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The relationship between stress and injury in junior college basketball

Julie Ann Finck
San Jose State University

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**THE RELATIONSHIP BETWEEN STRESS AND INJURY
IN JUNIOR COLLEGE BASKETBALL**

A Thesis

Presented to

**The Faculty of the Department of Human Performance
San Jose State University**

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Julie Ann Finck

December 2000

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APPROVED FOR THE DEPARTMENT OF HUMAN PERFORMANCE

Dr. David Furst, Chair

Dr. Barbara Conry

Dr. Bethany Shifflett

APPROVED FOR THE UNIVERSITY

ABSTRACT

THE RELATIONSHIP BETWEEN STRESS AND INJURY IN JUNIOR COLLEGE BASKETBALL

By Julie A. Finck

This thesis investigated the relationship between life stress and athletic injury using coping skills as a moderator. Male and female athletes participating in basketball at two junior colleges in the San Francisco Bay Area during the 1999-2000 season were included. Stress levels and coping skills were measured using the Social and Athletic Readjustment Rating Scale and the Athletic Coping Skills Inventory-28, respectively. Injury data was collected from athletic trainers at each school, including number of injuries, number of days out due to injury, and injury severity.

No statistically significant results were obtained. However, there was a trend for athletes with fewer injuries to have lower stress and higher coping skills. Athletes with more injuries showed a tendency for higher stress and lower coping skills. Freshmen and females had higher stress and lower coping skills compared to sophomores and males, respectively. Further research is warranted.

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CHAPTER 1

INTRODUCTION

Despite advances in the technology of safety equipment, injuries in all sports are increasing. Kraus and Conroy (1984) stated that an estimated 5-6 million athletic and recreational injuries occur in the United States each year. This may be due in part to an increase in the number of participants, but many other factors must be considered.

In the past, injuries have been attributed to physiological factors such as lack of training or overtraining, equipment, type of sport, and other environmental factors such as playing field conditions or weather conditions (Blackwell & McCullagh, 1990). However, as early as the 1940's, Adolph Meyer proposed several non-physiological factors related to injury, including changes in habitat, entrance into a new school, graduation, changes in amount of failures, important family births and deaths, and other environmental influences (Ieif, 1948). All of these occurrences can be sources of stress for athletes. In turn, these stressors can be one of the many factors contributing to an injury. Currently, explanations for the stress-injury relationship in athletes are numerous. They include physiological, as well as psychological, explanations (Hanson, McCullagh, & Tonymon, 1992; Kerr & Minden, 1988; Lysens, Vanden Auweele, & Ostyn, 1986).

Numerous researchers have proposed various physiological mechanisms which attempt to explain why there is an increased risk for sustaining injuries in athletes with high levels of life stress. One such mechanism is that stress can lead to greater muscle tension which can decrease flexibility, leading to injury (Blackwell & McCullagh, 1990; Bramwell, Masuda, Wagner, & Holmes, 1975; Cryan & Alles, 1983; Williams,

Tonymon, & Wadsworth, 1986). It is also reported that individuals may narrow their field of vision and not recognize environmental cues that would aid them in avoiding potential injury producing situations (Blackwell & McCullagh, 1990; Williams, Tonymon, & Anderson, 1991).

Other researchers have found psychological mechanisms which attempt to explain the stress-injury relationship. For example, Thompson and Morris (1994) detected a negative relationship between focused attention and injury. As an individual player's ability to focus attention increased, risk of sustaining an injury significantly decreased. Lysens et al. (1986) presented similar findings that preoccupation with life events may alter concentration on the game and increase the chance of sustaining an injury. They also reported that life stress could contribute to the blocking of adaptive responses during potentially dangerous athletic situations.

Even though significant relationships between life stress and injury have been found, much of the previous research has focused on male athletes (Coddington & Troxell, 1980; Thompson & Morris, 1994), and more specifically, collegiate football players (Blackwell & McCullagh, 1990; Cryan & Alles, 1983; Petrie, 1993).

Similarly, very few studies have examined the stress-injury relationship in female athletes, and the results have been mixed (Kerr & Minden, 1988; Rider & Hicks, 1995; Williams et al., 1986). Williams et al. agreed with the findings that the life stress-injury relationship existed in the contact sport of football, but found that it did not generalize to the non-contact sport of volleyball. The stress-injury relationship needs to be investigated further using female athletes competing outside the traditional female sports.

Additionally, the majority of research has focused on the 4-year collegiate setting (Blackwell & McCullagh, 1990; Cryan & Alles, 1983; Hansen et al., 1992; Lysens et al., 1986; Petrie, 1993; Rawson, Bloomer, & Kendall, 1994). A few studies have focused on high school football players (Coddington & Troxell, 1980; Thompson & Morris, 1994), but once again few studies have focused on a variety of sports and female athletes. Rider and Hicks (1995) suggested that the life stress-injury relationship may be specific to certain sports and needs to be investigated in a wider range of settings.

The occurrence of an injury is a multi-faceted problem. Past research has shown there to be a relationship between life stress and athletic injury. The focus of this study was to further examine this relationship in the sport of basketball for both males and females at the junior college level.

Statement of the Purpose

The purpose of this study was to investigate the relationship between life stress and athletic injury in junior college athletes using coping skills as a moderating variable. The relationship was examined for both males and females in the sport of basketball. This sport was selected to provide for a comparison of males and females competing in the same sport. Stress levels were determined for each athlete using a questionnaire based on the Social and Athletic Readjustment Rating Scale (Bramwell et al., 1975). The coping skills of each athlete was measured using the Athletic Coping Skills Inventory-28 (Smith, Smoll, Schutz, & Ptacek, 1995). The stress score and coping skills score of each athlete were compared to the number of injuries sustained by each athlete and the number

of games and practices missed because of injury. Any differences in stress scores, injury rates, and the stress-injury relationship between genders were investigated.

