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original research

Postinjury Anxiety and Social Support Among Collegiate Athletes: A Comparison Between Orthopaedic Injuries and Concussions

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Context: When an athlete is injured, the primary focus of the sports medicine team is to treat the physical effects of the injury. However, many injured athletes experience negative psychological responses, including anxiety, regarding their injury.

Objective: To compare the anxiety and social support of athletes with concussions and a matched group of athletes with orthopaedic injuries.

Design: Cross-sectional study.

Setting: Athletic training room.

Patients or Other Participants: A total of 525 injuries among athletes from 2 Big Ten universities were observed. Of these, 63 concussion injuries were matched with 63 orthopaedic injuries for the athlete's sex, sport, and time loss due to injury.

Main Outcome Measure(s): Clinical measures included the State-Trait Anxiety Inventory (which measures both state and trait anxiety) and the modified 6-item Social Support Questionnaire.

Results: The group with concussions relied on their family for social support 89% of the time, followed by friends (78%), teammates (65%), athletic trainers (48%), coaches (47%), and physicians (35%). The group with orthopaedic injuries relied on their family for social support 87% of the time, followed by friends (84%), teammates (65%), athletic trainers (57%), coaches (51%), and physicians (36%). We found no differences for the State-Trait Anxiety Inventory ($t = -1.38$, $P = .193$) between the concussed and orthopaedic-injury groups. Social Support Questionnaire scores were significant predictors for postinjury state anxiety. Specifically, increased scores were associated with decreased postinjury state anxiety ($\beta = -4.21$, $P = .0001$).

Conclusions: Both the concussed athletes and those with orthopaedic injuries experienced similar state and trait anxiety and relied on similar sources of social support postinjury. However, athletes with orthopaedic injuries reported greater satisfaction with support from all sources compared with concussed athletes. In contrast, concussed athletes showed more significant predictor models of social support on state anxiety at return to play.

Key Words: psychology, state anxiety, trait anxiety, return to play

Key Points

- Athletes with concussions or orthopaedic injuries showed similar levels of state and trait anxiety.
- Sources of social support were similar for athletes with concussions and orthopaedic injuries.
- Compared with concussed athletes, athletes with orthopaedic injuries reported more satisfaction with social support from all sources.
- Compared with athletes who sustained orthopaedic injuries, concussed athletes showed more significant predictor models of social support on state anxiety at return to play. These differences may reflect the nature of injury, suggesting that additional research is needed to understand the relationship of social-support satisfaction and postinjury anxiety by injury type.

With approximately 444 000 National Collegiate Athletic Association athletes competing annually, athletic injuries are likely to occur. According to the association's injury-surveillance system, about 12 500 athletic injuries are sustained each year.[1] When an athlete is injured, the primary focus of the sports medicine team is to treat the physical effects of the injury. However, many injured athletes experience negative psychological responses, including anxiety.[2,3] Anxiety in athletes with orthopaedic injuries may result from the cognitive appraisal of the injury rather than from the injury itself.[4,5] In contrast, anxiety in athletes with concussions may result from both cognitive appraisal and physiologic sequelae.[6] Social support has been shown to mediate both the physical and psychological effects of athletic injury.[7] Yet the relationship between anxiety and social support in concussed athletes compared with athletes with orthopaedic injuries is unknown.

Injured athletes may exhibit trait anxiety related to perceived loss of athleticism, lack of social support, pain, and fear of reinjury.[3,8,9] Injured athletes with high levels of trait anxiety may also experience high levels of state anxiety postinjury.[10] Factors such as injury severity and time loss from practice or competition can influence whether or not athletes experience high or low levels of trait anxiety.[11] Although anxiety after orthopaedic injuries

has received attention in the literature, considerably less research has been conducted on anxiety in concussed athletes.

