Stress, Coping, and Injury in High School and Collegiate Basketball Players

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Abstract

**Purpose:** Several theories have been proposed relating life event stress and the occurrence of injuries in basketball. Coping mechanisms have also been brought in as a third factor that can alter the relationship, acting as a moderator variable. The purpose of this study was to verify the stress-injury relationship presented in previous research, test the results of a study done at San Jose State University, and determine if there is a difference between high school and collegiate student-athletes due to coping mechanism differences.

**Methods:** Eight high school and sixteen collegiate basketball players (age 19 ±1.77 years) were surveyed throughout their respective seasons. Tools used were the Life Events Stress for Collegiate Athletes (LESCA) for stress, the Athletic Coping Skills Inventory (ACSI) for coping mechanisms, and a weekly log for injuries. Surveys were administered via email.

**Results:** No statistically significant relationships were found between age, coping mechanisms, life event stress, and injuries. Injured athletes had lower stress scores than those who were not injured, but it was not statistically significant (t = -1.26, P = 0.231). High school athletes had higher coping skills than collegiate athletes, but it was also not statistically significant (t = 0.37, P = 0.720). **Conclusion:** Results found are consistent with other research done in the sport of basketball, including the San Jose State University study, which says that the stress-injury model does not hold for the sport of basketball. This study also found no statistically significant difference in stress, injuries, and coping skills between high school and collegiate athletes. The biggest challenge with this study was getting participants to respond throughout the duration of the study. Future research would be aided by adding greater incentive to complete the study in its entirety.
Introduction

Each year approximately 30% of interscholastic athletes miss at least one day of practice or competition due to some sort of injury (Rogers & Landers, 2005). Injuries to athletes bring increased amounts of stress and numerous physical and psychosocial burdens, including peer isolation, physical stress, and self-esteem (Ivarsson, Johnson, & Podlog, 2013). Because of this, coaches are always looking for ways to prevent injuries, often through interventions such as: weight training, stretching, taping, and preseason programs (Thacker, Stroup, Branche, Gilchrist, & Goodman, 2003). However, one aspect of an athlete’s life that is sometimes ignored is stress from everyday life. Stress can be defined as an individual’s reaction to internal and external events, which poses a real or perceived threat to the maintenance of the individual’s homeostasis that in turn affects the individual’s performance (Lenz, 1991). This can be internal or external, expected or unexpected. For example, an internal, expected stress could come from participation in the sport itself—getting anxious for a game. An example of an external, unexpected stress would be the death of a loved one.

According to Meyers (2001), stress brings about physical effects within the body that are detrimental to sport performance. Currently, young athletes are finding themselves under incredible amounts of psychological stress. This stress can come via pressures from parents and coaches to perform at a certain level, attempting to balance a large number of activities, or the increased level of competition in amateur sports (Spano, 2008). In a review of empirical studies, it was found that 85% of the studies showed a positive relationship between life-event stress and the increased risk of injury for athletes (Williams & Andersen, 2007). Several studies have shown that an athlete’s history of life stressors increases the
likelihood that he or she will become injured (Rogers & Landers, 2005; Nigorikawa et al., 2003; Steffen, Pensgaard, & Bahr, 2009). This relationship also depends on whether the appraised stress is positive or negative to the individual, as research has shown that only life events thought of as negative increase the likelihood of injury (Sarason, Johnson, & Siegel, 1978).

When looking at what sports to study, basketball jumps out for a number of reasons. For one, basketball has one of the highest overall injury rates among noncollision sports (Messina, Farney, & DeLee, 1999). Additionally, the sport of basketball lends itself to an increased impact of stress-caused injuries based on the amount of physical and mental stress experienced during practices and competitions, including: fouls, errors, and quick movements (Anschell & Wells, 2000). Adding to the performance-specific factors are the length and time of the season. Basketball season is stretched out as long as six months for collegiate athletes and four months for high school athletes. Finally, the sport takes place during one of the most stressful times for athletes competing at the scholastic level—final examinations and the holiday break both occur during this timeframe. A review of the descriptive epidemiological records kept by the NCAA found that from 1988-2004 an average of 44% of Division I (D-I) men’s basketball athletes were injured every season (Dick, Hertel, Agel, Grossman, & Marshall, 2007). The injury rates in Division III (D-III) men’s basketball were 9.0 injuries per 1000 athlete-exposures (A-E) in games and 4.0 injuries per 1000 A-E in practices. For the women, the rates were lower at 6.62 injuries per 1000 A-E in games and 3.45 per 1000 A-E in practices (Dick et al., 2007). A study on Texas public 4A and 5A high school basketball teams found an injury rate of 0.56 injuries per
athlete per season for boys and 0.49 injuries per athlete per season for the girls (Messina et al., 1999).

