeve et al., 2007). The PROMIS-29 assesses these subscales with 4-items per subscale using a 5-point Likert-scale from 1 (*never*) to 5 (*always*). Previous research has shown scores from this measure to exhibit acceptable internal consistency, reliability and validity in college athlete and non-athlete populations (Simon & Docherty, 2014). Internal consistency reliability of scores ranged from $\alpha = .81$ to $.94$ for subscales in the current study.

Social Support. Social support was assessed using the 6-item Enhancing Recovery in Coronary Heart Disease Social Support Instrument (ENRICH-SSI). The ENRICH-SSI assesses emotional, instrumental, informational, and appraisal social support (Mitchell et al., 2003) using a 5-point Likert-scale with responses ranging from 1 (*none of the time*) to 5 (*all of the time*). Previous research has shown scores from this measure to exhibit acceptable internal consistency, reliability and validity in college student populations (Certain et al., 2009). Internal consistency reliability of scores was $\alpha = .89$ for the current study.

Perceived Stress. Perceived psychological stress was assessed using the 4-item Perceived Stress Scale (PSS-4). The PSS-4 assesses how stressful respondents find their lives rather than measuring responses to a specific stressor (Cohen et al., 1983), using a 5-point Likert-scale with responses ranging from 1 (*never*) to 5 (*very often*). Previous research has shown PSS-4 scores to exhibit acceptable internal consistency, reliability and validity in college athlete populations (DeFreese & Smith, 2014). Internal consistency reliability of scores was $\alpha = .77$ for the current study.

Life Satisfaction. Life satisfaction was assessed using the 5-item Satisfaction with Life Scale (SWLS-5). It assesses global judgments of life satisfaction (Pavot & Diener, 2008) using a 7-point Likert-scale with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research has shown SWLS-5 scores to exhibit acceptable internal consistency, reliability and validity in college athlete populations (DeFreese & Smith, 2014). Internal consistency reliability of scores was $\alpha = .91$ for the current study.

Data Analysis

Following data screening, descriptive statistics were calculated for all study variables. Multicollinearity was examined using the variance inflation factors with a 10-point cut-off (Hair et al., 1998). Study hypotheses regarding differences between former college athletes and non-athletes were tested using multivariate analysis of variance (MANOVA) in three individual models including concussion history, career ending injury, and revenue sport status. Gender was included as the third variable in all three models. Main effects results are presented in Tables 2-4.

Results

Descriptive Statistics

Participants reported relatively good scores on all HRQoL domains (anxiety, $M = 6.00$, $SD = 2.52$; physical function problems, $M = 4.46$, $SD = 1.59$; depression, $M = 5.10$, $SD = 2.19$; fatigue, $M = 7.74$, $SD = 3.30$; sleep disturbance, $M = 10.62$, $SD = 1.55$; social roles difficulty, $M = 6.63$, $SD = 3.14$; pain, $M = 5.33$, $SD = 2.50$), social support ($M = 25.45$, $SD = 4.50$), perceived stress ($M = 8.37$, $SD = 2.79$) and life satisfaction ($M = 27.76$, $SD = 5.99$). Variables were correlated in expected directions. Independent samples t -tests (i.e., univariate results) revealed former collegiate athletes to report significantly higher social support and life satisfaction but also significantly lower depression, fatigue, and social roles difficulty compared to non-athletes.

Results for Athlete Status, Concussion History and Gender

For the MANOVA model examining collegiate athlete status, concussion history, and gender, no three-way (Wilk's Lambda = 1.12, $p = .34$) or two-way interactions were significant (athlete status*concussion history; Wilk's Lambda = 1.41, $p = .17$; athlete status*gender; Wilk's Lambda = 0.94, $p = .50$; concussion history*gender; Wilk's Lambda = 0.54, $p = .86$) for this multivariate model. Main effects of athlete status (Wilk's Lambda = 2.60, $p = .004$, partial eta squared = .022), concussion history (Wilk's Lambda = 2.23, $p = .014$, partial eta squared = .019), and gender (Wilk's Lambda = 2.25, $p = .014$, partial eta squared = .019) were significant. Between-subjects follow-up tests showed these effects to be significant for athlete status for the outcome variables of social roles difficulty ($F = 5.42$, $p = .020$) and life satisfaction ($F = 9.85$, $p = .002$), for concussion history for the outcome variables of physical function problems ($F = 7.57$, $p = .006$) and social support ($F = 4.24$, $p = .040$), and for gender for the outcome variables of fatigue ($F = 9.74$, $p < .001$) and sleep disturbance ($F = 4.95$, $p = .026$). For athlete status, former athletes reported significantly higher life satisfaction and lower social roles difficulty than non-athletes. For concussion history, those reporting at least one prior concussion reported significantly more physical function problems and higher social support than those with no concussion history. For gender, women reported significantly higher fatigue and sleep disturbance than men sampled.

