Psychological Factors Related to the Occurrence of Athletic Injuries

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This study reports data regarding gymnastic injuries. Examined were the number, severity, and location of injuries, events associated with injury occurrence, relationship in time between occurrence and competition, and the perceptions of causes. In addition, this study investigated the relationships between the psychological factors of trait anxiety, locus of control, self-concept and stressful life events, and the occurrence of athletic injuries. The subjects were 41 elite female gymnasts and five national level coaches. There was a high rate of injury (83%), primarily to the ankle region, with most injuries occurring during the floor exercise. The timing of injuries was related to the approach of competition. The data indicated that stressful life events were significantly related to both the number and severity of injuries. Significant relationships were not found between trait anxiety, locus of control, self-concept, and the injury measures.

In the world of sport, numerous factors contribute to making the pursuit of excellence possible. The athlete must have the necessary physical attributes, an appropriate learning environment, certain personality variables, and strategies for managing high stress levels. Another critical variable that affects success is an absence of injuries. Injuries have negative consequences for the athlete’s health, training, and competitive performance, for the team as a unit, and for the development of a national program (Bajin, 1982; Calvert & Clarke, 1979).

Although the study of injuries is important in all sports, the present research dealt specifically with women’s gymnastics, a sport in which the frequency of injuries appears to be increasing. The literature indicates injury rates as high as 70% in women’s gymnastics (Lowry & LeVeau, 1982). Shaffer (1974) has claimed that the risk of injury in this sport is twice that of any other women’s sport, and it is ranked third in frequency to men’s football and wrestling (Clarke & Buckley, 1980).

Considering the high incidence of injuries in women’s gymnastics, it seemed appropriate to examine the possible causes. The literature to date, however, deals

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almost exclusively with the rehabilitation of injuries and not the causes. This ex post facto analysis gives limited information for the prevention of injuries.

The genesis of injuries is undoubtedly a complex, multifactor equation that may include the athlete’s physical and psychological state, skill level, training conditions, expertise of his or her coach, and many other variables. Generally the reasons for injury occurrence have not been considered as psychological. However, this direction was pursued in the present study because the injury rate appears to be rising despite improvements in such areas as training facilities, equipment, physical conditioning, and coaching.

One selected psychological variable was trait anxiety. This is the relatively stable individual difference in anxiety proneness, that is, the tendency to perceive situations as anxiety provoking and to respond to them with anxiety (Spielberger, 1966). It seemed plausible to expect that gymnasts who tended to be more anxious would also tend to incur more injuries. Another variable that may influence injury rate is locus of control, which is assessed along a continuum ranging from internal to external. Individuals with an external locus of control generally believe that the world is controlled by external factors such as fate, luck, chance, or people in more powerful positions. In contrast, an internal locus of control refers to a belief in self-control and self-responsibility (Lefcourt, 1976; Rotter, 1972). The personality variable of self-concept, or the perception one holds of oneself (Minden, 1982), was examined because a positive relationship with injuries has been previously reported (Young & Cohen, 1981). Finally the variable of stressful life events was investigated. These are positive or negative events that the individual perceives as threatening, stressful, or conflictual and that require an expenditure of energy and adaptive behavior (Rahe, Meyer, Smith, Kjaer, & Holmes, 1964). Research has consistently shown a positive relationship between life events and football injuries (Bramwell, Masuda, Wagner, & Holmes, 1975; Coddington & Troxell, 1980; Cryan & Alles, 1983; Passer & Seese, 1983). Perhaps this relationship also holds for gymnastics injuries.

One purpose of this research was to gather injury data, specifically the number and severity of injuries incurred, body regions injured, events most highly associated with injuries, the relationship in time between injury occurrence and competitions, and the perceived causes of injuries. The second purpose was to determine whether the psychological variables of trait anxiety, locus of control, self-concept, and stressful life events were related to the number of injuries or severity of injuries incurred.