Pioneers in the area of research relating these specific sports injuries and the stress of every day life have been Williams and Andersen, whose proposed stress-injury model has been used by many others in the field of sport psychology (Rogers & Landers, 2007; Ivarsson et al., 2013; Ivarsson & Johnson, 2010; Galambos, Terry, Moyle, & Locke, 2005; Maddison & Prapavessis, 2005; Petrie, 1993). The Williams-Anderson model starts with the fact that any potentially stressful situation will elicit a stress response, the strength of which varies along a continuum (Andersen & Williams, 1988). Influences of the severity include: how threatening the athlete perceives the situation to be and three categories of variables—personality traits, history of stressors, and coping strategies (Andersen & Williams, 1988). Stress increases the risk of injury by attentional and somatic changes that occur as a result (Andersen & Williams, 1988). Attentional changes include peripheral narrowing and distraction, while somatic changes include muscle tension, fatigue, and reduced coordination (Andersen & Williams, 1988).

Stressful events result in several biological changes that can impact the likelihood of an athlete being injured. Some of the symptoms of a stressed athlete include: upset stomach, headache, sweaty palms, nervous habits, lack of energy, insomnia, anxiety, impatience, anger, irritability (Spano, 2008). While these serve as symptoms and markers that coaches, parents, and athletic trainers can use to monitor their athletes, these stress results can have effects when it comes to performance. This means that when placed in a stressful competitive situation, their stress response will be exaggerated and could lead to injury. There are other effects of stress on the body that have also been proposed to lead to an
increase in injuries, and they include disrupted attention spans and an increase in muscle tension which decreases coordination (Spano, 2008).

Stress causes the release of the hormone cortisol, resulting in a state of hypercortisolaemia or high blood-cortisol levels (Gocentas & Landor, 2012). Cortisol is an immunosuppressive hormone in the body that works as a muscle catabolist (Perna & McDowell, 1995). This steroid hormone also inhibits protein synthesis and is released in higher levels following exhaustive exercise (Hayes, Bickerstaff, & Baker, 2010). Upon release of cortisol, the body’s metabolic rate increases, magnifying cortisol’s other effects on body composition and reduced immune system function (Lowery & Forsythe, 2006). Highest levels of cortisol correlate with the time of highest training load (Gocentas & Landor, 2012). Typically, these levels return to normal within several hours of an intense training bout, but for athletes who are overtrained cortisol levels remain elevated for extended periods of time (Flynn et al., 1994). Overtraining syndrome is defined as a condition of fatigue and underperformance associated with frequent infections and depression which follows hard training and competition (Budgett, 1998). Symptoms persist despite at least two weeks of rest, and no other medical cause can be identified (Budgett, 1998). Effects of long-term hypercortisolaemia are bone demineralization, muscle catabolism, impaired antimicrobial defense, emotional disturbances. (Flynn et al., 1994).

Research by Perna and McDowell (1995) added further evidence to previous notions that psychological stress may play a role in increasing the effects of cortisol on the body. Their study using elite athletes found that athletes with high life event stress experienced more skeletal muscle symptoms and had a significant increase in cortisol levels post-exercise (Perna & McDowell, 1995). Even though the low-stress group had higher initial cortisol
levels, this was thought to be a prepatory effect, as the levels post-exercise decreased significantly (Perna & McDowell, 1995). Therefore, athletes with high life event stress are more susceptible to injury and illness following exhaustive exercise due to the effects of cortisol (Perna and McDowell, 1995).

A decrease in peripheral vision is another one of the results of the stress effect. A study by Rogers and Landers (2005) looked at 171 high school soccer players, 98 male and 73 female. Each athlete filled out a Life Events Survey for Collegiate Athletes (LESCA), Perceived Stress Scale (PSS), State-Trait Anxiety Inventory (STAI), Perceived Social Support Friends and Family (PSSF), and Athletic Coping Skills Inventory (ACSI) in the first two weeks of their season. Rogers and Landers’ main goal was to see how these things related to stress effects and injuries, with “injury” defined as a medical problem resulting from sport participation that restricted participation for at least one day beyond the day of occurrence. Two times during the season the soccer players were to fill out the STAI and have their peripheral vision tested—first before a practice within the first three weeks of the season and again before an important game (as determined by the head coach). Results support the Williams and Andersen stress-injury model. As expected, they found that with the increased state of anxiety came decreased peripheral vision and that these results were greater before the game than before practice. Correlations were found between both life events stress (LES) and negative life events stress (N-LES) and injury, with an odds ratio of 1.040 for LES and 1.072 for N-LES. But only negative life events stress could predict injuries ($r=0.44$, $p<0.001$). For every one unit increase in stress, there was a 50% chance that the individual would end up in the injured group at some point. As found in other studies, they found that those individuals with increased coping skills had a decreased chance of
being injured. Based on peripheral vision alone, researchers were able to correctly classify almost 70% of the athletes as injured or healthy.

