Psychological Predictors of Injury Occurrence: A Prospective Investigation of Professional Swedish Soccer Players

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Context: Athletes participating in sport are exposed to a high injury risk. Previous research has found a great number of risk factors (both physiological and psychological) that could increase injury risk. One limitation in previous studies is that few have considered the complex interaction between psychological factors in their research design. Objective: To study whether personality, stress, and coping predicted injury occurrence in an elite soccer population based on a hypothesized model. Design: Prospective. Participants: 56 (n = 38 male, n = 18 female) Swedish Premiere League soccer players were selected based on convenience sampling. Intervention: Participants completed 4 questionnaires including the Swedish Universities Scales of Personality, 2 Life Events Survey for Collegiate Athletes, and Brief COPE during the initial questionnaire administration. Subsequent to the first meeting, participants also completed the Hassle and Uplift Scale once per wk for a 13-wk period throughout the competitive season. Main Outcome Measures: A path analysis was conducted examining the influence of personality traits (ie, trait anxiety), state-level stressors (ie, negative-life-event stress and daily hassles), and coping on injury frequency. Results: Results of the path analysis indicated that trait anxiety, negative-life-event stress, and daily hassle were significant predictors of injury among professional soccer players, accounting for 24% of the variance. Conclusion: The findings highlight the need for athletes, coaches, and medical practitioners to attempt to reduce state-level stressors, especially daily hassles, in minimizing injury risk. Educating and training athletes and coaches in proactive stress-management techniques appears warranted.

Keywords: prospective study, sport injuries, sport psychology

Over the past 2 decades, conceptual, empirical, applied knowledge regarding the psychology of injury has grown substantially. Still, given the magnitude and severity of injuries each year, the search for continued knowledge about the causes of injury occurrence continues. One sport with relatively high injury rates is soccer. For instance, research found that 92% of elite Finnish male and 79% of female soccer players reported at least one injury per year. High injury rates have also been found in a Swedish elite sample, with 65% to 95% reporting at least one injury during a single season.

In addition to an epidemiologic interest in sport injury, high injury rates are of widespread concern to those involved in assisting elite athletes with the psychosocial consequences of injury. A wealth of evidence indicates that sport injury can be an extremely stressful and emotionally disruptive event for elite athletes, particularly in cases where the injury is severe and the athlete is heavily invested in sport. In addition to having to cope with the physical stresses of injury (eg, pain, discomfort, the rigors of rehabilitation), athletes must contend with the psychosocial stresses of injury such as threats to self-esteem, threats to athletic-career involvement, and isolation from peers. Given the profound physical and psychosocial burden of injury, prediction efforts aimed at minimizing injury risk are important. As highlighted herein, the focus of the current investigation was to examine whether specific psychosocial factors could predict sport injuries in a population of professional soccer players.

In an attempt to identify salient injury risk factors in the area of sport psychology, several conceptual models have been developed. One of the most influential and well tested of these models is Williams and Andersen’s stress-injury model. Williams and Andersen posit that a potentially stressful situation will generate a stress response varying in intensity along a continuum. The strength of the stress response is suggested to be influenced by how threatening the athlete perceives
the situation to be (ie, the extent to which the demands of the situation outweigh the perceived ability to meet such demands). Three broad categories of variables, personality traits (eg, trait anxiety, perfectionism), history of stressors (eg, major-life-event stress, daily hassles, previous injury history), and coping strategies/resources (eg, psychological-skill use, social support) are also suggested to influence the strength of the stress response and the subsequent likelihood of injury. The mechanism by which the stress response is believed to increase injury occurrence is through attentional and somatic changes such as increased distractibility and peripheral narrowing, as well as muscle tension, fatigue, and reduced timing/coordination. For example, a professional soccer player who is worried about contractual obligations (ie, a major life stressor) and who is experiencing relationship difficulties (ie, a chronic stressor) may, when placed in a potentially stressful situation (eg, a league final), experience heightened attentional and physical deficits that preclude him or her from seeing or reacting to a blindside tackle. Under such circumstances, this player would be at greater risk for injury. In support of these proposed mechanisms, Williams et al found that athletes who had experienced a high level of major stressors showed an increased peripheral narrowing during high-stress settings compared with athletes who had experienced lower levels of major stressors. A similar result was reported in a soccer population by Rogers and Landers, who found that peripheral narrowing mediated the relationship between major stressors (ie, negative-life-event stress) and injury occurrence.