Significance of the Study

As athletic participation continues to increase, the number of injuries as a result of such participation increase as well (Kelley, 1990). The use of safety equipment and proper instruction do not prevent all injuries. There are many other factors contributing to the occurrence of an injury. These factors may include stress and lack of the ability to cope with stressors.

Delimitations

- 1) The subjects for this study included male and female athletes competing in the sport of basketball during the 1999-2000 academic year at two junior colleges in the Greater San Francisco Bay Area.
- 2) Only subjects between the ages of 18-23 were considered for the study.

Limitations

The use of a retrospective life stress questionnaire was a limitation of this study. Memory was involved and accurate recall of past life events could not be ensured. Also, it could not be certain that all questions were answered truthfully. Other limitations included the accuracy of injury evaluations, as well as the problem of whether an athlete sought medical attention for a particular injury. Two athletes with identical injuries may or may not have sought medical attention. Finally, an athlete may not have returned to play following an injury, decreasing his/her chances for multiple injuries.

Limitations also existed when calculating the days an athlete did not participate due to an injury. The number of practices and games missed may have been affected by the athlete's desire to return to play, the athlete's perceived importance of any upcoming competition, and whether or not an adequate substitute was available to replace the injured athlete.

Assumptions

The following assumptions were made regarding the present study:

1. All injuries were promptly reported to the medical staff.
2. Injury rates were accurately recorded.
3. The data from questionnaires and scales used were reliable and valid.
4. Subjects answered all questions truthfully and to the best of their ability.

Null Hypotheses

The null hypothesis was that the stress-injury relationship did not exist for any of the included subjects, regardless of gender, using coping skills as a moderating variable. The alternative hypothesis was that the stress-injury relationship did exist for athletes with low coping skills at the junior college level in the sport of basketball. The dependent variable was the number of days an athlete was held out of practice or competition due to injury. The independent variable was stress level and level of coping skills was the moderating variable.

Definition of Terms

Injury. An injury was any complaint by an athlete requiring the attention of an athletic trainer or team physician and classifiable using the Colorado Injury Reporting System (Hanson et al., 1992).

Days Out. A day out was any game or practice which was missed because of injury. The day an athlete was injured was considered day one.

Stress. "Stress is the emotional, psychological, or social response we experience in a challenging or threatening situation for which we may not have effective coping skills." (Wardenburg Health Center, 1998).

Summary

Further knowledge of the causes of athletic injury serves to help prevent the occurrence of such injuries. One suspected cause of athletic injury is that of life stress. Limited research is available concerning the relationship between life stress and athletic injury in junior college athletes, and specifically, female athletes. This study focused on the role of stress as related to injury frequency and severity in male and female athletes at the junior college level in the sport of basketball.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this research study was to investigate the relationship between life stress and athletic injury in junior college basketball. This chapter will present literature focusing on the relationship between life stress and athletic injury in various populations. Comparisons and contrasts will be noted. Methodological concerns of past research will be discussed.

The relationship between stress and physical illness has been documented for decades. Holmes and Rahe (1967) reported a significant relationship between an increase in events that require adaptive or coping resources in the individual and the onset of illness. From this research they developed the Social Readjustment Rating Scale (SRRS), which assessed an individual's stress level based on life events he or she had experienced in the past 12 months.

Several studies support the stress-illness relationship. For example, Rawson et al. (1994) used a college population to investigate the relationships between stress, anxiety, depression, and physical illness. Anxiety seemed to be an intervening variable between stress and physical health when focusing on the stress-illness and anxiety-illness relationships. The authors also found that both stress and anxiety varied across year in school, with sophomores having the highest mean levels of anxiety.

The stress-illness relationship has been applied to injuries as well. In a study of first year college physical education students, those who had experienced a high level of life change were at an increased risk of incurring acute injuries compared to students who

experienced lower amounts of life change (Lysens et al., 1986). Other research has focused on determining the extent of the stress-injury relationship in organized athletic situations, specifically in high school football (Coddington & Troxell, 1980; Thompson & Morris, 1994), college football (Cryan & Alles, 1983; Petrie, 1993), and gymnastics at the elite level (Kerr & Minden, 1988).

Stress-Injury Relationship in Football

Numerous research studies have been conducted to determine the relationship between stress and injury in the sport of football. Coddington and Troxell (1980) reported that in a study of high school football players, those experiencing recent instability in family relations; parental illness, separation, or divorce; or death of a parent had an increased risk of sustaining moderate to severe injuries. Thompson and Morris (1994) supported these findings in another study of adolescent football players. They reported that 33% of the athletes being studied were injured within a single playing season. Of those injured, many had experienced a stressful event in the previous year.

In addition, Bramwell et al. (1975) determined that the risk of injury for football players increased directly with an accumulation of life events that were challenging to the athletes. This study was replicated by Passer and Seese (1983) using two separate football teams from different divisions, one from the NAIA and one from NCAA Division I. The results showed a significant relationship between negative, but not positive, life change for only the team competing at the NAIA level. The authors suggest that further research is needed to determine the role of any moderating variables in the life stress-injury relationship.