Concussion is often referred to as the "invisible injury."[6] A concussed athlete who is experiencing lingering headaches and memory difficulties does not outwardly look any different from uninjured peers. Furthermore, it may be difficult to distinguish anxiety as a symptom of concussion from anxiety as a psychological effect.[6,12]

In a recent study,[13] concussed athletes did not experience as much emotional disturbance as athletes with anterior cruciate ligament injuries. Although these authors did not exclusively examine anxiety symptoms of concussed athletes versus those with orthopaedic injuries, emotional disturbances do seem to differ between the groups, which provides a framework for future studies.

When working with injured athletes who are experiencing anxiety, it is important to also consider coping mechanisms that may facilitate recovery. The integrated model of psychological response to sport injury[5] suggests that coping resources may be salient factors in an athlete's postinjury psychological state. Seriously injured athletes will seek social support as a coping mechanism.[11,14,15] Common types of social support that are useful for injured athletes include emotional support (eg, empathy), tangible support (eg, practical assistance), and informational support (eg, problem solving).[11,15,16]

The social-support network for injured athletes often consists of family and friends, health professionals, coaches, teammates, and other injured athletes.[11,15,17,18] Flint[18] described how modeling of successful recovery by fellow or formerly injured athletes may be a helpful form of support and confidence for currently injured athletes. This modeling may provide currently injured athletes with information that aids their ability to successfully manage the recovery process.

Literature within the sport-injury domain has shown that athletes may turn to coaches and health professionals (eg, athletic trainers [ATs]) for emotional support.[7,16,17,19] Injured athletes may view ATs as an important source of emotional support given the amount of time injured athletes spend rehabilitating their injuries in the athletic training room.[7,17,19] However, this may be different for athletes with concussions. Concussions often lack any outward physical signs of a sport injury (eg, braces, crutches). Additionally, athletes with concussions may spend less time in the athletic training room than athletes with orthopaedic injuries because concussion symptoms are usually managed by the athlete, with guidance from the ATs. Thus, athletes in the athletic training room may receive a more viable sense of social support.

To our knowledge, no authors have examined differences in anxiety and social support between athletes who have sustained a concussion versus an orthopaedic injury. Understanding how anxiety and social support compare between athletes with concussions and those with orthopaedic injuries is important when the clinician attempts to provide a holistic approach to rehabilitation. Persons within an athlete's social-support network who are more aware of their roles as social-support providers can help the athlete manage postinjury anxiety. Therefore, our objective was to compare the anxiety and social support of athletes with concussions versus a matched group of athletes with orthopaedic injuries.

METHODS

Study Design

We used a pretest–posttest research design to determine differences in anxiety levels and social support in matched samples of athletes with concussions or orthopaedic injuries. The independent variable was injury group (concussed versus orthopaedic), and the dependent variables were state and trait anxiety and number of sources of and satisfaction with social support.

Study Population

A total of 525 injuries among athletes from 2 Big Ten universities were observed during the study period from January 2008 through December 2010. Of these, 63 concussion injuries were matched with 63 orthopaedic injuries for the athlete's sex, sport, and time loss due to injury. Lower body injuries accounted for 43 (68.3%) and upper body injuries for 20 (31.7%) of the orthopaedic injuries. Athletes from institution A sustained 44 concussions and 53 orthopaedic injuries, and athletes from institution B sustained 19 concussions and 10 orthopaedic injuries.

Study Protocol

Before the study, permission was obtained from the athletic director, sports medicine director, and coaches at each university. Eligible athletes older than 18 years were invited to participate and enrolled in the study after they provided signed informed consent. Athletes completed a baseline survey that included demographics, injury history, and trait anxiety. Injured athletes were identified using the Sport Injury Monitoring System, an ongoing injury-surveillance system used by Big Ten universities.[20] Athletes who incurred a concussion or orthopaedic injury that met the case definitions for this study were administered an injury follow-up survey within 1 week of injury. Completed follow-up surveys were collected in person in the athletic training room before or after treatment; injured athletes were asked about state anxiety symptoms and sources of and satisfaction with social support received during their recovery. Preinjury and postinjury surveys took approximately 5 to 10 minutes each to complete. The study was approved by each participating university's institutional review board.