Table 2
Main Effect Results for MANOVA by Athlete Status, Concussion History, and Gender

Variable	Athletes			Non-Athletes			0 Concussions		≥ 1 Concussions		Female		Male					
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>			
1. Anxiety	522	5.82	.19	669	5.90	.26	1099	5.99	.08	92	5.73	.32	570	6.00	.27	621	5.72	.18
2. Physical Function Problems	522	4.59	.12	669	4.75	.16	1099	4.41**	.05	92	4.94**	.19	570	4.65	.16	621	4.70	.11
3. Depression	522	4.76	.17	669	5.02	.23	1099	5.13	.07	92	4.65	.28	570	4.93	.24	621	4.84	.16
4. Fatigue	522	7.63	.25	669	8.36	.34	1099	7.79	.10	92	8.20	.41	570	8.65**	.35	621	7.34**	.23
5. Sleep Disturbance	522	10.77	.12	669	10.88	.16	1099	10.63	.05	92	11.00	.19	570	11.04*	.17	621	10.60*	.11
6. Social Roles Difficulty	522	6.21*	.24	669	7.14*	.32	1099	6.61	.10	92	6.74	.39	570	6.95	.33	621	6.40	.22
7. Pain	522	5.45	.19	669	5.70	.26	1099	5.30	.08	92	5.85	.31	570	5.55	.27	621	5.59	.18
8. Social Support	522	25.88	.34	669	26.15	.47	1099	25.42*	.14	92	26.61*	.56	570	26.37	.48	621	25.65	.32
9. Perceived Stress	522	8.09	.21	669	8.15	.29	1099	8.38	.09	92	7.85	.35	570	8.22	.30	621	8.02	.20
10. Life Satisfaction	522	29.20**	.45	669	26.84**	.61	1099	27.86	.18	92	28.18	.73	570	28.17	.63	621	27.87	.42

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3
 Main Effect Results for MANOVA by Athlete Status, Career Ending Injury History, and Gender

Variable	Athletes		Non-Athletes		Injury		No Injury		Female		Male							
	n	M	SD	n	M	SD	n	M	SD	n	M	SD						
1. Anxiety	534	5.92	.17	425	6.26	.29	86	6.28	.32	873	5.91	.08	391	6.34	.27	568	5.85	.19
2. Physical Function Problems	534	4.81	.11	425	4.85	.19	86	5.28***	.21	873	4.38***	.06	391	4.66	.18	568	5.00	.13
3. Depression	534	5.04	.14	425	5.30	.25	86	5.33	.27	873	5.01	.07	391	5.06	.23	568	5.28	.17
4. Fatigue	534	7.89	.21	425	8.47	.36	86	8.67*	.41	873	7.69*	.11	391	8.87**	.34	568	7.48**	.25
5. Sleep Disturbance	534	10.66	.10	425	10.45	.18	86	10.48	.20	873	10.63	.05	391	10.73	.17	568	10.38	.12
6. Social Roles Difficulty	534	6.62	.21	425	7.76	.36	86	7.81**	.40	873	6.56**	.11	391	7.44	.34	568	6.94	.24
7. Pain	534	5.74	.17	425	5.99	.29	86	6.52***	.33	873	5.22***	.09	391	5.81	.27	568	5.93	.20
8. Social Support	534	26.12	.31	425	24.94	.53	86	25.46	.59	873	25.60	.15	391	25.61	.50	568	25.45	.36
9. Perceived Stress	534	8.25	.19	425	8.63	.32	86	8.56	.36	873	8.31	.09	391	8.56	.30	568	8.31	.22
10. Life Satisfaction	534	28.30	.39	425	27.39	.68	86	27.56	.76	873	28.13	.20	391	28.57	.63	568	27.12	.46

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$.

