Cognitive Appraisals, Stress, and Coping: Preinjury and Postinjury Factors Influencing Psychological Adjustment to Sport Injury

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Objectives: To examine the relationships among preinjury and postinjury stress, coping, personality, mood state, and rehabilitation adherence. Design: Participants completed measures of preinjury life-event stress, social-support satisfaction, dispositional optimism, and mood state. Injured athletes completed postinjury measures of mood state, coping methods, and cognitive appraisals of stress and coping ability 1, 4, 7, 14, and 28 days postinjury. Their athletic trainer completed a measure of rehabilitation adherence on those days. Participants: 84 college football players including 19 injured athletes. Results: Negative-life-event stress predicted postinjury mood disturbance, which was positively related with appraisals. Appraisals were related to greater avoidance coping at day 7, greater active behavioral coping at days 14 and 28, and less active cognitive coping at day 28. Active behavioral coping was associated with greater mood disturbance, and active cognitive coping and avoidance coping were inversely related. Conclusions: Results support cognitive-appraisal models of sport injury and dynamic views of coping with injury. Key Words: life-event stress, social-support satisfaction, dispositional optimism, mood state

According to the Wiese-Bjornstal et al.1 integrated model of psychological responses to sport injury, athletes experience a variety of cognitive, emotional, and behavioral responses as they cope with the stress of incurring an injury. Wiese-Bjornstal et al suggest that some of the same variables found to predispose athletes to sport injury (ie, history of stressors, coping resources, personality characteristics; for a review, see Williams and Andersen2) continue to exert their effects postinjury by influencing athletes’ cognitive, emotional, and behavioral responses and their resulting recovery outcomes. In this model, cognitive appraisals and emotional and behavioral responses to the injury reciprocally influence each other.

A few studies3–5 have integrated the antecedents and consequences of sport injury to obtain a more complete picture of the sport-injury process6;
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however, this picture is far from complete. In one such study, Petrie et al examined the influences of life-event stress, social support, competitive trait anxiety, and athletic identity on female college-level athletes’ mood states 3 days postinjury. After controlling for injury duration, negative-life-event stress was found to be the best predictor of emotional disturbance after injury. This finding is consistent with the strong relationships found between negative-life-event stress and injury occurrence in a variety of sport-injury-prediction studies. Furthermore, a positive relationship was found between competitive trait anxiety and total mood disturbance, and inverse relationships were found between social support and depression and anger. In addition to the preinjury factors examined by Petrie et al and hypothesized in Andersen and Williams’ stress-injury model, other personal (eg, dispositional optimism, explanatory style) and situational (eg, injury severity, level of sport participation) factors have been related to postinjury mood response (for a review, see Brewer).

Although the integrated model of Wiese-Bjornstal et al suggests that the influences of personal and situational factors on emotional responses are mediated by cognitive processes, very few studies have examined this mediational pathway. Moreover, little is known about injured athletes’ appraisals of the initial stress they experience associated with their injuries or about their appraisals of their abilities to cope. In the integrated model, the appraisal process plays a central role in determining athletes’ psychological reactions. Consistent with Lazarus and Folkman’s transactional model of stress and coping, the primary appraisal “concerns mainly the discrimination between transactions in which there is some personal investment and those that are irrelevant for the person’s well-being.” During the secondary appraisal process, the individual “takes into account which coping options are available, the likelihood that a given coping option will accomplish what it is supposed to, and the likelihood that one can apply a particular strategy or set of strategies effectively.” Individuals experience stress if they perceive that the demands of a personally significant event outweigh their abilities to cope with them. Cognitive and behavioral strategies are then invoked to master, reduce, or tolerate the demands associated with the stressful event.

Empirical examinations of appraisals, stress, and coping in the context of the Wiese-Bjornstal et al model are relatively limited. Recent qualitative and quantitative studies have indicated that athletes perceive sport injury to be stressful and that they use a variety of cognitive, emotional, and behavioral coping methods to deal with that stress. For example, research with injured skiers has shown that athletes cope by learning about and assessing the extent of their injuries; adopting aggressive rehabilitation approaches and working hard to achieve rehabilitation goals; managing their emotions and thoughts; seeking social resources, as well as avoiding others; distracting themselves; taking breaks from rehabilitation; and learning from their injury experiences.
Consistent with the findings of qualitative studies, quantitative investigations have shown that athletes do not take unidimensional approaches to coping with their injuries but, rather, employ a wide variety of strategies to deal with their injuries. Furthermore, these studies have shown that athletes use active behavioral methods of coping more frequently than other forms of coping. For example, Udry found that instrumental coping (ie, attempts to alleviate stress by learning more about the injury or seeking the advice of health-care providers) was the most-used coping strategy across all rehabilitative time periods, whereas palliative coping (ie, self-help activities and responses used to soothe or alleviate the unpleasantness of the injury) was the least-used strategy. Furthermore, active coping strategies have been shown to have an effect on injured athletes’ recovery time, being associated with greater rehabilitation adherence and predicting faster recovery times one third of the way through rehabilitation.