Method

Sample

The subjects were 41 elite female gymnasts from the top two skill levels of the Canadian Gymnastic Federation, Level 3 and Level 2. Gymnasts comprising the more skilled Level 3 were contenders for Olympic and World Championship teams. The slightly lesser skilled Level 2 gymnasts comprised a second string, or junior team. Their ages ranged from 11 to 19 years with a mean and standard deviation of 14.5 ± .6 years. The 20 coaches of these athletes were invited to participate and 5 responded.
Measures

In the absence of a standardized, published inventory, a Gymnasts’ Injury Questionnaire was designed for the purposes of this study. The gymnasts were asked to report the following: injuries incurred over the previous 2 years (measure of injury rate), a description of each injury and its occurrence, the timing of the injury in relation to the next competition, the number of days that the injury interfered with regular training (measure of injury severity), and finally, what they perceived to be the causes of each injury. Similarly, the coaches were given a Coaches’ Questionnaire which asked them to report their gymnasts’ injuries and what they perceived to be the causes of each injury.

The following published inventories were selected to assess the psychological variables: Spielberger Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970), Nowicki–Strickland Locus of Control Scale (Nowicki & Strickland, 1973), Coopersmith Self-Esteem Inventory (Coopersmith, 1967), and Coddington Life Event Record (Coddington, 1972). In light of the present controversy regarding the assessment of life stressors, the Coddington Life Event Record will be briefly described. This measure consists of 42 items, but the item ‘‘fathering an unwed pregnancy’’ was eliminated due to its inappropriateness for this particular sample, thus leaving a list of 41 items. The gymnasts were asked to check those events they had experienced during the previous 2 years. The record is scored by summing the life change units preassigned to each life event. This life stress measure was chosen over the many alternatives because it was originally designed for the high school age group and therefore was appropriate for the present sample.

Procedure

Before proceeding with testing, consent was obtained from the Canadian Gymnastic Federation, the national coach, the individual coaches, and the gymnasts’ parents. Together, the injury and psychological questionnaires were then mailed to the sample and the data were collected retrospectively.

Results

Nature of Injuries

The data revealed that 83% of the gymnasts experienced at least one injury over the 2-year period under study, while only 17% remained free from injury. The majority (21%) of the injuries interfered with or caused complete absence from training for 2 weeks, representing approximately 50 training hours. At the extreme, 6% of the reported injuries required more than 4 months for full recovery. The area most frequently injured was the ankle (29%), followed by injuries to the knee (15%), back (13%), and foot (12%). The majority of the injuries (31%) occurred on the floor exercise. Furthermore, regardless of the event, a predominance of injuries occurred upon landings (63%).

*The Gymnasts’ and Coaches’ Injury Questionnaires are available from the principal author.*
Perception of Injury Causes

When the gymnasts were asked what they perceived to be the causes of their injuries, the most commonly reported cause was a lack of concentration or “thinking of other things” (12%). This cause was followed by physical fatigue (9%), equipment (7%), and repeat of a previous injury (5%). In comparison, the coaches reported that inadequate technique (20%) was usually the cause of their gymnasts’ injuries.

Psychological Variables

Due to a significant difference in age between the two skill levels, \( t(39) = 3.49, p < .01 \), partial correlations were carried out to control for the variable of age. The correlations between the psychological factors and injury measures are shown in Table 1. No significant relationships were found between the injury measures and the variables of anxiety or locus of control. There was a trend toward significance between self-concept and the injury measures, suggesting that gymnasts with higher self-concepts expose themselves to greater risk and therefore are more likely to incur injuries. Moderately strong relationships resulted between stressful life events and both injury measures, \( p < .01 \), such that as the number of life events the gymnasts experienced increased, the number and severity of incurred injuries also increased. Stepwise regression analyses, using the psychological variables as predictors of the injury measures, yielded meaningless results due to insufficient data for the number of variables examined. Furthermore, none of the psychological variables were significantly related to each other.

Time Between Injury Occurrence and Competition

An injury pattern is suggested from the responses to the question, “When did the injury occur in relation to the next meet?” Of the total number of injuries reported, 15% occurred 1 month prior to competition. The injury rate stabilized here until the final week before competition, at which point it rose to 27%. In addition, 21% of the total number of reported injuries occurred on the day of competition and only 15% occurred prior to the time frame of 4 weeks before competition.