Another in-depth study also concluded that football players at the collegiate level with increased levels of life change were at a higher risk of sustaining an injury than players with low levels of life change (Cryan & Alles, 1983). The authors also reported that players were more likely to experience multiple, less serious injuries during the season when they had high levels of life stress. However, these athletes were not at increased risk for experiencing a major injury, which normally results in time lost from practice and competition and/or the possibility of surgical intervention.

Researchers have focused on specific groups within the football team to determine other links between life stress and injury. Thompson and Morris (1994) found that all positions had higher injury rates than the lineman. However, positions such as wide receivers, split ends, and running backs displayed a statistically increased likelihood of sustaining an injury compared to linemen and other positions. This may partially be attributed to the fact that these positions are receiving hits from other players rather than generating them, and are due to the forces of acceleration which tend to be working against them in athletic situations.

Petrie (1993) investigated potential differences in the injury rates of starting versus non-starting collegiate football players, as well as whether the playing status of an athlete was related to life stress and social support as predictors of experiencing an injury. He concluded that similar levels of life stress and social support are experienced in both starting and non-starting athletes. It was found that social support balanced negative life stress in its relationship to injury in starting football players. In other words, even though

the stress levels of some of the athletes were high, a high level of social support helped the athletes cope with these stressors.

Stress-Injury Relationship in Females

Another study was conducted to determine the effect of social support on the life stress-injury relationship (Hardy et al., 1991). The researchers concluded that several components of social support were indicative of the frequency of injury among male collegiate athletes. However, no relationship was found between life stress-social support and injury in female athletes. Lysens et al. (1986) also found no relationship between psychosocial factors and the occurrence of overuse injuries, which occur as a result of repeated training.

Kerr and Minden (1988) reported research findings of the stress-injury relationship in women's gymnastics, a sport they reported having injury rates as high as 70%. They reported that gymnasts tended to suffer more injuries, as well as more severe injuries, when they experienced more life stressors. The researchers also noted a pattern of increased injury rates as the athletes approached competition situations. The authors proposed that this increase could be due to an increase in training intensity, or increased anxiety and stress because of the upcoming competition.

In summary of the findings of the past 20 years, Williams et al. (1991) stated that football players experiencing high levels of life stress were two to five times as likely to suffer an injury when compared to those with low or moderate levels of stress. It is possible that the relationship is found in the sport of football because of the high rate of severe injuries among these athletes (Rider & Hicks, 1995). However, the fact that

numerous studies have focused on football limits the generalizability of these findings (Hardy & Riehl, 1988). Suggestions for further study were to conduct the same studies with female athletes and/or with other athletic teams (Petrie, 1993), and to take into account the amount of time each individual athlete spends on the field in relationship to the number of injuries sustained (Thompson & Morris, 1994).

Explanations for Stress-Injury Relationship

The occurrence of an injury is a complex phenomenon with several contributing factors. Past research has focused on physiological factors related to training, such as poor conditioning, overtraining, faulty equipment, or type of sport. As stated previously, in the 1940's, Meyer proposed several non-physiological factors contributing to injury occurrence, including changes in habitat, entrance into a new school, graduation, changes in amount of failures, and important family events (Ieif, 1948). Current research supports a complex explanation for the stress-injury relationship, including physiological and psychological components.

Several researchers have proposed various physiological and psychological mechanisms which attempt to explain why athletes with high life stress are at an increased risk for sustaining injuries. One such mechanism may be that stress can lead to greater muscle tension, which can alter flexibility and lead to injury (Blackwell & McCullagh, 1990; Bramwell et al., 1975; Cryan & Alles, 1983; Williams et al., 1986). If an athlete experiences too many life stressors, as well as the stressors associated with a particular sport, injury may occur as a result of the body's inability to adapt or cope with this stress sufficiently (Hardy & Riehl, 1988). It is also reported that individuals

experiencing stress may narrow their field of peripheral vision and fail to respond to environmental cues that would aid them in avoiding situations in which injury is likely (Blackwell & McCullagh, 1990; Williams et al., 1991).

Researchers have found other mechanisms which attempt to explain the stress-injury relationship. An accumulation of psychological stressors may interrupt an athlete's mental functioning and inhibit physical conditioning to an extent that injury occurs or is prolonged (Kelley, 1990). For example, Thompson and Morris (1994) detected a negative relationship between focused attention and injury. As an individual player's ability to focus attention increased, the athlete was at a significantly decreased risk of sustaining an injury. The researchers also determined that too much or too little aggression, which was measured by outwardly directed anger, also increased an athlete's chances of injury occurrence.

Lysens et al. (1986) supported the findings that preoccupation with life events may alter concentration on the game and increase the likelihood of injury. It was also stated that life stress could contribute to the blocking of adaptive responses during potentially dangerous athletic situations. Bramwell et al. (1975) previously reported that possible effects of life change were to interrupt concentration or perception of environmental cues, as in failing to sense the blind side block, and/or to block adaptive responses previously learned by the athlete when potentially hazardous situations are recognized, commonly termed "freezing up".

Similarly, Hardy et al. (1991) reported additional findings which showed that an increase in injury frequency was associated with an increase in total life change. These

changes could distract or increase the physiological arousal of the individual, resulting in attentional conflict and/or a decrease in motor coordination. Finally, Ryde (1965) proposed that nearly 30% of athletic injuries were primarily caused by psychosocial factors and that these factors needed to be addressed by medical personnel and coaches.

All of these findings were combined into a model of predisposing factors to athletic injury (Anderson & Williams, 1988). The authors concluded that injury occurrence is influenced by the stress response of the athlete. These factors include cognitive appraisal; physiological and attentional aspects; history of stressors such as life events, daily hassles, and previous injury; and, personality aspects such as coping resources and social interventions.