Although the investigation of coping methods has received recent attention, examinations of injured athletes’ cognitive appraisals of their coping abilities has been examined in only 1 sport-injury study. Daly et al concurrently examined athletes’ cognitive appraisals of their abilities to cope with their injuries (ie, secondary appraisal), their mood states, and the extent to which they adhered to rehabilitation. Negative cognitive appraisals were associated with greater mood disturbance, and mood disturbance was inversely related to attendance at rehabilitation sessions. Mood disturbance was not, however, significantly related to the physical therapists’ or athletic trainers’ assessments of the injured athletes’ adherence during rehabilitation sessions. Daly et al did not measure primary appraisals of the injury or methods of coping; therefore, the relationships between the injured athletes’ appraisals of stress and coping and the actual methods they used to cope with their injuries are unclear. Cognitive appraisals strongly influence an individual’s perception of the importance and intensity of a stressor, as well as his or her choice of coping strategy; therefore, in any study or model of coping processes, they should be linked to the individual’s use of coping strategies.

The first purpose of this investigation was to examine the link between athletes’ primary and secondary appraisals of their injuries and their use of coping strategies after injury. Furthermore, within the context of the Wiese-Bjornstal et al model, we examined these variables in relation to other postinjury responses such as mood disturbance and rehabilitation adherence. We hypothesized that both primary and secondary appraisals would be associated with higher levels of mood disturbance and choice of coping strategies but that primary appraisals (ie, appraisals of stress) would be more strongly related to mood disturbance and that secondary appraisals (ie, appraisals of coping ability) would be more strongly related to choice of coping strategies. Furthermore, we hypothesized that mood disturbance
and rehabilitation adherence would be inversely related and that both would be positively associated with avoidance coping.

The second purpose of this study was to integrate the antecedents and consequences of sport injury by exploring the relationships between preinjury history of stressors (i.e., life event stress), coping resources (i.e., social support satisfaction), personality characteristics (i.e., dispositional optimism), and postinjury cognitive and emotional responses. Life-event stress was hypothesized to be the strongest predictor of cognitive appraisals and mood disturbance.

Method

Design

This study used a prospective, repeated-measures design to assess psychological factors both preinjury and postinjury. Preinjury measures were taken at the first team meeting of the preseason. Postinjury measures were taken on days 1, 4, 7, 14, and 28 after injury occurrence.

Participants

Eighty-four Division I-A university football players participated; mean age was 19.59 years (SD = 1.49), with 57% reporting their race/ethnicity as White, 37% Black, and 4% other. Freshmen athletes made up 38% of the sample, with 17% classified as sophomores, 23% as juniors, and 20% as seniors. Although 61% of the athletes were nonstarting players, the majority had full athletic scholarships (77%).

Measures

Demographic Information. The demographic data sheet consisted of questions concerning the participants’ age, race/ethnicity, year in school, competitive playing status (i.e., starter or nonstarter), and athletic/nonathletic scholarship status (i.e., full, partial, or none). In addition, participants rated their identification with the athletic role ("I consider myself an athlete"; 1 = strongly disagree to 7 = strongly agree) and their injury history ("I have experienced an injury within the past 2 years that required me to miss a significant portion of my competitive season"; 1 = not at all true for me to 7 = definitely true for me).

Life-Event Stress. The 69-item Life Event Stress for College Athletes (LESCA) measures athletes’ perceptions of life-event stress. On the LESCA, athletes indicate the life events they have experienced during the preceding 12 months and then rate their perceptions of each event at the time of its occurrence on an 8-point Likert scale, ranging from extremely negative (−4) to extremely positive (+4). Negative and positive life-event-stress scores
are obtained by summing the absolute values of the events reported as negative or positive, respectively. As reported by Petrie, test–retest reliabilities have ranged from .76 to .84 for these scores. In addition, Petrie provided evidence for the scale’s validity.