Case Definitions

Concussion was operationally defined as "a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces."[21] Only athletes who presented with on-field signs and symptoms of concussion, as determined by the AT or team physician, were included in the study. All patients with orthopaedic injuries and concussions included in this study met the following criteria: (1) clinical signs of injury were determined by the team AT or team physician and (2) the player was

Table 1. Modified 6-Item Social Support Questionnaire[a]

1. During your recovery, whom could you really count on to be dependable when you need help?
2. During your recovery, whom could you really count on to help you feel more relaxed when you are under pressure or tense?
3. During your recovery, who accepted you totally, including both your worst and your best points?
4. During your recovery, whom could you really count on to care about you, regardless of what is happening to you?
5. During your recovery, whom could you really count on to help you feel better when you are feeling generally down in the dumps?
6. During your recovery, whom could you count on to console you when you are very upset?

[a] Questions are phrased as in the instrument.

unable to return to practice or game the same day or was absent from 1 or more days of practice or competition.[20]

Measures

Anxiety was measured by the State-Trait Anxiety Inventory (STAI), a self-reported, 40-item questionnaire that includes separate measures of state anxiety (20 items) and trait anxiety (20 items).[22] *State anxiety* describes how a person feels in the current moment about various situations that may influence anxiety levels; a score of 1 indicates *not at all* and 4 indicates *very much so*. In contrast, *trait anxiety* describes how a person feels in general toward various situations that may influence anxiety levels; a score of 1 indicates *almost never* and 4 indicates *almost always*. For each scale, scores range from 20 to 80; higher scores reflect a greater level of anxiety. For both tests of the STAI, excellent internal consistency ($\alpha = .86$ to .95) and good 20-day test-retest reliability in college students were reported (state scale, $r = 0.76$; trait scale, $r = 0.86$).[23] In addition, the STAI has been extensively used in sport contexts.[24–29]

Perceived social support was measured using the modified 6-item Social Support Questionnaire[30] (Table 1). Each of the 6 social-support questions contains 2 parts. The first part measures the number of sources of social support in various situations from available people, including family, friends, teammates, coaches, ATs, and physicians. The second part assesses the athlete's satisfaction with the social support received; a score of 1 indicates *very dissatisfied* and 6 indicates *very satisfied*. The Social Support Questionnaire has excellent internal reliability, ranging from 0.93 to 0.96.[31]

Statistical Analysis

We analyzed the data using descriptive and inferential statistics. An independent *t* test was conducted to determine if differences exist for time loss due to injury between the concussed and orthopaedic-injury groups. To determine the percentage of athletes' total social support from various people, scores on the 6 questions were totaled for each category of person. We performed a series of between-groups (concussed, orthopaedic injury) multiple analyses of variance with Bonferroni corrections on each of the 6 social-support questions. Dependent variables for the social-support analyses of variance were the 6 people-category satisfaction scores. Independent *t* tests were performed for state and trait anxiety between the concussed and orthopaedic-injury groups. Multiple regression was calculated to model the group effect on the outcome of state anxiety, with baseline trait anxiety and social-support satisfaction summary score of support from family, friends, teammates, ATs, coaches, and physicians as a covariate. We analyzed all data using SPSS (version 20.0; IBM Corporation, Armonk, NY). Statistical significance for all analyses was set a priori at $P < .05$.

RESULTS

Demographic Data

A total of 126 athletes (92 men, 34 women) were included in the study analysis. The athletes ranged in age from 18 to 24 years (mean = 22.69 ± 1.75 years; Table 2). Participants were active in football (n = 70, 55.6%), men's wrestling (n = 18, 14.3%,), softball (n = 8, 6.3%), women's soccer (n = 8, 6.3%), women's volleyball (n = 8, 6.3%), women's basketball (n = 6, 4.8%), field hockey (n = 4, 3.2%), baseball (n = 2, 1.6%), and men's basketball (n = 2, 1.6%). They had 1.56 ± 1.20 years of collegiate playing experience. Slightly more injuries were observed among upper-class athletes: 22.2% in freshmen (n = 28), 26.2% in sophomores (n = 33), 24.6% in juniors (n = 31), and 27.0% in seniors or fifth-year seniors (n = 34).