Measures of Stress

Support for the notion that life change stress is associated with the occurrence of athletic injury, in the same way as it is related to the risk of physical illness, continues to increase. In order to measure the psychological influences on injury risk, Bramwell, et al. (1975) researched the specific experiences of athletes and revised the Social Readjustment Rating Scale (SRRS) to create the Social and Athletic Readjustment Rating Scale (SARRS). Situations which did not pertain to collegiate athletes were eliminated and replaced with more relevant situations.

The researchers then investigated whether acute trauma and injury would be linked to increased perception of stressful life events. A significant relationship was reported between perceived stressful life events and the risk of athletic injury. The

authors determined that a positive relationship existed between changes occurring in an athlete's life and the likelihood of experiencing an injury (Bramwell et al., 1975).

Blackwell and McCullagh (1990) used the Athletic Life Event Scale (ALES), devised to assess stressful events such as death, divorce, or family illness, as well as problems with coaches or changes in playing status, to study the stress-injury relationship in collegiate athletes. The scale was developed to determine whether stressful events had a positive or negative effect, as well as the magnitude of the effect. Although no statistical differences were found between injured and non-injury groups, there were trends. Specifically, injured players had high scores on the ALES, as well as high factors of life stress, daily hassles and competitive anxiety, and lower coping resources compared to non-injured players. It was also determined that those who scored high on the ALES had a higher percentage of severe injuries when compared to those with low scores.

Methodological Concerns of Previous Research

Very few studies have examined the stress-injury relationship outside the sport of football, particularly in female athletes, and the obtained results have been mixed (Hardy & Riehl, 1988; Kerr & Minden, 1988; Williams et al., 1986). Hardy and Riehl determined that male and female injured athletes in the non-contact sports of baseball, softball, track, and tennis experienced significantly higher levels of negative life change during the previous 12 months than those who were not injured. Their findings showed that athletes were injured more frequently, but not more severely, when they experienced higher levels of total life change. Williams et al. (1986) agreed with the findings that the life stress-injury relationship existed in the contact sport of football, but found that it did

not generalize to non-contact sports. In their study of collegiate female volleyball players, they found no association between stress factors and injury occurrence. If the stress-injury relationship does not exist for female athletes, lack of a relationship might be due to the difference in which female athletes manage their stressful experiences and the suggestion that females maintain sources of social support that are more stable and constant (Hardy et al., 1991).

It has been shown that there are several moderating variables in the life stress-injury relationship, including coping resources, state anxiety, social support, cognitive appraisal, and attentional aspects (Anderson & Williams, 1988). The suggestion that stress injury relationship may be moderated by the coping resources of an athlete has led to the development of specific questionnaires designed to measure coping abilities. Smith et al. (1995) have developed and validated the Athletic Coping Skills Inventory-28. This questionnaire is specifically designed to assess the coping resources of athletes.

In contrast to the findings of Williams et al. (1986) indicating no stress-injury relationship in the sport of volleyball, are the research results of the study by Kerr and Minden (1988), who found a significant relationship between stress and injury in the sport of women's gymnastics. Further investigations need to be conducted to determine whether the stress-injury relationship exists in female athletes. If the relationship does exist, coaches and players need to be aware of this so stress management and reduction techniques may be implemented.

The National Athletic Injury Reporting System (NAIRS) was used by Cryan and Alles (1983) to classify injuries in their study of the stress-injury relationship in

collegiate football players. Specifically, the scale classifies injuries into minor, moderate, and severe categories. A minor injury allows a player to return to play within 7 days of injury occurrence. Moderate injuries are those that require 8-21 days before returning to play. Only when an athlete is unable to participate for more than 21 days, is the injury considered severe.

The failure in finding a relationship between stress and injury in female collegiate volleyball players (Williams et al., 1986) has been attributed to the use of the NAIRS. It is argued that this system of injury classification is not sensitive enough to detect a slight relationship which may exist in non-contact sports that have low risk of injury (Blackwell & McCullagh, 1990).

Studies only comparing stress to the number of injuries sustained are also open to criticism. An athlete who sustains a severe injury, may or may not return to play during the current season. This eliminates the chance of sustaining a high number of injuries during the course of the season (Thompson & Morris, 1994). Operational definitions of injury should be more sensitive to situations such as this.

The problem lies in the lack of a standard definition of injury. Lysens et al. (1986) defined injury as that which occurred during a sports practice session and caused at least 3 days exclusion from sport practice. This definition makes no reference to injuries which occur during or exclude athletes from competition. Additional confounding variables include the athlete's willingness to return to play, pressures from coaches and teammates to return to play, the athlete's tolerance to injury, and the objectiveness of medical evaluations.

Thompson and Morris (1994) defined an injury as any traumatic event resulting in time loss from a game or the subsequent loss of 1 day from practice, a fracture, or any laceration requiring stitches. A similar definition was used by Rider and Hicks (1995). They defined an injury as a medical problem resulting from athletic participation that restricted subsequent participation for at least 1 day following the occurrence of the injury. These definitions may not be sensitive enough to include injuries such as mild concussions, when an athlete may return to practice the following day.

Hanson et al. (1992) defined an injury as any illness or injury that required the attention of an athletic trainer or team physician. This definition is sensitive enough to detect minor injuries that may not interfere with participation, but are legitimate injuries. The authors also used the Colorado Injury Rating System to classify the severity of all injuries.