Social Support. The 39-item Social Support Inventory (SSI) assesses an individual’s satisfaction with various types of social support. On a 7-point Likert scale (1 = not at all satisfied to 7 = very satisfied), participants rate their satisfaction with the support they have received during the preceding 30 days. A total social-support score is obtained by summing participants’ responses to the 39 items, with scores ranging from 39 to 273. Brown et al. provided evidence for the scale’s validity and reported split-half reliability to be .94 and internal consistency reliability (Cronbach’s alpha) to be .96. In the current study, the coefficient alpha was .97.

Dispositional Optimism. The Life Orientation Test (LOT) measures dispositional optimism. Participants indicate their agreement with 12 statements on a 5-point Likert scale (0 = strongly disagree to 4 = strongly agree). Four of the statements are worded in an optimistic direction, and 4 are worded in a negative direction. The other 4 items are filler items and do not contribute to the total score. Total scores range from 0, low optimism, to 32, high optimism. Scheier and Carver reported a Cronbach’s alpha of .76 and a test–retest correlation of .79. The coefficient alpha from the current sample was .63.

Mood State. The Incredibly Short Profile of Mood States (ISP) measures mood disturbance. The ISP is a 6-item mood assessment using 1 item to assess each mood dimension (anxious, sad/depressed, confused, angry, energetic, and fatigued) from the Profile of Mood States (POMS). This instrument was created as a brief alternative to the original 65-item POMS, permitting it to be administered in less than 1 minute. For the initial preinjury assessment, participants rated on a 5-point Likert scale (0 = not at all to 4 = extremely) how they had been feeling during the preceding 30 days. For the postinjury assessments, the participants were asked to rate how they were currently feeling. A total mood-disturbance score was calculated by subtracting the positive mood state (energetic) from the sum of the remaining negative mood states. Total mood-disturbance scores could range from –4 to 20, with higher scores indicating greater disturbance. The ISP items and the POMS subscales, and the total mood-disturbance indexes for each scale, have been shown to be significantly correlated, with correlations between .69 and .82 for the subscales and .88 for the total mood-disturbance indexes. In the current study, internal consistency of the 6-item scale was established with alpha coefficients ranging from .63 to .78 across the multiple administrations.

Cognitive Appraisals. Consistent with Daly et al., on 5-point Likert scales (0 = strongly disagree to 4 = strongly agree), participants rated their agreement with the following statements: “I am experiencing stress due to my injury” (primary appraisal) and “My injury is difficult to deal with” (secondary appraisal).
Coping Methods. Billings and Moos'19 19-item coping-responses inventory measures active cognitive coping (attempts to manage one’s appraisal of the stressfulness of the event), active behavioral coping (overt behavioral attempts to deal directly with the problem and its effects), and avoidance coping (attempts to avoid actively confronting the problem or to indirectly reduce emotional tension through other behaviors such as eating or smoking more). For each item, athletes indicated whether or not they used that coping method to handle their current injury. Total scores for the 6 active-cognitive-coping items and 6 active-behavioral-coping items could range from 0 to 6, and total scores for the 5 avoidance-coping items, from 0 to 5. Two items did not contribute to the coping subscales. Billings and Moos reported moderate internal consistencies: .72 for active cognitive coping, .80 for active behavioral coping, and .44 for avoidance coping. With the current sample, coefficient alphas of .81, .65, and .63 were obtained for these 3 scales, respectively.

Rehabilitation Adherence. Rehabilitation adherence was assessed by the team’s athletic trainer using the Sports Injury Rehabilitation Adherence Scale (SIRAS).29 On 5-point Likert scales ranging from 0 to 4, the athletic trainer rated the intensity with which the injured athlete completed rehabilitation exercises, the frequency with which the injured athlete followed instructions and advice, and the degree to which the injured athlete was receptive to changes in the rehabilitation program. A total rehabilitation-adherence score was obtained by summing the athletic trainer’s responses to the 3 items, with scores ranging from 0, no or poor adherence, to 12, positive or complete adherence. The SIRAS has been shown to have adequate internal consistency, with Cronbach’s alpha ranging from .81 to .82.22 Alpha coefficients ranging from .95 to 1.00 were obtained in the current study.

Procedure

At a preseason team meeting, eligible participants (ie, those not currently injured) completed an informed-consent form and a baseline packet that included the demographic data sheet, LESCA, SSI, LOT, and ISP. Each athlete was assigned a code number that was used to identify him in subsequent administrations if he became injured. Athletes were considered injured if they met the criteria specified by the NCAA Injury Surveillance System.30 Specifically, a sport injury was defined as having occurred as a result of participation in an organized intercollegiate practice or game, requiring medical attention by a team athletic trainer or physician, and having resulted in the inability to participate for 1 or more days beyond the day of injury.