Findings from empirical investigations have largely supported Williams and Andersen’s model. With regard to personality variables, trait anxiety, state anxiety, type A behaviors, and stress susceptibility have all been linked to increased injury vulnerability. Empirical support also exists for the contention that history of stressors influences the likelihood of injury occurrence. For example, numerous studies have demonstrated a relationship between negative-life-event stress and injury. Fewer studies, however, and less consistent support exist for the role of continuous stressors (eg, daily hassles) in injury. This may reflect methodological weaknesses in the studies—specifically, the failure to obtain measures of daily hassles of sufficient frequency or duration. Of importance to this investigation, researchers outside the sport-injury realm have also suggested that continuous stressors such as daily hassles may mediate the relationship between discrete stressors (eg, major life changes) and health and well-being. Empirical support for this contention was, for example, found by Pillow et al, who reported that major life events had a direct influence on distress and an indirect influence through minor stressors. Considering these findings, research in an injury context is needed to determine whether continuous stressors (eg, daily life hassles) mediate the relationship between discrete stressors (eg, major-life-event stress) and injury frequency.

With regard to coping and injury vulnerability, a negative relationship between adaptive coping strategies, such as the use of social support, and injury frequency has been reported. Smith et al found that athletes who reported low levels of social support and coping skills experienced more injuries than athletes with medium or high levels. Furthermore, soccer players who exhibit ineffective coping strategies such as self-blame have been demonstrated to be at risk for injury.

These findings provide substantial evidence for the influence of psychological variables on athletes’ risk of sport injury. Nonetheless, high levels of injury occurrence remain, suggesting the need for further research targeting injury risk factors. Toward this end, Williams and Andersen advocated research focusing on the ways that multiple psychosocial factors interact to increase injury vulnerability. In particular, examining the interactions between trait (eg, trait anxiety) and state variables (eg, daily hassles) would advance knowledge of the complex relationship between the psychological variables that potentially influence injury risk. Petrie and Falkstein also highlight the importance of examining mediating relationships among salient injury predictors. Consistent with these suggestions, the aim of this study was to prospectively examine whether personality (ie, trait anxiety), history of stressors (ie, negative-life-event stress, daily hassles), and maladaptive coping strategies predicted injury occurrence among a sample of Premier League soccer players in Sweden. We sought to overcome weaknesses in previous research that failed to address history of stressors on a consistent basis by measuring an indicator of the construct (ie, daily hassles) on a weekly basis for the 13-week duration of the study.

To investigate how specific psychosocial variables interact and influence injury risk, we proposed a model, based on previous findings, as seen in Figure 1. We hypothesized that trait anxiety would have a positive relationship with negative-life-event stress and injury frequency (H1), daily hassle would mediate the relationship between negative-life-event stress and injury frequency (H2), and trait anxiety, negative-life-event stress, daily hassle, and injury frequency would all have a positive relationship with maladaptive coping strategies (H3).

Method

Participants

A total of 56 players (n = 38 male, n = 18 female) competing on 4 different teams in the Swedish Premier League participated in the study. Participants ranged in age from 16 to 36 years (mean = 25.05, SD = 5.46). All were professional, normally practiced 5 to 7 d/wk, and played weekly games for the duration of the 8-month season.
Measures

**Swedish Universities Scales of Personality.** Trait anxiety was assessed using subscales of the Swedish Universities Scales of Personality: somatic trait anxiety (7 items) and psychic trait anxiety (7 items). Participants responded to items on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much so*). Anxiety subscales were selected given previous research demonstrating good psychometric properties with Swedish samples. Adequate subscale internal reliabilities for somatic trait anxiety ($\alpha = .75$) and psychic trait anxiety ($\alpha = .82$) were observed in the current investigation. The mean scores for the 2 subscales were combined to form an overall average score for trait anxiety.

**Life Events Survey for Collegiate Athletes.** The Life Events Survey for Collegiate Athletes (LESCA) was used to measure athletes’ history of life-event stressors. The scale is composed of a list of 69 life events. Athletes were asked to indicate which events they had experienced in the previous 12 months and then, for each event, to rate the intensity of the stressor on an 8-point Likert-type scale ranging from –4 (*extremely negative*) to +4 (*extremely positive*). A score for negative-life-event stress (69 items) was calculated by adding the sum of all experiences that athletes indicated as negative. Only the negative-life-event subscale was scored, as this variable has consistently demonstrated associations with injury occurrence, whereas few studies have found a relationship between positive-life-event stress and injury. The LESCA has been used in previous research with similar populations and has demonstrated validity and adequate test–retest reliabilities ($\alpha = .76$–.84).