Present Study

The focus of the present study was to investigate the relationship between life stress and athletic injury at the junior college level using coping skills as a moderating variable. Athletes competing in the sport of basketball were included. This sport provided for a comparison between males and females within the same sport. Injury rates were recorded according to the definition used by Hanson et al. (1992) and classified using the Colorado Injury Rating System. The number of days out because of injury, as defined earlier, was also recorded.

A statistical analysis was performed using stress levels, coping skills, and the total number of days an athlete was held out of participation due to injury. Non-statistical

analyses were also conducted for male versus female athletes within the same sport to determine any differences in the relationship between life stress and the occurrence of athletic injury.

CHAPTER 3

METHODS

The purpose of this research study was to investigate the relationship between life stress and athletic injury in male and female junior college basketball players. This chapter will discuss the participants, materials, and procedures used to conduct this investigation.

Participants

Subjects included those athletes participating in the sport of basketball at two junior colleges in the Greater San Francisco Bay Area during the 1999-2000 academic year. This sport was included because of the minimal amount of research in sports outside of football. Both male and female athletes were included because of the contradiction of results of previous studies using female athletes (Hardy & Riehl, 1988; Kerr & Minden, 1988; Williams et al., 1986). Subject involvement in this study was strictly voluntary.

Materials

The stress questionnaire for this study was based on the Social and Athletic Readjustment Rating Scale (SARRS) designed by Bramwell et al. (1975) (see Appendix A). The SARRS was originally developed for assessing life stress levels in 4-year collegiate athletes, but the majority of the items also pertain to 2-year collegiate athletes. The original questionnaire contained 57 items. Four items were removed from the questionnaire because of the low likelihood that athletes of the included age range would have had these experiences. The items were “foreclosure on mortgage or loan”, “taking

mortgage or loan greater than \$10,000", business readjustment", and "mortgage or loan less than \$10,000". The item "birth of a child" was added to the questionnaire based on the opinion of the researcher that this event can cause a great deal of stress in some individuals. The revised questionnaire contained 54 items.

Scores for each item were based on the development of this scale by Bramwell et al. (1975). The scores were obtained by computing the mean of the magnitude scores assigned by the subjects in the developmental study for this questionnaire. Scores range from 101, for "death of a spouse", to 4, for "change in recreation". The added item of "birth of a child" was given a value of 52, the same score as being dropped from the team and being fired from work. The potential score for each individual ranged from 0-1846. Stress scores for each individual were a total of the values assigned to each event the athlete indicated had occurred in his/her life during the previous 12 months.

The Athletic Coping Skills Inventory-28 (ACSI-28) (Smith et al., 1995) was used to assess the coping abilities of each athlete ($R = .87$) (see Appendix B). The questionnaire contained 28 items with 7 factors. Each factor had four items. The factors were "Coping with Adversity", "Coachability", "Concentration", "Confidence and Achievement Motivation", "Goal Setting and Mental Preparation", "Peaking Under Pressure", and "Freedom from Worry". Examples of items included were. "On a daily or weekly basis, I set very specific goals for myself that guide what I do", "I tend to play better under pressure because I think more clearly" and "I maintain emotional control regardless of how things are going for me".

The athletes were asked to indicate how often he/she experienced each situation using the scale “almost never”, “sometimes”, “often”, or “almost always”. Items were scored from 0 (almost never) to 3 (almost always). For 6 factors, scoring was reversed, meaning an answer of almost never will receive a score of 3 and an answer of almost always will receive a score of 0. The potential range of each individual’s score was 0-84. The scores from this questionnaire were statistically compared with stress scores and injury rates.

Demographic information requested on the survey included name, age, school, year in school (freshman, sophomore), gender, and number of years playing the sport of basketball. Names and school were used only to match subjects with the appropriate injury records, not to refer to a specific participant.

The Colorado Injury Rating System was used by the athletic trainers at each junior college to classify the severity of each injury (see Appendix C). This system assesses the severity of athletic injuries by the need for treatment, modification of activity, and absence from practice or games. The ratings are: mild - treatment required with no modification of activity; moderate - treatment with activity modification; severe 1 - nonparticipation for 1 to 7 days; severe 2 - nonparticipation for 1 to 4 weeks; and, severe 3 - nonparticipation for more than 4 weeks (Hanson et al., 1992).

Procedures

Prior to collection of data, approval to use human subjects was obtained from San Jose State University. Verbal permission was obtained from the athletic director from each junior college. Verbal consent was also obtained from the coach of each individual

team. Informed consent was obtained from each participant on the day the questionnaire was administered (see Appendix F). Permission was also requested in each informed consent to access each subject's injury records from his/her respective athletic training staff.

Each athletic trainer received specific instructions for recording and rating injuries based on the Colorado Injury Reporting System (Hanson et al., 1992). Records also included the total days out due to injury, as defined earlier. The day the athlete was injured was considered day 1. The data was collected from each athletic trainer at the conclusion of the athletic season.

Questionnaires were given by the researcher in group format for each individual team at each junior college. Questionnaires were administered approximately mid-season for each team. Instructions for completing the questionnaire were at the top of each copy and were read out loud to the group by the researcher. Any questions concerning the questionnaire or procedures for its completion were answered at that time. Participants indicated the number of times each event had occurred in their lives during the previous 12 months. After completing the questionnaire, each participant returned it to the researcher. For identification purposes only, a subject number was assigned to each participant. The top portion of the questionnaire included each athlete's name, school, and subject number. This portion was detached and given to the athletic trainer at the corresponding school. The subject number assigned to each individual was used to report injury data to the researcher. Individual names were not used. Calculated stress and coping skills scores were only associated with the respective subject number.