A study by Andersen and Williams (1999) found similar results in 196 Division I college athletes. The stressed condition consisted of performing the Stroop test while listening to a loud distraction tape. A double task test, the Stroop test examines the interference between two tasks (Kapoula, Matheron, Demule, Fauvel, & Bucci, 2011). Andersen and Williams’ study differed from the Rogers and Landers (2005) study in that the participants came from a variety of sports and this test was completed entirely in a laboratory rather than in real-life events—a major limitation, as it is more difficult to apply these results to actual practice and competition environments. Compared to the baseline measures, the athletes showed increased state anxiety and decreased peripheral vision in the stressed condition. They also found that more negative life event stress resulted in an increased likelihood of injury. Although high negative life events and decreased peripheral vision both resulted in an increased risk of injury, there was no correlation between negative life events stress and narrowed peripheral vision (r=0.02).

The way that athletes view their sports can determine whether or not it adds to the athlete’s total negative life stress and results in the aforementioned effects. As mentioned in research by Kimball and Freysinger (2003), stress can be thought of as a transitional process. In this case, it means that competitive athletics can have both positive and negative effects on the athlete. For example, the stress of an important competition could cause an athlete to perform at his or her peak. On the other hand, a bad performance could bring about negative stress for the same athlete. The results that Kimball and Freysinger (2003) found in their work on leisure, stress and coping were quite surprising. Athletics was a source of stress for
some student-athletes, but for others athletics was a coping mechanism that reduced levels of perceived stress (Kimball & Freysinger, 2003).

Moderator variables also play a role in determining whether or not stress leads to an injury. According to Smith, Smoll, and Ptacek (1990), a moderator variable is a variable (qualitative or quantitative) that changes the nature, direction, or strength of a relationship between an independent and dependent variable. In other words, a moderator variable is something that alters the effects of a certain variable. In sport psychology, examples of moderator variables include: social support, sensation-seeking motivation, internal locus of control, or other coping skills (Smith et al., 1990). A conjunctive pattern means that in the case of multiple moderator variables, they must occur in a specific sequence or combination (Smith et al., 1990).

Coping skills and effectiveness are two such moderator variables that are studied in sport psychology research. According to research by Lazarus (2000), athletes must be able to effectively cope with performance stressors in order to be successful in sport. Coping is defined as the conscious attempts individuals make to manage situations that they perceive as stressful and endangering their well-being and can be divided into strategies and dimensions (Nicholls, Polman, Morley, & Taylor, 2009). Strategies for coping are single responses used for managing a stressful demand, while dimensions refer to the purpose the strategy serves (Nicholls et al., 2009). Smith et al. (1990) performed a study looking at social support and coping skill as possible moderator variables affecting the negative life events relationship with athletic injuries in adolescents. Their results showed this conjunctive relationship between social support and coping skills, in that a low amount of both exacerbated the effects of negative life events on athletes. Similarly, a study by Maddison and Prapavessis (2005)
found no correlation between negative life events and injury for people with either low social support or poor coping strategies; however, there was a correlation for subjects who had negative life events in addition to low social support, rather than just one or the other. This shows that there is much more at work in this topic than just one or two isolated factors. A study by Hazzard (2004) looked at the moderation effect as well, but he used competitive trait anxiety and mood as the relationship. High coping skills moderated the negative effects of the trait anxiety and mood.

Another factor that alters the effect of the coping variable is age and development. Compas, Connor-Smith, Saltzman, Harding-Thomsen, and Wadsworth (2001) suggest that the processes that occur during adolescence influence coping, and Nicholls et al., (2009) note that acquiring these strategies often occurs during adolescence. During puberty, the hypothalamic-pituitary-gonadal-axis (HPGA) matures (Nicholls et al., 2009). As it does so, functional adaptations occur to cope more efficiently in order to meet the demands experienced (Nicholls et al., 2009). Therefore, it would appear that pre-pubertal student-athletes would have a more difficult time coping, as their mechanisms are not fully developed.

To address this difference in the pre-pubertal brain, Ebata and Moos (1994) developed a model of adolescent coping involving the role of three factors—personal, situational, and contextual. Personal factors include age, sex, and temperament. Situational factors include different methods of coping used for different situations—challenging/controllable situations use problem-focused efforts or approach, while situations that have to do with threat, loss, or are uncontrollable result in the use of avoidance. Finally, contextual factors have to do with the availability of ongoing resources like family support.
Fewer chronic strains in one’s life results in more approach-oriented mechanisms which deal
directly with the emotion or problem. In addition, the cumulative effects of negative events
appear to impair ability to cope with current and future stresses.

*Current Study*

The current study was modeled after a similar study done at San Jose State University
in 1993 on collegiate basketball players (Rider & Hicks, 1995). They hypothesized that
athletes with lower coping skills and higher levels of stress would experience a greater
number of injuries throughout the season. Their definition of an injury was anything that
restricted participation for one day beyond occurrence. Life event stress was measured using
the Social and Athletic Readjustment Rating Scale (SARRS) and the Athletic Life
Experiences Survey (ALES) while coping skills were measured using the ACSI. Injury
information was collected every day from the head coach, and the coping and stress
inventories were done once at the end of the season. Twenty seven percent of the 67 total
athletes sustained at least one injury throughout the season. The results of the San Jose State
study ended with the researchers rejecting the hypothesis, as there was no relationship
between coping skills, stress, and injury.