Table 1

Relationships Between Psychological Factors and Injury Measures\(^a\)

<table>
<thead>
<tr>
<th>Injury measures</th>
<th>Psychological factors</th>
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<tbody>
<tr>
<td></td>
<td>Trait anxiety</td>
</tr>
<tr>
<td>Number</td>
<td>-.03</td>
</tr>
<tr>
<td>Severity</td>
<td>-.11</td>
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\(^aN = 41\)

\(^{*}p < .01\)
Discussion

The present research has resulted in three noteworthy findings, deserving of discussion: (a) the number and nature of injuries, (b) the psychological factors associated with injuries, and (c) an apparent injury pattern in relation to competition.

The data indicate a high injury rate (83%) and a substantial time loss due to injury. The high incidence of reported ankle injuries appears to be related to the predominance of injuries incurred upon landings. Possible explanations for this injury pattern include inadequate ankle strength or resilience, poor landing technique or landing surfaces, physical fatigue, lapses of attention, or the complexity of the required skills.

Perhaps the most important finding of the study is that stressful life events are clearly related to the injury measures. These significant findings suggest that those gymnasts who have experienced more life stressors tend to incur more injuries and more severe injuries. Previous research has consistently shown a positive relationship between stressful life events and football injuries. The only study that investigated a sport other than football was done by Williams, Tonyman, and Wadsworth (1986), in which no significant relationships were found between life events and volleyball injuries. The authors concluded that although the life event/injury relationship holds for the contact sport of football, it may not generalize to noncontact sports and thus there may be merit in considering the types of sports. As gymnastics is also a noncontact sport, the findings of the present study fail to support Williams et al.'s contention.

This raises the question of how stress leads to injury occurrence, which cannot be answered by the present study. Although one should be cautious in interpreting retrospective data, a possible explanation for this relationship involves the intervening variable of attention. Stressful life events demand some attention, thus leaving less attention available for the task at hand. Considering the complex nature of gymnastics, a lack of concentration may lead to performance decrement and injury occurrence. This explanation is congruent with the lack of concentration reported by some gymnasts as the major cause of their injuries. A second plausible explanation for the relationship between life events and injuries is physical fatigue. Life stressors may tax or exceed the athlete's energy resources, rendering her or him fatigued and therefore susceptible to injury.

The absence of relationships between the injury measures and trait anxiety or locus of control is consistent with previous research. Passer and Seese (1983) found trait anxiety and locus of control to bear no relationships with football injuries. The trend toward significance with respect to self-concept suggests support for previous work by Young and Cohen (1981), who reported that female high school basketball players with high self-concepts incurred more injuries than did players with low self-concepts.

A particularly provocative finding, which apparently has not been reported before, is the suggested pattern of an increasing injury rate as competition approaches. Due to the retrospective nature of the study and the absence of data regarding competitive schedules, no conclusions can be drawn; however, there are several explanations for this pattern. One possibility is that these results are due to an increase in training intensity. This is unlikely because standard coaching theory advocates a tapering of intensity as competition draws near. However,
since training schedules were not monitored in the present study, increasing intensity remains a possible explanation. This pattern may also be attributed to heightened anxiety or stress as competition approaches. In addition to being an interesting theoretical question, avoiding injury prior to competition is of immense practical importance.

As mentioned previously, the present study is limited by its retrospective design. Asking subjects to review past events involves memory, and thus recall problems. Furthermore, there is risk of "retrospective contamination" or "effort after meaning" (Brown, 1974), in which the reporting of past events is exaggerated in order to explain subsequent difficulties. In the present study, it is possible the gymnasts over-reported past life events to account for more recent injuries. A prospective design would circumvent these limitations by recording life events and injuries as they occur in time.

Although this study was designed as an exploratory one, the findings have practical implications and may provide direction for future studies, particularly in the areas of injury causes and the life event/injury relationship. More specifically, there is a need for prospective, longitudinal designs that consider training and competitive schedules and the mediating mechanisms of this stress/injury connection. Future studies would also benefit by using a composite life stressor measure, including both general life stressors common to most people and athletic life stressors specific to athletes.

References


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