Athletes who became injured throughout the course of the competitive season completed the ISP and the cognitive-appraisal items 1 day after their injury occurrences. At this time, the team’s athletic trainer completed the 1998 version of the NCAA Injury Surveillance System’s football-injury form, consisting of 31 items related to the timing of the injury and the
situation in which it had occurred (eg, practice or game situation, weather/field conditions), the type and location of the injury, the apparent cause of the injury, and the athlete’s position at the time of injury. In addition, the athletic trainer completed the SIRAS. If still injured at day 4, the athlete completed the ISP and cognitive-appraisal items, as well as the coping-response inventory. The athletes continued to complete these 3 instruments if they were still injured and unable to participate in practices or competitions at days 7, 14, and 28 postinjury. Athletes who were injured longer than 28 days continued to complete the measures every 2 weeks until they returned to sport participation or the competitive season ended. Meanwhile, the athletic trainer continued to complete the SIRAS at each of these times until the athlete returned to sport participation. All postinjury data administrations were conducted by the athletic trainer and supervised by the principal investigator.

Statistical Analyses

Predictive Relationships Between Preinjury and Postinjury Factors. To determine the relationships between preinjury life-event stress, social support, and dispositional optimism and postinjury cognitive appraisals and mood disturbance, several partial Pearson $r$ correlations were calculated. Correlations were examined between each preinjury variable and each postinjury response occurring at days 1, 4, 7, 14, and 28. To control for injury severity, the effects of injury duration on the cognitive-appraisal and mood-disturbance variables were partialled out. For the correlations between the preinjury variables and postinjury mood disturbance, the effects of preinjury mood state also were controlled. Analyses were not conducted beyond 28 days postinjury because of the low number of injured participants ($n = 4$).

Predictive and Concurrent Postinjury Analyses. Predictive relationships among postinjury cognitive appraisals, mood disturbance, and coping methods also were examined with partial Pearson $r$ correlations. Each variable was examined in relation to another postinjury variable occurring at a subsequent time point through day 28. Again, to control for injury severity, the effects of injury duration were partialled out. Concurrent relationships were examined in a similar manner (ie, we controlled for injury duration), but each postinjury response was examined in relation to another postinjury response occurring on the same day. Analyses were not conducted with rehabilitation adherence because of the low variability in adherence scores (eg, for days 14 and 28, SD = 0).

Results

Injury Characteristics

Nineteen athletes (23%) incurred injuries during the course of the competitive football season. One athlete was not included in the statistical
analyses, however, because he experienced a career-ending injury and decided to discontinue his involvement in athletics and in the study. Thus, a total of 18 injured athletes were statistically examined, with 10 athletes remaining injured at day 4, 6 athletes at day 7, and 5 athletes at days 14 and 28. These athletes were injured and unable to participate in practice or competition for a median of 5 days. The athletes’ injuries consisted primarily of ligament sprains (n = 8) and muscle-tendon strains (n = 5), with the remaining athletes incurring concussions (n = 1), contusions (n = 1), and lacerations (n = 1). One athlete’s injury did not fit the provided injury categories, and another athlete’s injury was not reported. The athletes strongly identified with the athletic role (M = 6.56, SD = 1.50) and reported not having experienced an injury within the preceding 2 years that required them to miss a significant portion of the competitive season (M = 3.06, SD = 2.41).

### Predictive Relationships Between Preinjury and Postinjury Factors

Five injured athletes had incomplete preinjury data; therefore, the following correlational analyses include data from 13 athletes injured at day 1, 7 athletes injured at day 4, 5 athletes injured at day 7, and 4 athletes injured at days 14 and 28. As a result of controlling for 2 variables (injury duration and preinjury mood disturbance), correlations could not be conducted with days 14 and 28 mood-disturbance scores because there were too few degrees of freedom. Mean scores and standard deviations for the preinjury and postinjury variables are presented in Table 1.

After controlling for injury duration and in the case of the mood-disturbance analyses, also for preinjury mood state, only 1 significant relationship resulted. Negative-life-event stress was positively related to mood disturbance at day 1 ($r = .64, P < .05$); greater perceptions of negative-life-event stress predicted greater postinjury mood disturbance immediately after injury occurrence. Although not significant, relationships between negative-life-event stress and day 4 secondary appraisals ($r = .80, P = .058$) and between dispositional optimism and day 4 primary appraisals ($r = -.81, P = .053$) were in the expected directions. Given that correlation coefficients represent effect size, it can be concluded that these results are clinically significant, because the effects were large and nonsignificance likely resulted from small sample sizes.