Days missed were not different between the concussed (mean = 8.87 ± 13.67 days) and orthopaedic-injury (mean = 8.90 ± 13.31 days) groups ($t_{125} = -0.13$, $P = .989$).

Social Support Questionnaire

Both the concussed and orthopaedic-injury groups used similar social-support resources (Table 3). The concussed group relied on family for social support 89% of the time, followed by friends (78%), teammates (65%), ATs (48%), coaches (47%), and physicians (35%). The orthopaedic-injury group relied on family for social support 87% of the time, followed by friends (84%), teammates (65%), ATs (57%), coaches (51%), and physicians (36%).

Results for the first question, "During your recovery, whom could you really count on to be dependable when you need [sic] help?" did not reveal any differences between the concussed and orthopaedic-injury groups for the 6 categories of people. The second question, "During your recovery, whom could you really count on to help you feel more relaxed when you are [sic] under pressure or tense?" revealed differences between the concussed and

Table 2. Demographic Information (Mean ± SD)

	Group	
Variable	Concussion (n = 63)	Orthopaedic Injuries (n = 63)
Age, y	22.54 ± 1.73	22.84 ± 1.77
Height, in (cm)	71.75 ± 4.79 (182.25 ± 12.17)	71.88 ± 3.79 (182.58 ± 9.63)
Weight, lb (kg)	207.60 ± 53.9 (94.17 ± 24.45)	197.80 ± 43.90 (89.72 ± 19.91)

Table 3. Social Support Questionnaire Satisfaction Scores and Analysis

Social Support Questionnaire Item[a]	Group, Mean ± SD			
	Concussion (n = 63)	Orthopaedic Injuries (n = 63)	*F* Value	*P* Value
1. During your recovery, whom could you really count on to be dependable when you need help?				
Family	5.35 ± 1.19	5.76 ± 0.52	2.52	.12
Friend	5.38 ± 0.94	5.56 ± 0.82	0.50	.48
Teammate	5.00 ± 1.23	5.52 ± 0.71	3.36	.07
Athletic trainer	5.15 ± 1.31	5.60 ± 0.86	2.09	.15
Coach	4.81 ± 1.36	4.92 ± 1.44	0.08	.78
Physician	5.08 ± 1.41	5.44 ± 0.92	1.18	.28
2. During your recovery, whom could you really count on to help you feel more relaxed when you are under pressure or tense?				
Family	5.37 ± 0.83	5.68 ± 0.35	6.49	.015
Friend	5.16 ± 1.21	5.68 ± 0.72	2.93	.095
Teammate	4.68 ± 1.46	5.55 ± 0.86	5.51	.248
Athletic trainer	4.84 ± 1.30	5.59 ± 0.73	5.33	.026
Coach	4.79 ± 1.40	4.82 ± 1.53	0.004	.951
Physician	4.74 ± 1.63	5.23 ± 1.02	1.38	.248
3. During your recovery, who accepted you totally, including both your worst and your best points?				
Family	5.67 ± 0.63	5.92 ± 0.28	1.17	.28
Friend	5.67 ± 0.73	5.79 ± 0.42	0.52	.48
Teammate	5.19 ± 1.12	5.75 ± 0.68	4.22	.046
Athletic trainer	5.38 ± 0.97	5.75 ± 0.67	2.23	.14
Coach	5.00 ± 1.27	5.38 ± 1.28	0.97	.33
Physician	5.24 ± 1.27	5.67 ± 0.76	1.96	.17
4. During your recovery, whom could you really count on to care about you, regardless of what is happening to you?				
Family	5.64 ± 0.95	5.96 ± 0.20	2.61	.11
Friend	5.55 ± 0.91	5.79 ± 0.67	1.17	.29
Teammate	5.14 ± 1.25	5.63 ± 0.77	2.61	.11
Athletic trainer	5.23 ± 1.19	5.62 ± 0.77	1.84	.18
Coach	4.91 ± 1.34	5.25 ± 1.29	0.77	.38
Physician	5.00 ± 1.38	5.54 ± 0.83	2.65	.11
5. During your recovery, whom could you really count on to help you feel better when you are feeling generally down in the dumps?				
Family	5.63 ± 0.83	5.83 ± 0.38	0.88	.35
Friend	5.68 ± 0.67	5.61 ± 0.61	0.12	.73
Teammate	5.26 ± 1.33	5.56 ± 0.78	0.66	.42
Athletic trainer	5.26 ± 1.09	5.39 ± 0.98	0.13	.72
Coach	4.79 ± 1.65	5.06 ± 1.35	0.29	.59
Physician	5.11 ± 1.41	5.44 ± 0.92	0.74	.39
6. During your recovery, whom could you count on to console you when you are very upset?				
Family	5.59 ±0.79	5.82 ± 0.39	1.19	.28
Friend	5.53 ± 0.94	5.65 ± 0.70	0.17	.68
Teammate	4.94 ± 1.39	5.53 ± 0.80	2.29	.14
Athletic trainer	5.06 ± 1.14	5.47 ± 0.87	1.39	.25
Coach	4.53 ± 1.59	4.88 ± 1.41	0.47	.49
Physician	4.76 ± 1.48	5.41 ± 1.00	2.23	.15