Results for Athlete Status, Career Ending Injury, and Gender

For the MANOVA model examining collegiate athlete status, career ending injury history, and gender, no three-way (Wilk's Lambda = 1.45, $p = .16$) or two-way interactions were significant (athlete status*career ending injury history; Wilk's Lambda = 0.55, $p = .86$; athlete status*gender; Wilk's Lambda = 1.49, $p = .14$; career ending injury history*gender; Wilk's Lambda = 1.60, $p = .10$) for this multivariate model. Main effects of career ending history (Wilk's Lambda = 2.21, $p = .016$, partial eta squared = .023) and gender (Wilk's Lambda = 3.40, $p < .001$, partial eta squared = .035), but not athlete status (Wilk's Lambda = 1.06, $p = .39$, partial eta squared = .011), were significant. Between-subjects follow-up tests showed these effects to be significant for career ending injury history for the outcome variables of physical function problems ($F = 16.98$, $p < .001$), fatigue ($F = 5.37$, $p = .021$), social roles difficulty ($F = 9.03$, $p = .003$), and pain ($F = 15.00$, $p < .001$), and for gender for the outcome variable of fatigue ($F = 10.92$, $p = .001$). For career ending injury history, those reporting a career ending injury reported significantly higher physical function problems, fatigue, social roles difficulty, and pain than those not reporting a career ending injury. For gender, men reported significantly higher pain than the women sampled. As the multivariate main effect was not significant, between-subject effects for athlete status were not probed.

Results for Athlete Status, Revenue Sport Status, and Gender

For the MANOVA model examining collegiate athlete status, revenue sport status, and gender, no three-way (Wilk's Lambda = 0.70, $p = .73$) or two-way interactions were significant (athlete status*revenue sport status; Wilk's Lambda = 1.57, $p = .11$; athlete status*gender; Wilk's Lambda = 0.92, $p = .52$; revenue sport status*gender; Wilk's Lambda = 0.67, $p = .75$) for this multivariate model. Main effects of revenue sport status (Wilk's Lambda = 3.72, $p < .001$, partial eta squared = .030) and gender (Wilk's Lambda = 3.49, $p < .001$, partial eta squared = .028), but not athlete status (Wilk's Lambda = 1.58, $p = .11$, partial eta squared = .013), were also significant for the multivariate model. Between-subjects follow-up tests showed these effects to be significant for revenue sport status for the outcome variables of physical function problems ($F = 29.23$, $p < .001$) and pain ($F = 13.09$, $p < .001$), and for gender for the outcome variables of anxiety ($F = 4.81$, $p = .028$), physical function problems ($F = 6.22$, $p = .013$), fatigue ($F = 16.60$, $p < .001$), and social roles difficulty ($F = 4.56$, $p = .033$). For revenue sport status, former revenue sport athletes reported significantly higher physical function problems and pain than those not participating in revenue sports. For gender, women significantly reported higher anxiety, physical function problems, fatigue, and social roles difficulty than men sampled. As the multivariate main effect was not significant, between-subject effects for athlete status were not probed.

Table 4
Main Effect Results for MANOVA by Athlete Status, Revenue Sport Status, and Gender

Variable	Athletes			Non-Athletes			Revenue			Non-Revenue			Female		Male			
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
1. Anxiety	536	6.08	.21	677	5.96	.16	216	6.03	.25	997	6.00	.08	579	6.30*	.24	634	5.73*	.11
2. Physical Function Problems	536	4.95	.12	677	4.62	.10	216	5.21***	.15	997	4.36***	.05	579	4.98*	.14	634	4.59*	.07
3. Depression	536	5.09	.18	677	5.14	.14	216	5.11	.22	997	5.13	.07	579	5.28	.21	634	4.96	.10
4. Fatigue	536	7.66	.26	677	8.11	.21	216	7.96	.32	997	7.80	.11	579	8.57***	.31	634	7.20***	.14
5. Sleep Disturbance	536	10.55	.12	677	10.62	.10	216	10.50	.15	997	10.66	.05	579	10.68	.14	634	10.49	.07
6. Social Roles Difficulty	536	6.45	.25	677	6.94	.20	216	6.76	.31	997	6.63	.10	579	7.04*	.29	634	6.35*	.14
7. Pain	536	5.84	.20	677	5.55	.16	216	6.16***	.25	997	5.23***	.08	579	5.84	.23	634	5.55	.11
8. Social Support	536	25.81	.36	677	25.46	.29	216	25.79	.44	997	25.48	.15	579	26.00	.42	634	25.28	.20
9. Perceived Stress	536	8.25	.23	677	8.41	.18	216	8.31	.27	997	8.35	.09	579	8.37	.26	634	8.29	.12
10. Life Satisfaction	536	27.97	.48	677	27.45	.38	216	27.39	.58	997	28.03	.19	579	28.07	.55	634	27.35	.26

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$.