### Predictive and Concurrent Postinjury Analyses

One athlete had incomplete postinjury coping-response data for day 4 and therefore was not included in the following analyses for that day. See Table 2 for the mean scores and standard deviations of all postinjury variables.

**Predictive Analyses.** The effect sizes for all significant predictive relationships were large, ranging from .71 to 1.00, which suggests that these data are both statistically and clinically significant. After controlling for
Table 1  Mean Scores and Standard Deviations of Preinjury and Postinjury Variables for Participants Injured on Days 1, 4, 7, 14, and 28*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Day 1 (n = 13)</th>
<th>Day 4 (n = 7)</th>
<th>Day 7 (n = 5)</th>
<th>Day 14 (n = 4)</th>
<th>Day 28 (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>SD</td>
<td>mean</td>
<td>SD</td>
<td>mean</td>
</tr>
<tr>
<td>Preinjury variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>negative-life-event stress</td>
<td>8.77</td>
<td>6.81</td>
<td>8.00</td>
<td>7.00</td>
<td>10.20</td>
</tr>
<tr>
<td>social support</td>
<td>153.46</td>
<td>48.54</td>
<td>157.43</td>
<td>46.61</td>
<td>153.60</td>
</tr>
<tr>
<td>dispositional optimism</td>
<td>19.54</td>
<td>3.64</td>
<td>19.14</td>
<td>4.26</td>
<td>18.80</td>
</tr>
<tr>
<td>preinjury mood disturbance</td>
<td>4.00</td>
<td>4.98</td>
<td>4.57</td>
<td>4.79</td>
<td>6.20</td>
</tr>
<tr>
<td>Postinjury variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>primary appraisals</td>
<td>2.31</td>
<td>1.44</td>
<td>2.43</td>
<td>1.40</td>
<td>2.60</td>
</tr>
<tr>
<td>secondary appraisals</td>
<td>2.00</td>
<td>1.22</td>
<td>2.43</td>
<td>0.98</td>
<td>2.40</td>
</tr>
<tr>
<td>postinjury mood disturbance</td>
<td>3.38</td>
<td>4.46</td>
<td>4.43</td>
<td>4.76</td>
<td>4.60</td>
</tr>
</tbody>
</table>

*Social support: 39, no satisfaction with support, to 273, complete satisfaction with support; dispositional optimism: 0, no/little optimism, to 32, high optimism; preinjury and postinjury mood disturbance: –4, no mood disturbance, to 20, extreme mood disturbance; and primary and secondary appraisals: 0, no/little perceived stress/coping difficulties, to 4, high perceived stress/coping difficulties.
Table 2  Mean Scores and Standard Deviations of Cognitive Appraisals, Mood Disturbance, Coping Methods, and Rehabilitation Adherence at Days 1, 4, 7, 14, and 28 Postinjury*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Day 1</th>
<th>Day 4</th>
<th>Day 7</th>
<th>Day 14</th>
<th>Day 28</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 18)</td>
<td>(n = 10)</td>
<td>(n = 6)</td>
<td>(n = 5)</td>
<td>(n = 5)</td>
</tr>
<tr>
<td>Primary appraisals</td>
<td>2.11 1.45</td>
<td>2.30 1.49</td>
<td>2.17 1.72</td>
<td>2.00 1.87</td>
<td>2.40 1.52</td>
</tr>
<tr>
<td>Secondary appraisals</td>
<td>1.83 1.20</td>
<td>2.10 1.10</td>
<td>2.00 1.67</td>
<td>1.80 1.79</td>
<td>1.60 1.67</td>
</tr>
<tr>
<td>Mood disturbance</td>
<td>4.06 4.73</td>
<td>5.40 5.02</td>
<td>4.00 5.18</td>
<td>5.20 8.29</td>
<td>5.40 6.95</td>
</tr>
<tr>
<td>Active cognitive coping</td>
<td>—</td>
<td>—</td>
<td>4.44† 1.74†</td>
<td>3.83 1.17</td>
<td>4.20 2.17</td>
</tr>
<tr>
<td>Active behavioral coping</td>
<td>—</td>
<td>—</td>
<td>3.33† 4.69†</td>
<td>2.67 4.18</td>
<td>5.80 7.63</td>
</tr>
<tr>
<td>Avoidance coping</td>
<td>—</td>
<td>—</td>
<td>1.33† 0.87†</td>
<td>1.33 1.51</td>
<td>2.60 0.98</td>
</tr>
<tr>
<td>Rehabilitation adherence</td>
<td>10.33 2.64</td>
<td>9.60 3.03</td>
<td>11.50 1.23</td>
<td>12.00 0.00</td>
<td>12.00 0.00</td>
</tr>
</tbody>
</table>