[a] Questions are phrased as in the instrument.

orthopaedic-injury groups for family ($P = .015$), ATs ($P = .026$), and teammates ($P = .024$). Specifically, the orthopaedic-injury group reported greater mean satisfaction than the concussed group for all 3 categories.

Answers to the third question, "During your recovery, who accepted you totally, including both your worst and best points?" indicated between-groups differences only for teammates, with the orthopaedic-injury group reporting more satisfaction than the concussed group ($P = .046$). The remaining 3 questions did not reveal any differences between the groups.

State-Trait Anxiety Inventory

We found no differences for trait anxiety between the concussed and orthopaedic-injury groups ($t_{1,124} = -1.38$, P

Table 4. State-Trait Anxiety Inventory Scores for Athletes with Concussions (n = 63) or Orthopaedic Injuries (n = 63)

Anxiety Inventory Scale[a]	Group Score, Mean ± SD	
	Concussions	Orthopaedic Injuries
Trait	47.27 ± 5.37	46.02 ± 5.28
State	31.42 ± 10.06	30.97 ± 10.24

[a] Scores range from 20 to 80; higher scores reflect greater levels of anxiety.

= .193) (Table 4). Similarly, we observed no differences between the groups for state anxiety ($t = 1.38$, $P = .193$).

Injury Group, Social-Support Satisfaction, and State Anxiety

We used multiple regression to assess the effect of injury group (concussion versus orthopaedic injury) on postinjury state anxiety, controlling for baseline trait anxiety and satisfaction with social support from family, friends, coaches, ATs, teammates, physicians, and others. No differences were evident in state anxiety between athletes in the concussed and orthopaedic-injury groups ($\beta = 1.37$, $P = .4344$; Table 5). In contrast, satisfaction with social support was a better predictor of state anxiety at return to play in the concussed group ($\beta = -4.26$, $P = .0001$).

DISCUSSION

Concussed athletes and athletes with orthopaedic injuries had similar levels of state and trait anxiety, and both groups had more trait anxiety than state anxiety. Both sets of athletes relied on similar sources of social support after their injuries: family, followed by friends, teammates, and ATs. However, when asked which people they could count on to help them relax when they felt pressured or tense, the orthopaedic-injury group reported greater satisfaction with family members, teammates, and ATs than did the concussed group. When asked who provided unconditional acceptance, the orthopaedic-injury group reported greater satisfaction with teammates than did the concussed group. Interestingly, regression analyses showed a stronger prediction model of social-support satisfaction and state anxiety for the concussed group than for athletes with orthopaedic injuries.