Discussion

Largely supporting study hypotheses, results suggest that for nearly all study outcomes (with the exception of social roles difficulty and life satisfaction in models controlling for concussion history), former collegiate athletes reported no significant differences on HRQoL or psychological outcomes when compared to their sampled non-athlete peers. Broadly, this suggests the experience of collegiate athletics on those sampled was similar or better than that of their non-athlete peers. Importantly, sport environments are not a homogeneous exposure and athlete experiences through sport—rather than sport as a unitary exposure—explained variability between athletes as well as in comparison to their non-athlete peers. Accordingly, when we explored further we found less positive HRQoL outcomes among athletes endorsing self-report concussion, career ending injury, and revenue sport participation histories. These findings align with previous studies finding positive health and well-being effects (i.e., not significantly different or better than comparison positions) for former collegiate athletes (e.g., Houston et al., 2016, Kerr et al., 2014) and suggest these variables as important effect modifiers. Study strengths include a relatively large cross-sectional sample including graduates in cohorts 10, 20, 30, and 40 years post-graduation. Bolstered by these strengths, study findings extend the Health through Sport Conceptual Model (Eime et al., 2013) to a new context of collegiate athletics.

Extending previous research, HRQoL and psychosocial markers of social roles difficulty and life satisfaction were the only outcomes which differed significantly across athlete and non-athlete groups and only in one of the three multivariate models examined. Moreover, former collegiate athletes and non-athletes sampled did not differ significantly on any other health and well-being markers. Further, former athletes reported more positive or comparable levels on all variables assessed relative to their former college student comparison group. These findings were somewhat in contrast to a previous study by Simon and Docherty (2014), which found nearly opposite findings relative to athletes versus non-athletes sampled. It is possible study differences could have resulted from variances in sampling procedures or sample populations. Specifically, Simon and Docherty (2014) included an athlete comparison group of students who were active in recreational activity, club, or intramural sport while the current study included a random sample of all university graduates. Differences in university and athletics department culture and resources between the two one-school samples could also play a factor. Additionally, unique environmental exposures during sport participation and/or post-career psychosocial experiences largely exclusive to individual former athletes could also contribute to study finding differences. Previous work suggests current collegiate athletes' social experiences are influenced by athletic identity development (Chen et al., 2010), a concept that may resonate beyond career completion, explaining potential differences in study findings from previous work. Accordingly, future research in this area should examine athletic identity as a potential mechanism for HRQoL and psychosocial well-being differences among former athletes.

Current theory on athlete retirement or transition suggests the plausibility of current study findings given athletes' overall psychological response to the social environment following career termination (Taylor & Ogilvie, 1994). Yet, it is also possible that these findings reflect self-selection into sport by youth athletes with better psychosocial functioning, or differential attrition at younger ages by youth with less optimal psychosocial functioning (Eime et al., 2013). Future work is needed which tests these dueling assertions for adaptive versus maladaptive lifespan outcomes for former collegiate athletes via the use of prospective study designs examining former athlete psychosocial experience before, during, and after the transition from college sport. Theoretical integration of the Health through Sport Conceptual Model and theory on athlete transition represents a fruitful lens to inform such future research efforts. Altogether, continued longitudinal work in this area is needed to probe study findings across additional former athlete samples, with a focus on determining how sport exposure influences psychosocial health and well-being outcomes over time as well as examining the complex interplay of factors which underpin differences in former collegiate athletes from their non-athlete peers. Such future work may benefit from examining potentially important moderators of the association of collegiate athlete status with HRQoL variables. Based on the main effect findings of the current study, moderators may include athlete injury histories and/or gender. Importantly, study findings are limited by our binary assessment of gender. Future work may benefit from probing gender expression beyond binary categories.

Despite some positive associations with sport participation revealed in main effects findings, unique physical, psychological, and social deficits were revealed relative to some exploratory demographic variables. Specifically, those sampled who reported a history of concussion endorsed more physical function problems as well as higher social support (possibly from requirements to reach out for medical services or interpersonal support to address challenges in activities of daily living) than their sampled non-injury counterparts. Those who reported a career ending injury reported more physical function problems, fatigue, social roles difficulty, and pain than their peers not endorsing this experience. Additionally, revenue sport athletes (i.e., basketball and football) reported more physical function problems and pain than those not exposed to this highly competitive and commercial environment. Finally, women in the sample reported worse HRQoL (as exemplified by higher levels of anxiety, physical function problems, fatigue, and social roles difficulty) than men. Based on study results, it appears that these key sport-based injury experiences and environmental exposures have important implications for the HRQoL outcomes of former collegiate athletes. Such findings shine light on the idea that the exposures of college sport, to the extent they result in serious injuries, could not only blunt potential benefits of this experience, but may also precipitate negative health and well-being in later-life. Findings also indicate the need for additional targeted research to understand the experiences of former female and revenue sport athletes, given evidence of heightened psychosocial deficits post-career relative to their peers. Such work could be supplemented by more intensive injury and participation histories as well as qualitative methods to further probe how these negative sport experiences may lead to lifespan HRQoL outcomes.