*Primary and secondary appraisals: 0, no/little perceived stress/coping difficulties; to 4, high perceived stress/coping difficulties; mood disturbance: –4, no mood disturbance, to 20, extreme mood disturbance; active cognitive coping and active behavioral coping: 0, no use of coping method, to 6, high use of coping method; avoidance coping: 0, no use of coping method, to 5, high use of coping method; and rehabilitation adherence: 0, no adherence, to 12, complete adherence. Dashes indicate that data were not obtained at that time point.
†n = 9.
injury duration, primary appraisals predicted subsequent primary appraisals at all but 1 time point. Specifically, primary appraisals were significantly related at days 1 and 4 ($r = .98, P < .001$), days 4 and 7 ($r = .97, P < .01$), and days 7 and 14 ($r = 1.00, P = .00$). Secondary appraisals were related at days 1 and 4 ($r = .77, P < .05$) and days 4 and 7 ($r = .96, P < .05$). Overall, these results suggest that athletes appraised their levels of stress and coping ability in a consistent manner during the first 1–2 weeks of recovery. Numerous relationships also were found between secondary appraisals and subsequent primary appraisals, with day 1 secondary appraisals predicting primary appraisals at days 4 ($r = .80, P < .05$), 7 ($r = .89, P < .05$), and 28 ($r = .97, P = .05$). Similar relationships between secondary and primary appraisals also were found at days 4 and 7 ($r = .94, P < .05$) and days 7 and 14 ($r = 1.00, P = .00$). Thus, athletes who reported greater coping difficulties subsequently reported greater perceptions of stress. Finally, athletes who had higher perceptions of stress at day 4 (primary appraisal) reported greater difficulty in coping with the injury at day 7 (secondary appraisal; $r = .97, P < .01$).

Cognitive appraisals also were related to subsequent levels of mood disturbance. Specifically, primary and secondary appraisals at days 4, 7, and 14 predicted mood disturbance at day 28, with correlations ranging from .96 to .99 ($P < .05$). Thus, among the athletes who were injured for at least 28 days, greater perceptions of stress and coping difficulties early in rehabilitation were related to greater mood disturbance approximately 1 month postinjury. Evidence of the reciprocal relationship between appraisals and mood disturbance also was found, with day 1 mood disturbance predicting more negative primary appraisals at day 4 ($r = .71, P < .05$). Finally, there were positive relationships between reported levels of mood disturbance during the first week postinjury. Specifically, day 1 mood disturbance was related to mood disturbance at days 4 ($r = .97, P < .0001$) and 7 ($r = .98, P < .005$), and day 4 mood disturbance was related to mood disturbance at day 7 ($r = .97, P < .01$).

Several relationships also were discovered among appraisals and coping, with most occurring between appraisals and subsequent active-behavioral- or active-cognitive-coping scores. Day 4 primary and secondary appraisals predicted day 28 active behavioral coping ($r = .98, P < .05$ for both), and day 7 primary and secondary appraisals predicted day 14 active behavioral coping ($r = .97, P < .05$ for both). Secondary appraisals at day 14 also were related to day 28 active behavioral coping ($r = .99, P < .01$). For cognitive coping, day 7 primary and secondary appraisals and day 14 primary appraisals were inversely related to day 28 active cognitive coping ($r = -.96, P < .05$ for all 3). These findings suggest that athletes perceiving greater stress and coping difficulties were more likely to subsequently use more active behavioral and less active cognitive coping when dealing with their injuries.
One significant relationship occurred between appraisals and avoidance coping, with day 1 secondary appraisals predicting day 7 avoidance coping ($r = .89, P < .05$). Athletes endorsing greater use of avoidance coping at day 7 reported less use of active cognitive coping at day 14 ($r = -.98, P < .05$), and athletes using less active cognitive coping at day 14 reported greater use of avoidance coping at Day 28 ($r = -.96, P < .05$). Use of active behavioral coping at day 4 was associated with greater use of active behavioral coping at day 7 ($r = .94, P < .05$). No significant relationships occurred between coping methods and mood disturbance.