The purpose of this study was to: 1) Verify the stress-injury relationship presented in
previous research. 2) Test the results of the San Jose State study. 3) Determine if there is a
difference between high school and collegiate student-athletes due to coping mechanism
differences. The hypothesis was that athletes with higher amounts of stress and lower coping
skills would have more injuries throughout the course of the season and high school athletes
would have lower coping skills, resulting in more injuries throughout the season than the
collegiate athletes.
Methods

Subjects for this study were male and female basketball players at a small Iowa high school and a D-III college. Conditions of this study were approved by the Institutional Review Board of the college. Coaches of all four teams were approached by the principal researcher and gave permission to talk to their teams. The principal researcher explained the study and invited participants at the end of a practice session early in the season. Permission was obtained from the participants and from the parents of all minors. A copy of the consent form is shown in Appendix A. Participants filled out an initial demographics sheet and chose for themselves a participant number that they could easily remember. A copy of the demographic form used is in Appendix B. Surveys were administered online via GoogleDoc using the participant number to ensure anonymity.

Life Events Survey for Collegiate Athletes (LESCA)

The LESC (Appendix C) was used to measure life stress. This survey consists of 58 questions that were adapted and modified to apply to both high school and collegiate athletes. Items were presented as questions, and the athlete was to answer whether or not that event occurred in the last year. If so, the athlete was to indicate the impact it had at the time on an 8-point Likert Scale from -4 (extremely negative) to +4 (extremely positive). Answers were totaled, resulting in two scores—one negative, the other positive (Petrie, 1993).

Athletic Coping Skills Inventory (ASCI)

To measure coping skills, the ASCI (Appendix D) was administered. This tool has been verified by several studies. One such study was done on a group of collegiate baseball players. Though the sample size was relatively small, the results showed that the scores on
the inventory were useful for accurately measuring coping skills, as compared to other methods (Kimbrough, DeBolt, & Balkin, 2007). It consisted of 28 items, divided into seven categories. Scores are added for each category and then summed for a total coping score.

Injury Measurement

For this study, an injury was defined as any occurrence to the body that resulted in at least one missed or modified practice or game. Once a week, an injury log (Appendix E) was sent out containing questions about number of days of missed practice, modified practice, a space to record major stressful events, and a question for females about their menstrual cycle.

Timing of Data Collection

The LESCA and ACI surveys were sent out at baseline, once during the middle of the season, and once at the end of the season. These times were chosen intentionally based on major events in the athletes’ school and competition seasons. Baseline scores were intended to be during a time of “low” stress. The mid-season checkpoint was done during the time of finals, and the ending measures were taken at the start of post-season play. The injury logs were sent out electronically once a week.

Statistical Analysis

Data was collected and analyzed using a One Way-Unstacked ANOVA and unpaired t-tests using Minitab software.
Results

Fifty eight scholastic basketball players consented to the study and responded at least once, but only 24 student-athletes responded to the weekly logs and provided injury data. The mean age of the participants who responded was 19 years, with a standard deviation of 1.77 years (Figure 1). Subjects averaged 10.55 years of experience playing basketball, with a range of 6 to 15 years and a standard deviation of 2.42 years. Of the 24 respondents, 6 were from the high school and 18 were from the college. There were 16 females and 8 males.

![Participant Ages](image)

**Figure 1:** Spread of the ages of participants. Mean age was 19 years, SD was 2.42 years.

Several differences were seen, but none of them were statistically significant. Throughout the course of the season, 11 participants reported at least one injury. Of the 11 injured, 10 identified at least one major life stressor throughout the season as well. Sources of life stressors included: death in the family, school, injuries, and poor performances.
individually and by the team. In total, 16 student-athletes reported that they experienced at least one of these life stressors, with 10 of those 16 suffering an injury at some point during the season. Injured athletes had a lower total stress score on the LESCA than noninjured athletes, but it was not significant ($t = -1.26, P = 0.231$).

High school athletes seemed to have higher coping skills than the collegiate athletes, but it was not statistically significant ($t = 0.37, P = 0.720$). The high school athletes also had higher total stress scores, but again it was not significant ($t = 0.45, P = 0.663$). See Table 1.

### Total Life Event Stress Scores

<table>
<thead>
<tr>
<th></th>
<th>Total Population</th>
<th>High School</th>
<th>College</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>18</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td><strong>Mean (LESCA score)</strong></td>
<td>30.22</td>
<td>32.4</td>
<td>29.39</td>
</tr>
<tr>
<td><strong>Standard Deviation (LESCA score)</strong></td>
<td>12.35</td>
<td>12.58</td>
<td>12.67</td>
</tr>
</tbody>
</table>

**Table 1**: Total life event stress score comparisons for total population, high school athletes, and collegiate athletes. No significant difference was found ($t = 0.45, P = 0.663$).