**The Hassle and Uplift Scale.** The Hassle and Uplift scale was used to measure athletes’ level of daily hassle and uplift. The inventory consists of 53 items addressing potential daily hassles and uplifts (eg, family issues, personal responsibilities, work relationships). Athletes were asked to indicate if the situation had been a hassle or an uplifting event over the course of the last week. Questions were answered on a 4-point Likert-type scale ranging from 0 (*not at all*) to 3 (*very much*). The hassle scores for the injured players in this study were calculated by summing the total hassle scores for the 2-week period before the week in which injury occurred. The reason for choosing the 2 weeks before injury occurrence was that hassle is a state variable that typically fluctuates over time; hence, an athlete experiencing hassle 1 week will not necessarily experience the same level of daily hassle a few weeks later, and injury risk may therefore alter accordingly. For the noninjured athletes, the average scores for all 13 weeks were summed into a single score for hassle. The alpha for the Hassle and Uplift Scale was .87 in the current study, a finding consistent with previous research demonstrating an alpha of .82 with athletes from different sports.

**Brief COPE.** The Brief COPE was used to measure athletes’ coping strategies. The scale consists of 28 items grouped into 14 subscales: self-blame, self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, and religion. Items were answered on a 4-point Likert-type scale ranging from 1 (*I have not used this at all*) to 4 (*I have used it a lot*). Carver found Cronbach’s alphas ranging from .50 to .90. Consistent with previous research (eg, Mahmoud) the subscales were divided into 2 broad categories, namely, adaptive coping (ie, active coping, use of instrumental support, use of emotional support, positive reframing, planning, religion, humor, and acceptance) and maladaptive coping (ie, denial, substance use, behavioral disengagement, venting, and self-blaming). In the suggested model, only the maladaptive coping category was used because maladaptive coping has been found to be related to injury risk in several studies (see, eg, Ivarsson and Johnson and Williams and Andersen).

**Injury Frequency.** During the research period, the physiotherapists for each team were asked to record any
injuries occurring during the past week. A player was defined as injured if he or she missed at least one practice or competition due to injury. The injury-frequency data collection was based on a nationally used Web-based questionnaire in which team physiotherapists recorded athletes’ injury type and severity and number of days out of practice. Before commencing the research, all physiotherapists (1 from each team) received instruction on how to complete the questionnaire to standardize injury assessment. The physiotherapists recorded injury data for the entire 13-week period of the study.

Procedures

Coaches and physiotherapists from the participating teams were first contacted by phone, and a meeting was arranged at which they received information regarding the study purposes. At this opening meeting, a schedule for the timing and place of questionnaire administration throughout the competitive season was determined. Participants were also informed about the study purposes, and informed-consent procedures were conducted. All participation was voluntary, and confidentiality of responses was ensured. All players included in the study were free from injuries at the beginning of the study. The research investigation was authorized and approved by an institutional ethics committee for human studies.

Finally, at the opening meeting players were asked to complete 3 questionnaires: the Swedish Universities Scales of Personality, LESCA, and Brief COPE. Subsequent to the initial meeting, participants completed the Hassle and Uplift Scale once per week for a 13-week period throughout the competitive season. The scale was administered with the assistance of each team’s physiotherapists. As daily hassle is a state variable that is fluid in nature, repeated measurement enabled a more accurate assessment of changes in athlete perceptions over time.

Data Analysis

Given the wide age range among study participants (16–36 y), we first sought to investigate group differences between younger (ie, 16–25) and older (ie, 25–36) athletes regarding stress perceptions (ie, LESCA and daily hassles). As a MANOVA showed no significant differences, the entire sample was used in all subsequent analyses. A path analysis was conducted to investigate the influence of the personality trait (trait anxiety), state-level stressors (ie, negative-life-event stress, daily hassles), and maladaptive coping strategies on injury occurrence. The model—data fit was based on commonly recommended indices such as CFI and RMSEA. We used Preacher and Hayes’ recommended methods and SPSS macro to examine whether negative-life-event stress had an indirect effect on injury frequency through daily hassle.

Results

The means and standard deviations for men and women for all study variables are presented in Table 1. Also included are descriptive statistics for younger and older players. These data indicate altogether that men experienced more injuries and higher hassle scores than women did. Moreover, the result also showed that older players reported more injuries and higher hassle scores than younger players did.