Concurrent Analyses. Concurrent analyses also revealed many statistically and clinically significant results, with moderate to large effect sizes ranging between .51 and .99. After controlling for injury duration, primary and secondary appraisals were significantly related at days 1 ($r = .66, P < .01$), 4 ($r = .71, P < .05$), and 7 ($r = .99, P = .001$). Primary appraisals and mood disturbance were related at days 1 ($r = .51, P < .05$) and 4 ($r = .69, P < .05$), whereas secondary appraisals and mood disturbance were related only at day 4 ($r = .68, P < .05$). These correlations indicate that athletes who appraised their injuries as more stressful and difficult to cope with within the first few days of being injured also reported greater mood disturbance. At day 14, negative primary appraisals were associated with greater use of active behavioral coping ($r = .96, P < .05$), and at days 14 and 28, active behavioral coping was associated with greater mood disturbance ($r = .99, P < .01$ and $r = .96, P < .05$, respectively).

Comments

Life-event stress, social support, and dispositional optimism did not significantly predict primary and secondary appraisals. Although the correlations between negative-life-event stress and secondary appraisals and between dispositional optimism and primary appraisals were large, the failure to reach statistical significance was likely a result of small sample size and not an inadequate effect. Thus, the results have some clinical meaning, suggesting that athletes who reported experiencing more negative-life-event stress during the year before the beginning of football season perceived themselves as having greater difficulties coping with their injuries 4 days postinjury. In addition, athletes who were less optimistic experienced greater injury-related stress 4 days postinjury. These findings suggest 2 possible explanations. First, athletes might be consistent in their perception of how stress affects them, and dispositional ways in which they view themselves, their world, and their future affect those perceptions. Alternatively, athletes’ coping resources or confidence in their ability to cope might have been sufficiently strained by their experience of higher levels of preinjury negative-life-event stress, thus making their secondary appraisals of the current stressor (ie, injury) more negative.
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The direct effects of preinjury life-event stress, social support, and dispositional optimism on emotional response to injury also were examined. Consistent with hypotheses, after controlling for injury duration and preinjury mood, life-event stress was the strongest predictor of mood disturbance, although only at day 1. This finding is consistent with previous research that has shown preinjury negative-life-event stress to be related to greater mood disturbance 3 days postinjury. Although it has not been examined directly in past research, it is theoretically consistent to suggest that the athletes’ negative appraisals of their injuries mediated the relationship between preinjury life stress and postinjury mood disturbance.

With regard to postinjury relationships, the findings suggest that athletes are consistent in how they appraise the stress and coping difficulties associated with their injuries. Concurrent examination of the data indicated that at each time point during the first week of rehabilitation, primary and secondary appraisals were significantly related. Furthermore, predictive relationships suggested that athletes who appraised their injuries as stressful or difficult to cope with at one time point viewed their injuries similarly at the next time point. Strong relationships also occurred between secondary appraisals and subsequent primary appraisals. Athletes who perceived greater difficulties coping with their injuries were more likely to later view their injuries as stressful. These findings support a dynamic view of the cognitive-appraisal process and suggest that injury rehabilitation interventions that aim to reduce either negative primary or negative secondary appraisal will likely have salutary effects on the other one, as well.

Consistent with hypotheses, primary and secondary appraisals were associated with higher levels of mood disturbance and with choice of coping strategies. Because of the strong relationships between primary and secondary appraisals, however, the data did not unequivocally support stronger relationships between primary appraisals and mood disturbance or between secondary appraisals and choice of coping strategies. Overall, athletes who perceived their injuries as stressful and difficult to cope with also experienced concomitant elevations in mood disturbance, particularly at day 28. Thus, among the athletes who were injured for at least 28 days, greater perceptions of stress and coping difficulties early in the rehabilitation process were related to greater mood disturbance approximately 1 month postinjury. These results support the hypothesized relationship between cognitive appraisals and emotional responses in the model of Wiese-Bjornstal et al and are consistent with previous research that has found a positive relationship between negative secondary appraisals and emotional disturbance.