Athletes who experienced an injury at some point during the season had lower coping skills than those who were not injured ($t = -1.18, P = 0.257$). Athletes who indicated stressful life events occurring throughout the season had lower coping skills, but it was not statistically significant ($t = -0.52, P = 0.620$).

Seven athletes completed the ACSI at each of the three checkpoints throughout the season. Their scores, averages, and standard deviations are shown in Table 2. Five athletes completed the LESCA at all three checkpoints. Their scores, averages, and standard deviations are shown in Table 3.
Coping Skills Throughout the Season

<table>
<thead>
<tr>
<th>Participant 1 (ACSI score)</th>
<th>Preseason</th>
<th>Midseason</th>
<th>Postseason</th>
<th>Average</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 2 (ACSI score)</td>
<td>44</td>
<td>39</td>
<td>42</td>
<td>41.67</td>
<td>2.05</td>
</tr>
<tr>
<td>Participant 3 (ACSI score)</td>
<td>51</td>
<td>49</td>
<td>50</td>
<td>50</td>
<td>0.82</td>
</tr>
<tr>
<td>Participant 4 (ACSI score)</td>
<td>45</td>
<td>43</td>
<td>44</td>
<td>44</td>
<td>0.82</td>
</tr>
<tr>
<td>Participant 5 (ACSI score)</td>
<td>47</td>
<td>43</td>
<td>47</td>
<td>45.67</td>
<td>1.89</td>
</tr>
<tr>
<td>Participant 6 (ACSI score)</td>
<td>44</td>
<td>46</td>
<td>44</td>
<td>44.67</td>
<td>0.94</td>
</tr>
<tr>
<td>Participant 7 (ACSI score)</td>
<td>57</td>
<td>59</td>
<td>57</td>
<td>57.67</td>
<td>0.94</td>
</tr>
<tr>
<td>Average (ACSI score)</td>
<td>47.29</td>
<td>45.57</td>
<td>46.29</td>
<td>46.38</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Table 2: Coping skills as measured by the ACSI for seven participants who completed the survey at three separate times throughout the season. No statistically significant relationship was found (F = 0.15, P = 0.863)

Life Event Stress Throughout the Season

<table>
<thead>
<tr>
<th>Participant 1 (LESCA score)</th>
<th>Preseason</th>
<th>Midseason</th>
<th>Postseason</th>
<th>Average</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 2 (LESCA score)</td>
<td>44</td>
<td>39</td>
<td>28</td>
<td>37</td>
<td>6.68</td>
</tr>
<tr>
<td>Participant 3 (LESCA score)</td>
<td>43</td>
<td>34</td>
<td>44</td>
<td>40.33</td>
<td>4.50</td>
</tr>
<tr>
<td>Participant 4 (LESCA score)</td>
<td>22</td>
<td>8</td>
<td>32</td>
<td>20.67</td>
<td>9.84</td>
</tr>
<tr>
<td>Participant 5 (LESCA score)</td>
<td>24</td>
<td>40</td>
<td>33</td>
<td>32.33</td>
<td>6.55</td>
</tr>
<tr>
<td>Participant 6 (LESCA score)</td>
<td>22</td>
<td>10</td>
<td>0</td>
<td>10.67</td>
<td>8.99</td>
</tr>
<tr>
<td>Average (LESCA score)</td>
<td>31</td>
<td>26.2</td>
<td>27.4</td>
<td>28.2</td>
<td>2.04</td>
</tr>
</tbody>
</table>

Table 3: Total life event stress scores as measured by LESCA for five participants who completed the survey at three separate times throughout the season. No statistically significant relationship was found (F = 0.14, P = 0.868).
Discussion

The results of this study match those of the San Jose State study, after which this study was modeled. No statistically significant relationships were found between life event stress and injuries in neither the high school nor the collegiate student-athletes. While the current and the San Jose State studies found no relationship between injury and life event stress, it should be noted that there is great variability among the research. For example, Andersen and Williams (1999) and Galambos et al. (2005) found there was a relationship between negative life events and injuries in a variety of Division I athletes. Rogers and Landers (2005) and Ivarsso et al. (2013) found this same relationship in soccer players. Some studies, on the other hand, only find this relationship in certain conditions. For example, Maddison and Prapavessis (2005) found a positive relationship between life stress and injury in rugby players, but only when they looked at specific coping skills. Similarly, Smith et al. (1990) found the relationship only for those high school athletes low in both coping skills and social support. Another factor likely responsible for some of this variability is the difference in definitions and measurements of population, injuries, exposure time, and time lost (Messina et al., 1999).