Data Analysis

The total number of athletes participating in the study was recorded along with the percentage of males and females. The mean age, standard deviation, and range were recorded for the entire group and for each gender.

Means and standard deviations for the SARRS and ACSI-28 scores were determined and reported for the total sample and for year in school, as well as for males and females separately. Number of injuries and days out were also summarized with means and standard deviations for the entire sample, males, females, and year in school.

A two-way ANOVA was planned using days out as the dependent variable. Independent variables were to be the SARRS category and the ACSI-28 category. The categories used were low, medium, or high using an equal number of subjects in each group. This was determined after data had been collected. Since the assumptions associated with a two-way ANOVA were not met, the non-parametrical equivalent, Kruskal-Wallis, was used. Two tests were performed. The first test included SARRS category as the independent variable and days out as the dependent variable. The second test used ACSI-28 category as the independent variable and days out as the dependent variable. Statistical tests were performed at an alpha level of .05/2.

A descriptive comparison was done for mean stress scores (SARRS) and mean coping skills scores (ACSI-28) by injury status (injured vs. non-injured) and by gender. Descriptive comparisons were also done between mean number of injuries and SARRS and ACSI-28 scores, and between days out and SARRS and ACSI-28 scores for each year in school and both genders. A graph was constructed to examine descriptively the

interaction between SARRS and ACSI-18 scores as they affect days out. To accomplish this, all raw scores were converted into z-scores and the horizontal axis was days out.

A crosstabulation table was also used to examine the relationship between SARRS category and injury status, as well as ACSI-28 category and injury status. Crosstabulation tables were also used to investigate injury category (0 injuries, 1-2 injuries, and 3 or more injuries) by SARRS and ACSI-28 categories. In addition, mean SARRS and ACSI-28 scores by injury category were examined. The relationship between years experience, SARRS, and ACSI-28 scores were also examined with a Pearson product moment correlation. Finally, the relationships between SARRS category and days out, and ACSI-28 category and days out, were examined separately using Spearman's Rank-Order Correlation.

CHAPTER 4

RESULTS

A total of 42 junior college athletes (48% male, 52% female) participated in this study. The mean age for the entire group was 19 years with a range of 18-23 years. Females had a mean age of 19.20 years with a range of 18-21 years, and males had a mean age of 19.59 years with a range of 18-23 years. Freshmen had a mean age of 19.17 and the mean age of sophomores was 19.68. Mean years experience in the sport of basketball for all participants was 9.62. Females, males, freshmen, and sophomores had mean years experience of 9.00, 10.11, 10.90, and 8.82, respectively. The lower mean for sophomores is due to one male having only 1 year of experience.

Table 1

Subject Characteristics

	<u>n</u>	<u>P</u>	<u>Age (y)</u>	<u>SD</u>	<u>Experience (y)</u>	<u>SD</u>
Females	20	48	19.20	0.83	9.00	5.63
Males	22	52	19.59	1.22	10.11	6.23
Freshmen	23	55	19.17	1.30	10.90	5.97
Sophomores	19	45	19.68	0.58	8.82	3.26
All	42	100	19.40	1.06	9.62	3.98

The mean SARRS and ACSI-28 scores for the entire sample were 515.69 and 49.26, respectively. Both mean scores are moderate as compared to the literature (Bramwell et al., 1975; Cryan & Alles, 1983). Freshmen had mean SARRS and ACSI-28 scores of 569.26 and 50.96, respectively. The mean SARRS and ACSI-28 scores for sophomores were 450.84 and 47.21, respectively. Females had mean SARRS and ACSI-28 scores of 609.05 and 45.90, respectively. Mean SARRS and ACSI-28 scores for males were 430.82 and 52.32, respectively.

Table 2

Summary of SARRS and ACSI-28 Scores

SARRS Scores	<u>M</u>	<u>SD</u>	<u>n</u>	ACSI-28 Scores	<u>M</u>	<u>SD</u>	<u>n</u>
All	515.69	242.66	42	All	49.26	10.65	42
Freshmen	569.26	263.18	23	Freshmen	50.96	9.12	23
Sophomores	450.84	203.38	19	Sophomores	47.21	12.18	19
Females	609.05	186.97	20	Females	45.90	11.53	20
Males	430.82	148.79	22	Males	52.32	8.97	22

Mean number of injuries for the entire sample, males, females, freshmen, and sophomores were .86, .73, 1.00, .52, and 1.26, respectively. Mean days out due to injury for the entire sample, males, females, freshmen, and sophomores were determined to be

4.20, 5.22, 3.36, 5.11, and 3.45, respectively. It should be noted that the data for one subject was left out since it was considered to be an outlier (days out = 130).

Table 3

Summary of Injuries and Days Out

Injuries	<u>n</u>	<u>M</u>	<u>SD</u>	Days Out	<u>n</u>	<u>M</u>	<u>SD</u>
All	42	0.86	1.16	All	20	4.20	4.23
Freshmen	23	0.52	0.67	Freshmen	9	5.11	4.73
Sophomores	19	1.26	1.48	Sophomores	11	3.45	3.83
Females	20	1.00	1.30	Females	11	3.36	3.78
Males	22	0.73	1.03	Males	9	5.22	4.74

The SARRS and ACSI-28 scores were categorized as low, medium, and high. Break points were determined based on the distribution of subjects' scores so that similar numbers were in each category. The higher the SARRS score, the more stressors the individual experienced during the previous 12 months. The higher the ACSI-28 score, the better the individual's coping ability. The categories for SARRS scores were divided as low ranging from 0-353, medium from 354-586, and high from 587-1270. ACSI-28 scores were categorized as low ranging from 1-44, medium from 45-53, and high from 54-70. Due to the fact that assumptions for testing the interaction between coping skills and life stress were not met, separate analyses were done to examine differences in days

out due to coping skills and life stress. Two Kruskal-Wallis tests were conducted using an alpha level of .05/2. No statistically significant difference was found in median days out due to SARRS category, $H(2) = 2.28$, $p = .32$, nor due to ACSI-28 category, $H(2) = 1.05$, $p = .59$.