Study findings have implications for sport psychology consultants and/or practitioners working with former collegiate athletes as they transition from sport to their post-athletic careers. Despite the potential for positive HRQoL and psychosocial outcomes (or no difference from non-athlete populations) following collegiate sport participation, it is clear that adaptive post-sport experiences vary across individual athlete cases and that concussion, injury, revenue sport status, and/or gender identity may mitigate these benefits for some former collegiate athletes. Therefore, targeted, psychoeducational intervention efforts may help athletes address social roles in the transition from sport and more effectively manage mental and physical challenges resulting from sport injury. A focus on healthy ways to process athletic identity may represent a high impact practice for practitioners (e.g., student-athlete development staff, sport administrators, sport psychologists) to consider in their respective duties. This supports a recent medical position statement calling for the need to support the detection and management of athlete mental health at all levels of participation including during transition (Chang et al., 2019).

These results challenge us to think critically about how sport exposures can be changed to limit the potential for unhealthy post-collegiate practices. Specifically, injury reduction efforts at a policy or institutional level and efforts to help athletes retain or construct more well-rounded identities while in college may be helpful upstream approaches to prevention. Based on study findings, such interventions may have unique benefits when specifically designed for female athletes, revenue sport athletes, athletes experiencing a career ending injury, and/or athletes with concussion histories. This may be particularly useful because, though strong guidelines exist to support college athlete mental health during their careers (NCAA, 2016a), few collegiate athletes have the same access to athletic department resources to support their physical (e.g., nutrition, strength training, medical services), psychological (e.g., psychological services) and social (e.g., supportive social network) health and functioning following their collegiate playing careers.

Limitations

Despite novel contributions of the current cross-sectional study to the former athlete literature, there are clear limitations to its generalizability and follow-up; prospective research is needed to validate and extend study conclusions. While the sample was appropriate for specific study research questions, it poses a limitation on the ability to generalize these findings to a broader sample of athletes and non-athletes from Division I Power Five or other divisions within intercollegiate athletics. Additionally, drawing participants from a population of graduates delimits athletes and non-athletes who did not graduate – a vulnerable population who may have chosen to discontinue school because of injury, academic or psychosocial issues. For that reason, future research should include non-graduates in order to uncover potential sub-population trends. Moreover, given potential racial disparities in the mental health experiences of African-American student-athletes (Wilkerson et al., 2020), future study designs would benefit from comparing the experiences of former athletes by race/ethnicity.

For study variables that were significantly different across former athlete versus non-athletes sampled, the more positive response was endorsed by the former athlete sample suggesting potential benefits of the collegiate athlete experience on lifespan health and well-being. However, caution is also warranted in interpreting these findings; as suggested by the non-significant effects found in other multivariate models investigated, the practical significance of the univariate differences across study groups (i.e., athletes versus non-athletes) and associated measures of model effect size were moderate at best. Finally, we think that the cohort-based design of the current study is appropriate for our research questions but also represents an important delimitation of the current work. Specifically, the present study design prevents causal inferences on whether results are attributable to athletics participation or whether the performance-driven environment of collegiate athletics may attract and/or select individuals with healthier life trajectories (e.g., healthy worker effect; Goodger et al., 2007). Consequently, prospective research designs would afford opportunities to build on the current findings and make stronger inferences about former collegiate athlete health and well-being across the post-sport transition. Such work would be dually beneficial as it would also minimize recall biases associated with retrospective, self-report designs.

Conclusions

This study adds to the knowledge base on former collegiate athlete health and well-being by indicating some positive post-athletic career HRQoL and psychosocial outcomes of former NCAA Division I Power Five collegiate athletes compared to their non-athlete student peers. Results also extend the Health through Sport Conceptual Model to a new context of collegiate athletics. That said, perhaps the most important takeaway from this study was further substantiation of the fact that sport is not a homogeneous exposure. While overall there may be some positive correlates of participation such as lower levels of social roles difficulty and greater levels of life satisfaction, different sport-related exposures may variably impact the association between sport participation and outcomes. Namely, concussion and career ending injury histories, revenue sport participation status, and gender identity appear to be important sport environmental factors with potential to mitigate positive (for former athletes) findings.

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