As mentioned in the San Jose State research, the specific sport used in the research can be another variable to explain differences among research (Rider & Hicks, 1995). High-contact sports such as football and rugby are the ones that have seen this relationship most clearly, which could be caused by a larger, more robust population (Meyers 2001; Rozen & de L. Horne, 2007).
The hypothesis that high school student-athletes would have lower coping skills was rejected in favor of the null hypothesis that there is no difference. One of the reasons for not seeing these results is that the coping assessment method used (ACSI) may not be best fit for adolescents. Properly assessing the coping mechanisms of adolescents is something that has been under debate for several years, as it is unclear whether or not the current methods are sufficient due to the lack of research needed to formulate an accurate assessment (Garcia, 2010). In addition, this study used chronological age as a marker of puberty and maturity, while some research suggests that pubertal status is a more accurate marker of development (Nicholls et al., 2009).

Limitations

Several issues and problems arose throughout the course of this study that would need to be modified for future research. As with any prospective cohort study, the biggest issue came from participant dropout. Initially, 58 subjects were recruited and consented to participate. Only 24 responded to the logs, and only 18 subjects completed all of the surveys and were able to be used for analysis. Because of this, the sample size was very small, especially for making comparisons among specific groups.

Administrating the studies via email presented several benefits. It was good in that the participants could do it on their own time, there was no paperwork to track down every week, and all students have active email accounts. However, this method also presented some confounding variables and limitations. The timing that the subjects took the surveys was not controlled—a student taking the survey first thing in the morning could differ greatly from a student taking it right after a difficult test. Having the study take place exclusively
online also made it seem less “real.” This also presented the subjects with the opportunity to avoid filling out the materials, as there was no researcher present to force completion. Therefore, they did not feel like they had to fill out the surveys; it became easy for it just to become another email in a full inbox. In addition, some young people are not very habitual about checking emails and responding promptly.

Additionally, during extremely stressful times, it is unlikely that the student would take time out to fill out a study that is somewhat meaningless for them. Even though there was opportunity for monetary compensation, that opportunity took a lower priority than school and athletic work. This presents an opportunity for exclusion of some of the most meaningful data. Finally, this study itself could have been perceived as stressful for the student athletes based on some of the questions asked making them recall stressful events, and putting off other work.

**Future Research**

Future research is needed to verify these results and to see if they extend to the population of athletes as a whole. To do this, a greater number of teams and athletes need to be involved. Other opportunities for research could include: comparing different types of sports, implementing interventions, and examining the time that it takes for stress to translate into injury. Possible subcategories that could be compared include: DIII compared to DI or DII, males compared to females, athletes taking anti-anxiety or anti-depressant drugs compared to those not taking drugs, or “individual” sports, such as cross country and gymnastics, compared to “team” sports, such as basketball and football.
Conclusions

Although the sample size was rather small and differences statistically insignificant, results the stress-injury model does not hold for the sport of basketball are consistent with other research done in the sport of basketball. This includes the San Jose State University study, which served as a model for this study. High school and collegiate athletes were not significantly different in their amounts of stress, injuries, and coping mechanisms which goes against the hypothesis presented. This was surprising, as it would appear that the effects of stress would make athletes more vulnerable to injuries, especially for those who cannot cope with their stress as well. Although no differences were statistically significant, the effects of stress on the performance of athletes should still be considered. The amount of stress being placed on young athletes is growing, so we may see additional effects appearing not only in athletics and injuries, but also in areas such as mental well-being and chronic illness. Coaches and parents need to make sure their athletes are well-equipped to handle the many stresses that they face before placing them in the competitive environment.
Appendix A

Consent form for College Student Participation

Purpose and Procedures: This study is intended to assess the relationship between stress and injuries in high school and collegiate basketball players. If you agree to take part in this research, you will be asked to complete two surveys three times during the season and a weekly injury log. The surveys and logs will be completed online. The surveys will take approximately 20 minutes to complete, and the logs will take about 5 minutes each week.

Voluntariness: Your participation in this research is voluntary. You may refuse to participate, discontinue participation, or skip any questions you don’t wish to answer at any time without penalty or loss of the benefits to which you are otherwise entitled. Your decision will not affect your grades or status at Central College or on the basketball team.

Risks and Benefits: This study does not involve any type of physical risk. You will be asked to answer questions about your experiences in school, on the team, life stress, and coping abilities. Some of the questions may be embarrassing or remind you of unhappy past experiences. There are some questions about drug and alcohol use, however, this will not be reported to school officials, coaches, or authorities.

Compensation: With your consent, you will be entered into a drawing for a gift card to a local restaurant by completing the study.

Confidentiality: Only the principal researcher will have access to research results associated with your identity. In the event of publication of this research, no personally identifying information will be disclosed. To make sure your participation is confidential, please do not provide any personally identifying information on the questionnaires and place your signed consent form and completed tests in separate envelopes.

Who to Contact with Questions: Questions about this research study should be directed to the primary investigator and person in charge, Melony McDermott, or her supervisor, Dave Pavalt. They can be reached at mcdermottm1@central.edu and pavlatd@central.edu. Questions about your rights as a research participant should be directed to the Dustin Briggs, head of the Central College Institutional Review Board, at briggsd@central.edu. You will receive a copy of this consent form.

I certify that I have read this form and volunteer to participate in this research study.