A descriptive comparison of mean SARRS score by injury status (injured vs. non-injured) resulted in a mean SARRS score of 529.24 for injured athletes and 481.16 for non-injured athletes. A comparison of mean ACSI-28 scores by injury status showed a mean coping skills score of 48.24 for injured athletes and 50.84 for non-injured athletes. Injured athletes showed a trend for higher stress scores and lower coping skills scores as compared to non-injured athletes.

A crosstabulation table examining the relationship between SARRS category and injury status did not show any significant trends. A crosstabulation of ACSI-28 category and injury status showed a slight trend of non-injured athletes having higher ACSI-28 scores. No notable trends were found in the crosstabulation of injury category and SARRS category. A trend was noted in the crosstabulation of injury category and ACSI-28 category for athletes with fewer injuries to have higher ACSI-28 scores and athletes with more injuries to have lower ACSI-28 scores.

The graph constructed to descriptively examine the interaction between SARRS and ACSI-28 scores (raw scores converted to z-scores) as they affect days out showed no trends for increasing stress level and decreasing coping skills as the number of days out increased. Coping skills and life stress levels did not seem to affect injury severity as measured by number of days out for this data set.

In a comparison of mean SARRS scores and mean ACSI-28 scores by injury category, a trend was noted in the data for athletes with fewer injuries to have lower SARRS scores and high ACSI-28 scores. Athletes with more injuries had higher SARRS scores and lower ACSI-28 scores.

A Pearson product moment correlation of total years of athletic experience by SARRS and ACSI-28 scores did not produce significant results ($r = .19, .21$, respectively). Correlations between SARRS category and number of days out, and for ACSI-28 category and number of days out, showed weak to slightly moderate relationships using Spearman's Rank-Order Correlation ($r = -.29, .37$, respectively).

CHAPTER 5

DISCUSSION

The results of the present study suggest that the relationship between life stress and injury in junior college basketball players may be affected by coping skills. Unfortunately, the moderating effect was not able to be tested, so no statistically significant relationship was found between these variables. However, the data did reveal some interesting trends that warrant further research in this area.

A trend was noted for athletes with fewer injuries to have lower SARRS scores and higher ACSI-28 scores. This suggests that these athletes experienced less stress during the previous 12 months and had better coping skills with which to deal with the stress they did experience. In contrast, athletes with more injuries showed a tendency for higher SARRS scores and lower ACSI-28 scores. These athletes were experiencing more stress and had less effective coping skills.

Another interesting finding was that freshmen had slightly higher mean SARRS scores and slightly lower ACSI-28 scores than sophomores. This finding would be expected due to the fact that freshmen are dealing with the new experiences associated with the beginning of post-secondary schooling. Females also had slightly higher mean SARRS scores and slightly lower ACSI-28 scores than males. This data may show a trend for female athletes to interpret situations as being stressful and to have less effective coping skills. This trend in female athletes would show support for the research findings of Kerr and Minden (1988). However, these findings conflict with the research of Hardy et al. (1991) in which it is suggested that the stress-injury relationship does not show up

in female athletes because they are better able to manage stressful situations and have more constant and stable sources of social support. The present findings showed that females showed a trend for lower coping skills levels than males. However, the small sample size must be acknowledged.

Patterns in the data from the present study were similar to those of previous research studies in this area, however the present findings were not as extreme. The mean SARRS scores obtained in this study for non-injury athletes were very similar to the findings of Cryan and Alles (1983) and only slightly lower for injured athletes. The same comparison can be made to the results of Bramwell et al. (1975). Mean scores were similar between studies for non-injured athletes, while the mean SARRS scores obtained for injured athletes in the present study were slightly lower.

Female participants in this study had higher mean stress scores and lower mean coping skills scores than male participants. The findings of previous research focusing on the stress-injury relationship in female athletes have been inconsistent. The present results show a trend supporting the findings of Kerr and Minden (1988). The findings are in contrast to suggestions by Hardy et al. (1991) that the reason the stress-injury relationship does not exist in female athletes is that females seems to have better coping skills and more social support.

It was recognized that more subjects were needed to increase power and the likelihood of obtaining significant results. Also, more subjects may have allowed the assumptions for a two-way ANOVA to be met, so it may be noted that the current findings are tentative. The intent was to include athletes from a variety of sports, but

permission from the coaches of these teams was not granted. This may be the subject of future research.

For this study, the questionnaires were administered during the second half of the season. Stress levels and coping skills may have been at levels that were not representative of the entire season due to the fact that play-off games were approaching. A suggestion for further research would be to test earlier in the season. Another suggestion for further research would be to administer the life stress and coping skills questionnaires at multiple times during the course of the season. Stress and the ability to cope with situations encountered by athletes are certainly variables that may fluctuate due to a variety of circumstances.

Differences were noted in SARRS and ACSI-28 scores between freshmen and sophomores and males and females. It may also be of interest to conduct further investigations to determine if year in school and gender interact to affect SARRS and ACSI-28 scores.