Overall, we found no differences between the concussed and orthopaedic-injury groups for either state or trait anxiety. These findings are in contrast to those of previous researchers[13] who noted different emotional responses in athletes with concussions versus athletes with anterior cruciate ligament injuries. One possible explanation is instrumentation: Mainwaring et al[13] used the Profile of Mood State, whereas we used the STAI.[22] Another explanation may be that we matched injuries with time loss only up to 1 week because of sampling limitations. This may be relevant considering that athletes with more severe injuries and longer recovery periods are more likely to experience a more negative mood state (ie, state anxiety)[32] and is an important consideration for future studies.

Table 5. Effect of Injury Group and Social Support on Postinjury Anxiety (n = 126)

	Parameter Estimate[a]	Standard Error	*P* Value
Injury group (concussion versus orthopaedic injury)	1.37	1.74	.4344
Social Support Satisfaction score[b]	–4.26	1.06	.0001

[a] Analysis adjusted for baseline trait anxiety.
[b] Value for the Social Support Satisfaction score was increased by 1.

Both the concussed and orthopaedic-injury groups had higher levels of trait anxiety than state anxiety. A contributing factor may be study design: we measured trait anxiety at baseline before the start of the sport season and state anxiety after the athlete recovered from the injury. Moreover, approximately 50% of athletes were freshmen at baseline, which may have contributed to the higher levels of trait anxiety. Another possible explanation for injured athletes having less state anxiety may be their satisfaction with their social support during the recovery period.

Regarding social support, our results suggest that athletes with concussions or orthopaedic injuries relied on similar sources of social support. Specifically, both injury groups relied on family, friends, and teammates for social support, which is consistent with the previous literature.[11,15,16] Other authors[7,17,33–35] have shown that injured athletes may also rely on support from coaches, ATs, and physicians.

Although both groups showed similarities in sources of social support, we found that the concussed and orthopaedic-injury groups were different in their satisfaction with social support and satisfaction predictors for state anxiety. The orthopaedic-injury group showed greater satisfaction with support from all sources than the concussed group. This may be because athletes with orthopaedic injuries have physical representations of their injuries as opposed to the relatively invisible nature of concussions.[6] The physical appearance of a sport injury may naturally attract more attention or support from those in the social-support network. In addition, athletes with orthopaedic injuries may require more tangible assistance (eg, carrying books) and rehabilitation treatment as opposed to athletes with concussions. These factors may result in more social support overall and thus a potentially greater level of satisfaction with the social support they receive.

Our findings also showed that increased social support was associated with decreased state anxiety, which is consistent with previous results. Positive social support may serve as a protective factor to reduce distress after an athletic injury and improve motivation during rehabilitation. Therefore, as we observed, injured athletes with greater social-support satisfaction may experience reduced anxiety, regardless of the type of injury sustained.

The relationship between social-support satisfaction and state anxiety appears to be important. An injured athlete's perception of the support he or she receives may significantly affect postinjury state anxiety. Perceptions of social support have a more significant effect than actual

support provided in populations with health-related concerns.[36] Additional research is needed to understand the differences in this relationship between injured athletes with concussions and orthopaedic injuries. Furthermore, future authors should explore the perceptions of social-support providers in assisting an athlete with a concussion versus an orthopaedic injury.

Limitations

This study had several limitations. Our baseline and injury follow-up surveys relied on each athlete's self-report of anxiety and social support. In addition, we were limited by a small sample size, and most of the sample comprised male football players. Another limitation is that only minor injuries were included in analysis for matching purposes. Thus, the results may reflect only the state anxiety experienced by athletes with less severe injuries.

CONCLUSIONS

Both concussed athletes and those with orthopaedic injuries experienced similar state and trait anxiety and relied on similar sources of social support postinjury. However, athletes with orthopaedic injuries reported greater satisfaction with support from all sources compared with concussed athletes. In contrast, satisfaction with social support was a better predictor of state anxiety at return to play in the concussed group. These differences may reflect the nature of injury, suggesting that additional research is needed to understand the relationship of social-support satisfaction on postinjury anxiety by injury type. Future researchers should also explore the relationship in other athlete populations and among athletes with more severe injuries and more time loss from sport participation.

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