______________________________
(Print) Name

______________________________ Date: ________________
Signed Name
GUARDIAN AUTHORIZATION:

Purpose: Your child is invited to participate in a research study conducted by Melony McDermott from the Central College Exercise Science Department. I hope to better understand the relationship between stress and injuries in high school and collegiate basketball players. Your child was selected as a possible participant in this study because he/she is on the boys/girls basketball team at Pella Community High School.

Procedures: If you decide to allow your child to participate, he/she will be asked to complete two surveys three times during the season and a weekly injury log. The surveys and logs will be completed online. The surveys will take approximately 20 minutes to complete, and the logs will take about 5 minutes each week.

Risks and Benefits: This study does not involve any type of physical risk. Your child will be asked to answer questions about your experiences in school, on the team, life stress, and coping abilities. Some of the questions may be embarrassing or remind them of unhappy past experiences. There are some questions about drug and alcohol use, however, this will not be reported to school officials, coaches, or authorities. There are no benefits directly from this study.

Compensation: With your consent, you will be entered into a drawing for a gift card to a local restaurant by completing the study.

Confidentiality: Only the principal researcher will have access to research results associated with your identity. In the event of publication of this research, no personally identifying information will be disclosed. Any information that is obtained in connection with this study and that can be identified with your child will remain confidential and will be disclosed only with your permission or as required by law. Subject identities will be kept confidential through coded numbers.

Voluntariness: Your child’s participation is voluntary. Your decision whether or not to allow our child to participate will not affect your or your child’s relationship with Pella Community High School. If you decide to allow your child to participate, you and/or your child are free to withdraw your consent and discontinue participation at any time without penalty.

Questions: If you have any questions about the study, please feel free to contact me at 641-512-6341 or mcdermottm1@central.edu. You can also contact my advisor, Dave Pavlat, at pavlatd@central.edu.

Your signature indicates that you have read and understand the information provided above, that you willingly agree to allow your child to participate, that you and/or your child may withdraw your consent at any time and discontinue participation without penalty, that you will receive a copy of this form, and that you are not waiving any legal claims.

Parent Signature ____________________________ Researcher Signature __________________________

Date ____________________________ Date ____________________________
Appendix B

Gender: _____ Male  _____ Female

Age: _________

Year in school: __________________

Race/Ethnicity:
- American Indian/Native American
- Asian
- Black/African American
- Hispanic/Latino
- White/Caucasian
- Pacific Islander
- Other

Religious Preference
- A. Christian/Catholic
- B. Christian/Non-Catholic
- C. Jewish
- D. Muslim
- E. Other _____________

Number of years playing basketball (at all levels): ______________

Position on team: _______________

Any current injuries:

Previous serious injuries (requiring surgery and/or sitting out more than 6 weeks):
Appendix C

Note: The Likert-scale was used in places of blanks, so the participant only had to click on a button to answer each question.

Life Events Survey for Collegiate Athletes
Listed below are 56 events that sometimes occur in the lives of collegiate athletes. These events often produce change within and individual’s life that require some adjustment by the individual. For each event that you have experienced within the last year (12 months).

1) Place a check under the column 0 months to 1 year to indicate that you experienced the event within the last year. Please make sure that each check corresponds to the event that has happened to you in the 1-year time-frame. Remember, only respond to those events that you have experienced within the last 12 months. If you have not experienced the event within the twelve months, leave the item blank.

2) Indicate what kind of effect it had on your life when the event occurred. A rating of -4 would indicate that the event had an extremely negative effect on you. A rating of +4 would indicate that the event had an extremely positive effect on you. For those events that have happened more than once, indicate the average effect across all occurrences.

The events are listed in no particular order, and there are no right or wrong answers. Please respond to each event honestly as applies to you.

<table>
<thead>
<tr>
<th>Occurred in last 1 year</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Marriage</td>
<td></td>
</tr>
<tr>
<td>2) Death of mate (spouse, significant other)</td>
<td></td>
</tr>
<tr>
<td>3) Major change in sleeping habits</td>
<td></td>
</tr>
<tr>
<td>4) Death of close family members</td>
<td></td>
</tr>
<tr>
<td>a) Father</td>
<td></td>
</tr>
<tr>
<td>b) Mother</td>
<td></td>
</tr>
<tr>
<td>c) Brother</td>
<td></td>
</tr>
<tr>
<td>d) Sister</td>
<td></td>
</tr>
<tr>
<td>e) Grandfather</td>
<td></td>
</tr>
<tr>
<td>f) Grandmother</td>
<td></td>
</tr>
<tr>
<td>g) Other</td>
<td></td>
</tr>
<tr>
<td>5) Major change in eating habits</td>
<td></td>
</tr>
<tr>
<td>6) Death of close friend(s)</td>
<td></td>
</tr>
<tr>
<td>7) Outstanding personal achievement</td>
<td></td>
</tr>
<tr>
<td>8) Being fired from job</td>
<td></td>
</tr>
<tr>
<td>9) Being apart from mate due to sport</td>
<td></td>
</tr>
<tr>
<td>10) Serious illness or injury of close family member</td>
<td></td>
</tr>
<tr>
<td>a) Father</td>
<td></td>
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<tr>
<td>b) Mother</td>
<td></td>
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<tr>
<td>c) Brother</td>
<td></td>
</tr>
<tr>
<td>d) Sister</td>
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</tbody>
</table>