Cognitive appraisals also were related to choice of coping strategies. The results suggested that the athletes used a variety of coping strategies to deal with their injuries and that the athletes’ primary and secondary appraisals of their injuries were related to how they chose to cope. Athletes endorsing more negative secondary appraisals immediately after injury
occurrence (ie, day 1) were more likely to use avoidance coping 1 week postinjury. In many ways day 7 (1 week postinjury) was a crucial marker for the athletes in this study. By day 7, 72% of the injured athletes had returned to competition, but 80% of those who were still injured at day 7 remained so at days 14 and 28. By day 7, these athletes might have realized the seriousness of their injuries, recognized just how much time and effort would be required for rehabilitation, and felt overwhelmed by the prospect of a long rehabilitation program. At this point, they coped with their disappointment indirectly (eg, keeping their feelings to themselves, taking things out on others when feeling angry or depressed). Unfortunately, the effects of engaging in avoidance coping at day 7 had longer-term effects, as well. Athletes who reported greater use of avoidance coping at day 7 used less active cognitive coping at day 14. In turn, those athletes who reported less use of active cognitive coping 2 weeks postinjury endorsed greater use of avoidance coping at day 28. This reciprocal relationship between avoidance and active cognitive coping makes intuitive sense. If the athletes attempted to avoid actively dealing with their injuries, they might also have been making little attempt to cognitively manage the stress associated with their injuries.

Coping results also indicated that athletes perceiving less ability to cope and more stress associated with their injuries at days 4, 7, and 14 were more likely to engage in active behavioral coping and/or less active cognitive coping at days 14 or 28. In addition, concurrent analyses revealed that use of active behavioral coping at days 14 and 28 was associated with greater mood disturbance. As the athletes realized that their return to competition would not be quick, they might have coped with their stress and doubts by seeking information from coaches and sports-medicine personnel (eg, athletic trainers) who would be a natural source for that type of information. Although obtaining information about their injury and engaging in rehabilitation exercises can help athletes cope with their injuries, with increased levels of mood disturbance these resources might become insufficient. Previous research has shown that athletes perceive greater support from family members and teammates than from coaches and medical personnel. Furthermore, athletes have identified family and friends as the predominant providers of emotional support and coaches and medical personnel as the predominant providers of informational and technical support. Given the amount of contact athletes have with their coaches and, particularly in the case of injury, with sports-medicine personnel, athletes would benefit from receiving greater support and assistance with managing psychological distress from these important people. Emotional support, in addition to informational and technical support, would likely enhance the rehabilitation and recovery process.

As with all forms of scientific inquiry, this investigation had a number of strengths and limitations. First, it linked cognitive appraisals of stress and coping ability with choice of coping methods. Because cognitive appraisals are an integral part of the coping process, it is important to
examine them concurrently. Future research is needed in this area and might benefit from measures that capture even greater specificity of the appraisal construct. According to Lazarus and Folkman, when individuals appraise an event as stressful they further categorize the event as harmful, threatening, or challenging. Although it has been suggested that harm appraisals are typical when athletes experience injuries or pain, athletes have also retrospectively indicated that they had benefited from the injury experience. Given the dynamic nature of the stress and coping process, it is possible that athletes appraise the stress associated with their injuries in a variety of ways and that their perceptions of harm, threat, and challenge change throughout recovery, particularly during lengthy rehabilitation periods. These changing perceptions, in turn, would influence how they choose to cope with their injuries. Although this investigation was an important first step in understanding the appraisal–coping link, further specificity of the appraisal construct could increase understanding of its dynamic nature.

A second strength of this investigation was that it assessed multiple components of the integrated model of Wiese-Bjornstal et al of response to sport injury using a prospective, repeated-measures design. In addition, the study integrated the antecedents and consequences of sport injury to portray a more complete picture of the injury process. A limiting factor, however, was the sample size; there were few injuries and some incomplete data. As a result, 1 variable (rehabilitation adherence) could not be statistically examined, and athletes with injuries of varying severity (based on time loss) had to be grouped together. To control for differences in time loss, the effects of injury severity were partialled out of all analyses. This approach, in combination with the small sample size, resulted in several significant zero-order correlations just missing statistical significance. Certainly, a larger sample would have increased statistical power and permitted examination of subgroups of individuals (eg, according to injury severity level). Unfortunately, small samples are typical in sport-injury research using prospective preinjury-to-postinjury designs. Similar to this study, other preinjury-to-postinjury studies have included fewer than 20 injured participants or have obtained samples of injured participants that are less than 25% the size of the starting sample of uninjured athletes. Researchers are encouraged to examine the relationships between these preinjury and postinjury variables in greater detail with larger samples, perhaps from multiple data-collection sites.

Finally, the study was limited in that it did not assess the injured athletes through postrehabilitation. Future research could provide an even more complete picture of the sport-injury process if athletes’ cognitive, emotional, and behavioral responses continued to be assessed when they completed their rehabilitation and returned to sport. Furthermore, sport-injury research could be enhanced if physical indicators of recovery (eg, range of motion, strength) were examined along with psychological aspects of rehabilitation and return to sport participation.
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References