The influence of trait anxiety, negative-life-event stress, daily hassle, and maladaptive coping in predicting injury occurrence was tested using path-analysis procedures. Results of the path analysis suggested that 24% of the variance in injury occurrence could be explained by the hypothesized model. The model fit the data well, $\chi^2 = .390$, df = 1, $P = .533$, CFI = 1, RMSEA < .001. The standardized solution, with significant paths displayed, is shown in Figure 2. Regarding the predictor variables, only daily hassle had a direct positive effect on injury frequency ($P < .001$). Negative-life-event stress had a direct positive effect on daily hassle ($P < .001$). Moreover, trait anxiety ($P < .001$) showed a direct positive relationship with negative-life-event stress but did not have significant relationships with daily hassles, maladaptive coping, or injury occurrence (see Figure 2). Maladaptive coping had no significant relationships with injury occurrence, daily hassle, negative-life-event stress, trait anxiety, or injury frequency.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Gender</th>
<th>Age, y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men, n = 38</td>
<td>Women, n = 18</td>
</tr>
<tr>
<td></td>
<td>16–25, n = 34</td>
<td>26–36, n = 22</td>
</tr>
<tr>
<td>Trait anxiety</td>
<td>3.6 (0.71)</td>
<td>4.2 (0.66)</td>
</tr>
<tr>
<td>Negative-life-event stress</td>
<td>11.9 (10.0)</td>
<td>16.2 (11.9)</td>
</tr>
<tr>
<td>Hassle</td>
<td>7.0 (8.8)</td>
<td>6.1 (6.7)</td>
</tr>
<tr>
<td>Maladaptive coping</td>
<td>1.8 (0.28)</td>
<td>1.7 (0.27)</td>
</tr>
<tr>
<td>Injuries</td>
<td>0.53 (0.73)</td>
<td>0.11 (0.32)</td>
</tr>
</tbody>
</table>

Table 1 Measures by Gender and Age Group, Mean (SD)

a The hassle score is a mean score for all 13 wk.
To test whether daily hassle mediated the relationship between negative-life-event stress and injury frequency, the recommendations of Preacher and Hayes were followed. Their recommendation for mediation testing is to use a bootstrapping procedure to compute a confidence interval around indirect effects. SPSS macro was used to perform the analysis (bootstrapped sample 5000). The result showed that the indirect effect via daily hassle equaled 2.63, with the 95% confidence interval ranging from .039 to .044. The fact that zero fell outside the interval indicated a significant indirect effect, $P < .05$. Mediation results are presented in Figure 3.

**Discussion**

The overall aim of the study was to prospectively examine whether personality variables, stressors (discrete and chronic), and coping strategies predicted injury occurrence among a sample of male and female Premier League soccer players. Overall, results indicated that negative-life-event stress had an indirect effect on injury occurrence through daily hassle among Swedish Premier League soccer players.

Previous injury-prediction models (eg, Williams and Andersen) highlight the role of personality variables, stress, and coping in injury onset. Findings from the current study partly support Williams and Andersen’s stress-injury model by indicating the role of daily hassle stresses in the prediction of injury occurrence. Moreover, consistent with previous research empirical support for the importance of personality variables (ie, trait anxiety) and state-level stress (ie, negative-life-event stress and daily hassle) in injury prediction was found. No support was found, however, for the suggestion that maladaptive coping strategies would influence injury risk. Each of these findings is now elaborated on in further detail.

We found partial support for our hypothesis (H1) that personality traits would increase injury risk. In line with previous research highlighting the role of trait anxiety in injury prediction, trait anxiety was indirectly related to injury risk through negative-life-event stress and daily hassles. One possible explanation for the lack of direct associations between trait anxiety and injury occurrence is that personality traits may be insufficient for directly increasing one’s injury susceptibility. Rather, particular personality traits such as trait anxiety may augment the likelihood that an individual will appraise a situation as threatening, thereby increasing the physiological stress response and the subsequent likelihood of injury. This line of argument was also supported by Perna et al., who found that negative emotions such as negative mood state had a positive relationship with physiological responses. Their finding suggests that attempts to decrease injury risk should address both the cognitive-affective component of stress and the somatic responses that are likely the causal mechanism behind injury occurrence.

We also hypothesized that daily hassle would mediate the relationship between negative-life-event stress and injury frequency (H2). This hypothesis was supported in our study, as negative-life-event stress was found to have an indirect effect on injury frequency through daily...
hassle. This finding adds to the growing body of evidence highlighting the important role of negative-life-event stress\(^{20,21}\) and daily hassles on injury risk.\(^{22}\) That daily hassles had a moderate, direct positive relationship with injury occurrence is important from a practical standpoint because it suggests that the injury risk to which an athlete is exposed could change rapidly. Moreover, the burden placed on athletes as a result of experiencing major negative life events or chronic daily hassles may increase their vulnerability to appraise seemingly minor stressors and events as stressful. As indicated, appraisals of threat likely increase athletes’ risk of injury.