23
e) Grandfather
f) Grandmother
g) Other

11) Major change in the number of arguments with mate

12) Major personal injury or illness

13) Major change in the frequency of social activities due to participation in sport

14) Serious illness of close friend

15) Breaking up with mate

16) Engagement

17) Academic probation/ineligibility

18) Failing an important exam

19) Major change in the relationship with coach

20) Failing a course

21) Major change in the length and/or conditions of practice/training

22) Major change in relationship with family member(s)

23) Major change in the amount of academic activity

24) Pressure to gain/lose weight—due to participation in sports

25) Discrimination from teammates/coaches

26) Suspended from team for nonacademic reasons

27) Trouble with academic counselor

28) Major change in use of alcohol/drugs

29) Major change in relationship(s) with friend(s)

30) Recovery from illness/injury/operation

31) Major change in level of athletic performance in actual competition

32) Divorce or separation of your parents

33) Major change in level of responsibility on team

34) Not attaining personal goals in sport

35) Major change in playing status on team

36) Injury to teammate(s)

37) Being absent from school (classes) because of participation in sport

38) Troubles with athletic association and/or athletic director

39) Difficulties with trainer/physician

40) Major change in playing time due to injury

41) Major errors/mistakes in actual competition

42) No recognition/praise of accomplishments from coaching staff

43) Pressure from family to perform well

44) Loss of confidence due to injury

45) Unable to find a job

46) Change in coaching staff

47) Female: menstrual period/PMS

48) Major change in level of academic performance

49) Making career decisions

50) Continual poor performance of team

51) Change in graduation schedule
<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>53) Major change in family finances</td>
<td></td>
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<tr>
<td>54) Major change in attitude toward sport</td>
<td></td>
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<tr>
<td>55) Victim of harassment/abuse (sexual, emotional, physical)</td>
<td></td>
</tr>
<tr>
<td>56) Victim of personal attack (rape, robbery, assault, etc.)</td>
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</tr>
</tbody>
</table>

Other events might have occurred to you in the past year (and affected you in a positive or negative manner) but were not included in this list. If there were such events, please list them below.

____________________________________________________

____________________________________________________

____________________________________________________
Appendix D

Note: The Likert-scale was used in places of blanks, so the participant only had to click on a button to answer each question.

Athletic Coping Skills Inventory-28

Directions: A number of statements that athletes have used to describe their experiences are given below. Please read each statement carefully and then recall as accurately as possible how often you experience the same thing. There are no right or wrong answers. Do not spend too much time on any one statement. Please put an X in the circle that indicates how often you have these experiences when playing sports

1) On a daily or weekly basis, I set very specific goals for myself that guide what I do
2) I get the most out of my talent and skills.
3) When a coach tells me how to correct a mistake I’ve made, I tend to take it personally and get upset.
4) When I’m playing sports, I can focus my attention and block out distractions.
5) I remain positive and enthusiastic during competition, no matter how badly things are going.
6) I tend to play better under pressure because I think more clearly.
7) I worry quite a bit about what others think of my performance.
8) I tend to do lots of planning about how to reach my goals.
9) I feel confident that I will play well.
10) When a coach or manager criticizes me, I become upset rather than helped.
11) It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to.
12) I put a lot of pressure on myself by worrying about how I will perform.
13) I set my own performance goals for each practice.
14) I don’t have to be pushed to practice or play hard; I give 100%.
15) If a coach criticizes or yells at me, I correct the mistake without getting upset about it.
16) I handle unexpected situations in my sport very well.
17) When things are going badly, I tell myself to keep calm, and this works for me.
18) The more pressure there is during a game, the more I enjoy it.
19) While competing, I worry about making mistakes or failing to come through.
20) I have my game plan worked out in my head long before the game begins.
21) When I feel myself getting too tense, I can quickly relax my body and calm myself.
22) To me, pressure situations are challenges that I welcome.
23) I think about and imagine what will happen if I fail or screw up.
24) I maintain emotional control regardless of how things are going for me.
25) It is easy for me to direct my attention and focus on a single object or person.
26) When I fail to reach my goals, it makes me try even harder.
27) I improve my skills by listening carefully to advice and instruction from coaches.
28) I make fewer mistakes when the pressure is on because I concentrate better.

Almost Never, Sometimes, Often, Almost Always

26
Appendix E

Injury Report
  ______ Number of days of missed practice
  ______ Number of days of modified practice (taping, unable to do certain activities, etc.)
Part of the body affected:

Stress
- Did you experience anything this week that increased your stress?

For Women Only
First day of menstruation:
References