Appendix A

Social and Athletic Readjustment Rating Scale

Name: _____

Subject # _____

School: _____
(please print clearly)

Age: _____

Subject # _____

Year in School: Fr So
(circle one)

Sport: (check one)

_____ wrestling	_____ water polo
_____ basketball	_____ field hockey
_____ soccer	

Sex: M F
(circle one)Years experience in
sport listed above _____

To the best of your ability, please indicate the number of times the following events have occurred in your life during the past 12 months by placing the appropriate number on the line next to each item. Please indicate any other events which occurred in your life not included in the questionnaire. **All answers will remain strictly confidential.** Return this questionnaire to the researcher when you are finished.

1) Death of spouse.	_____
2) Death of close family member.	_____
3) Marriage.	_____
4) Death of a close friend.	_____
5) Divorce.	_____
6) Marital separation.	_____
7) Being dropped from team.	_____
8) Being fired from work.	_____
9) Entering college.	_____
10) Personal injury or illness.	_____

- 11) Change in health of family member. _____
- 12) Begin or cease formal schooling. _____
- 13) Change in financial status. _____
- 14) Jail term. _____
- 15) Outstanding personal achievement. _____
- 16) Change to different kind of work. _____
- 17) Change in level of performance. _____
- 18) Troubles with head coach. _____
- 19) Gaining a new family member. _____
- 20) Sexual difficulties. _____
- 21) Change in responsibility at work. _____
- 22) Change in number of arguments with
spouse or girl/boyfriend. _____
- 23) Being dropped to lesser playing status. _____
- 24) Changing to new school or team. _____
- 25) Discrimination from coaches or team. _____
- 26) Difficulties with eligibility. _____
- 27) Difficulties in demonstrating athletic
ability. _____
- 28) Troubles with assistant coaches. _____
- 29) Girl/boyfriend begins or ceases work. _____
- 30) Marital reconciliation. _____
- 31) Troubles with athletic director. _____
- 32) Major errors in ball games. _____
- 33) Change in living condition. _____
- 34) Playing time lost due to injury. _____
- 35) Separation from girl/boyfriend. _____
- 36) Changing to new position. _____
- 37) Change in social activities. _____
- 38) Troubles with family members. _____

- 39) Change in personal habits. _____
- 40) Discrimination in community
(because of race, athletic status, etc.) _____
- 41) Change in work hours or conditions. _____
- 42) Change in team responsibility. _____
- 43) Change in playing time or conditions. _____
- 44) Brother or sister leaving home. _____
- 45) Change in eating habits. _____
- 46) Change in sleeping habits. _____
- 47) Difficulties with trainer or physician. _____
- 48) Vacation. _____
- 49) Change in residence. _____
- 50) Change in family get-togethers. _____
- 51) Minor violations of the law. _____
- 52) Change in religious activities. _____
- 53) Change in recreation. _____
- 54) Birth of child. _____

Appendix B

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 check the box which indicates how often you have these experiences when playing sports (almost never, sometimes, often, almost always). Return the questionnaire to the researcher when you are done.

	Almost Never	Sometimes	Often	Almost Always
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.	☐	☐	☐	☐

	Almost Never	Sometimes	Often	Almost Always
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 the game, the more I enjoy it.	☐	☐	☐	☐
19. While competing, I worry about 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.	☐	☐	☐	☐

	Almost Never	Sometimes	Often	Almost Always
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.	☐	☐	☐	☐

Appendix C

Injury Report Form

Please complete this injury report as accurately as possible. Please include the subject number, name, sport, injury, practices or games missed due to injury, and the severity using the Colorado Injury Rating System. When reporting injury data to the researcher, only use the subject's number, not the subject's name.

Days Out: The day an athlete is injured is considered day 1, regardless of whether the athlete returns to play that same day. Subsequent days out are practices or games missed entirely because of injury.

Severity: Mild - treatment required But no modification of activity
 Moderate - treatment with activity modification
 Severe 1 - nonparticipation for 1 to 7 days
 Severe 2 - nonparticipation for 1 to 4 weeks
 Severe 3 - nonparticipation for more than 4 weeks

[illegible]

Appendix D

Informed Consent

Your participation has been requested for a research study investigating the relationship between stress and athletic injury. This study is being conducted with junior college athletes in the San Francisco Bay Area. You will be asked to complete 2 questionnaires. The first questionnaire is designed to measure life stress levels and the second is to measure coping abilities. Injury records will also be obtained from the athletic trainers at your school. Only for the purpose of accessing your injury records are you asked to provide your name.

There are no foreseeable risks or discomforts to the participants of this study. The possible benefits resulting from your participation in this study is to help prevent the occurrence of athletic injuries by achieving a better understanding of the causes of such injuries, and to be able to identify athletes who may be at risk for sustaining an injury. The results of this study may be published, but no information will be included that could identify individual participants.

Consent to participate is given voluntarily. You may refuse to participate in this study or any part of the study. If you choose to participate, you are free to withdraw at any time without penalty to you or your school, or prejudice to your relations with San Jose State University.

Any questions you have concerning this study or the participation of your athletes may be addressed by the principal investigator, Julie Finck at (510) 782-9655, or the thesis advisor Dr. David Furst at (408) 924-3039. Complaints about the research may be presented to the Chair of the Department of Human Performance at San Jose State University, Dr. Carol Christensen at (408) 924-3010, or to Nabil Ibrahim, Academic Vice President for Graduate Studies and Research at (408) 924-2480.

I have read the above information and understand the nature, demands, risks, and benefits of the research study. I hereby give my permission to participate in this study. I have received a signed and dated copy of this consent form.

Signature _____ Date _____

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