Moreover, consistent with previous research and injury theorizing,\(^{13,27}\) we hypothesized (H3) that maladaptive coping strategies would have a positive relationship with injury susceptibility. This prediction was not supported. One possible explanation for the lack of a hypothesized relationship might relate to the nature of the sample under investigation. Specifically, to reach a professional level, elite soccer players have likely developed highly skilled and adaptive coping mechanisms through their sustained and long-term sport involvement.\(^{34}\) Given that all participants were competing at the premier level, it seems reasonable that maladaptive coping strategies did not influence stress level or injury occurrence, taking into account the coping mechanisms of this elite sample. In addition, previous research examining the influence of coping on injury prediction has found equivocal results. While some studies support the idea that maladaptive coping increases injury occurrence through stress,\(^{27}\) others have not found this link. One example is Steffen et al.,\(^{21}\) who reported that general coping strategies had no significant relationship with injuries in a Norwegian soccer population.

### Study Limitations

Although we found prospective evidence for the importance of daily hassle in directly predicting injury occurrence, several limitations warrant mention. First, the relatively small sample size may be considered a limitation of this investigation. As indicated however, the prospective design and homogeneous sample represent important strengths. Along these lines, the fact that only elite-level soccer players participated in the study suggests that the generalizability of the findings may be limited to this population. Second, it is possible that the general nature of the items on the coping questionnaire used in the study did not address the specific coping strategies employed by athletes in this investigation. Third, the fact that there was no significant relationship between the independent variable—negative-life-event stress—and the dependent variable—injury frequency—in the mediation analysis could be considered a limitation. However, according to Hayes,\(^{35}\) a mediating variable could still be causally linked in a theoretically proposed sequence between an independent and a dependent variable, but this link would be considered an indirect effect rather than a mediating one. A fourth limitation may have been the age range of players represented in the sample. That is, players of different ages (e.g., 16 vs 36) may have experienced a greater or lesser tendency to experience situations as stressful, a fact that may have influenced stress scores (and subsequent injury) in our results. That said, there were no group differences between younger and older players for any of the stress variables, and previous research has documented a number of organizational stressors (e.g., coach, teammates, financial stressors) affecting players of all ages at the professional level.\(^{36}\) Moreover, the age range captured in the current sample is indicative of other teams in the Swedish Premier Soccer League, suggesting that the findings may be more amenable to generalizability. Fifth, the fact that the LESCA was designed for college students may be considered a limitation that could have influenced results in the present investigation. As indicated, however, previous research\(^{29}\) has used the LESCA with professional Swedish soccer players and found adequate psychometric properties, suggesting its appropriateness for use in the current study. Sixth, although the physiotherapists used a standardized assessment tool for determining injury occurrence and severity, interclinician variance with regard to injury evaluation may have influenced determinations regarding injury occurrence. Finally, the fact that the researchers did not instruct the physiotherapists to withhold preventive treatment in instances where concerning physical findings were evident may have influenced the number of injuries reported.

### Conclusions

The aforementioned limitations notwithstanding, findings from this study indicate the importance of daily hassles in influencing the relationship between two psychological variables, trait anxiety and negative-life-event stress, and injury occurrence among Swedish Premiere League soccer players. The findings have several important implications for players, coaches, and medical staff. First, developing resilience strategies that help athletes understand the relationship between personal traits, negative life events, thoughts, emotions, and physiological states seems important in helping them minimize the impact of negative life events and the subsequent risk of injury. Preventive strategies such as education in stress-management techniques, confidence building, and goal setting, under supervision of a sport psychology consultant, may help minimize the effects of stress and reduce the likelihood of injury.\(^{23}\) Moreover, reducing athlete training loads and intensities for those who appear unfocused as a consequence of negative life events or ongoing daily hassles may prove beneficial in reducing injury occurrence. Due to our research design, it was possible to overcome several weaknesses in previous research, especially those who have failed to consider the complexity in the interactions between injury predictor variables. Given the importance of daily hassles in injury prediction, the use of prospective designs and analysis of individual differences (e.g., through use of latent growth-curve techniques) would
prove beneficial in examining the influence of dynamic intra-individual trends and processes in injury prediction. Such analyses would enable a sensitive and individualized understanding of psychosocial preconditions and fluctuations in injury risk over time. Ultimately, results from this investigation suggest that sports medicine clinicians could implement a pre-season stress assessment (eg, Hassle and Uplift Scale, LESCA) to adjust players’ training loads. An athlete who reports high levels of daily hassle or stress could likely benefit from having a reduced training load during a specified time period to prevent potential injuries and fatigue or burnout.

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References


30. Mahmoud JSR. The Relationship of Anxiety, Coping, Thinking Style, Life Satisfaction, Social Support, and Selected Demographics Among Young Adult College Students [dissertation]. Lexington: University of Kentucky; 2011.


